



New Mobility and Technology 2018

TABLE OF CONTENTS

	Page
Introduction	1
Background.....	1
Shared Use Mobility.....	3
Connected and Autonomous Vehicles.....	5
Freight and Delivery Services.....	8
Future Scenarios.....	10
Current Actions	11
Street Design Test Space.....	11
Innovation Delivery and Performance.....	11
Best Practices from Peer Cities	12
Los Angeles.....	12
Austin.....	13
Columbus.....	14
Considerations	15
Public Transportation.....	15
Data	16
An Atlanta Action Plan	20
Infrastructure.....	20
Policy and Planning.....	20
Data Management	22
Engagement	23
Testing.....	23
Procurement	24

INTRODUCTION

Atlanta's Transportation Plan is the access strategy for Atlanta City Design. The Plan is divided into a concise final report and a series of detailed technical appendices. The final report summarizes Atlanta's Transportation Plan in an easily digestible manner using infographics, maps, and images and is intended for the general public and elected officials. The technical memorandums are intended for planners, City staff, and implementation partners that require a higher level of detail.

As part of Atlanta's Transportation Plan, this technical appendix focuses on the impact of autonomous and connected vehicles, shared mobility options, and technology on the transportation system. This document provides an overview of the emerging national and regional trends in technology and mobility, and case studies of smart cities around the country with implications for Atlanta. Finally, the document presents a series of recommendations and action items to prepare Atlanta for the emergence of new mobility models, technologies, and challenges.

BACKGROUND

Transportation and technology experts agree that we are entering the biggest transportation revolution since the widespread adoption of the personal automobile, which began nearly a century ago. This transition began with the ubiquity of cell phones and will quicken when automation becomes widespread. Although some of the biggest changes in our ongoing mobility revolution are not yet visible on city streets, they are certainly in the mid-term planning horizon, with initial autonomous vehicles likely to be on the road within a decade. Connected and autonomous vehicles will likely speed up and scale up many of the current trends we are already seeing on Atlanta streets, and introduce a completely new host of impacts and opportunities.

The most important lesson learned from the automobile era is that core civic goals must be maintained and reprioritized during times of change. Some goals, such as the need to create walkable communities, opportunities for physical activity, and affordable transportation options, are timeless, regardless of the presence of any new mobility technology. The reminders of the risks of allowing new mobility tools to self-regulate and drive urban policies still linger. We allowed private vehicles to reshape our cities, and most American cities are still facing down the monumental task of correcting course to provide other mobility options. On the threshold of our entrance into a new era of mobility technology, this time the City of Atlanta, and its peer cities, must put their own goals and visions ahead of the technology, and let the technology serve broader goals, rather than adjusting goals to meet the technology. Atlanta's transportation system goals are safety, mobility, and affordability, with reduced congestion, improved access, and increased economic growth. The vision of a safer system calls for eliminating traffic fatalities, reducing injuries, reducing emissions, improving air quality, and boosting active

transportation opportunities. Achieving mobility involves locating density around transportation investments, and focusing on maintenance over new facilities. A vision for affordability calls for reducing transportation costs for lower income households, providing options to economically disadvantaged neighborhoods, expanding access to jobs and services, and supporting livable communities and local character through great design. To serve these goals, emerging mobility technologies must:

1. Increase access and mobility for all;
2. Improve public health and environmental outcomes; and
3. Achieve a higher cost efficiency of mobility ecosystem.

To the extent that emerging mobility tools support these goals, they should be allowed and encouraged. However, there will also be matters of induced demand, unanticipated secondary effects, and unintended consequences associated with new options.

While great uncertainty exists, waiting to act is the biggest risk of all. There will be many upcoming opportunities to set the rules and incentives for different mobility tools. Atlanta needs a clear agenda in navigating these new, unknown opportunities. For autonomous vehicles, the biggest risk is that more currently shared trips become disaggregated and the newfound ease of driving causes a major increase in induced demand and thus more auto trips and congestion. Smart partnership decisions should acknowledge this long-term risk, and avoid decisions that increase it. Demand management tools should be in place before a full saturation of autonomous vehicles takes place, to reduce risks of unchecked, induced demand leading to more emissions, more traffic, and more congestion. Some transportation options such as walking, biking, and transit, need to become more attractive than ever to compete with new auto-based options. The rate of change of mobility options will require a new, faster-paced approach and a playbook for piloting and testing new tools. Navigating this change requires a commitment to Atlanta's overriding mobility goals, and new policies, procurement methods, and infrastructure typologies, which are described in detail in the last section of this paper.

The Opportunity

In the past decade, emerging technologies, new mobility providers, and new ways of accessing real-time travel information have changed the way many people get around. The growth of the sharing economy and the promise of autonomous vehicles will continue to shift how we consider, price, access, and use transportation. From ride-hailing and bikesharing to connected vehicles and microtransit, new mobility service providers offer a great customer experience that people have come to expect. These mobility trends are already intertwining with demographic and behavior shifts to create new types of transportation consumers.

However, while much has been written about new technologies and private mobility service providers, less is known about how these new entrants have influenced demand for existing modes. How can private companies augment under-performing public transit routes? How might we ensure equitable and affordable access? What role does technology have in fulfilling mobility

needs? This White Paper explores the emergence of new on-demand technologies (including shared mobility and connected and autonomous vehicles), the implications they may have for the shape of our future cities, and proactive strategies for cities like Atlanta.

SHARED USE MOBILITY

Shared use mobility is a new form of travel that shares characteristics of both public and private transportation. Shared mobility refers to transportation services that allow individual users to access or 'share' the use of a common vehicle (such as a bicycle, car, taxi, shuttle, bus, or scooter) on a short-term or as needed basis rather than owning a private vehicle. Often, users access a pool of vehicles through the aid of a smartphone, computer, or tablet. Common examples of technology enabled shared mobility include ride-hailing, carshare, bikeshare, and microtransit, or shared shuttles.

Within the umbrella of shared mobility, there are different models and providers offering an array of services targeted at different types of trips. As the largest and longest running carshare service in the country, Zipcar offers a membership based, two-way ("round trip"), short-term car rental model. Similarly, car2go focuses primarily on one-way carsharing with a specialized fleet of smaller, two-passenger vehicles. Transportation Network Companies (TNCs), such as Lyft and Uber, are shared mobility providers that connect users with drivers in real time through a smartphone. These companies also allow users to share the cost of a ride with multiple passengers headed in a similar route (called Lyft Line and Uber Pool, respectively).

While carsharing and ride-hailing are generally used for longer distance trips, bikesharing is particularly useful for shorter trips, such as running errands, biking to or from transit stations, or for work commutes of less than three miles. Bikeshare systems can utilize stations or on-bike locking mechanisms and users access the bicycles through their smartphone. For shorter trips often to and from transit stations, some cities are experimenting with microtransit. Services like Via and Chariot are on-demand, shared commuter shuttle systems without fixed routes. A passenger can summon a ride through his or her smartphone, but may have to walk a few blocks to reach a designated pick up spot.

While these shared mobility models are relatively new, they are rapidly growing in cities nationwide. Since first launching in 2010, bikesharing is now available in 55 cities, with 28 million trips taken in 2016 alone – a number comparable to Amtrak's annual ridership.¹ TNCs, such as Lyft and Uber, operate in hundreds of cities nationwide, while carsharing has an estimated 800,000 users in the United States.² In New York City alone, the number of licensed TNC vehicles grew exponentially in the last two years, from less than 10,000 in January 2014 to

¹ National Association of City Transportation Officials (9 March 2017) *Bike-Share in the US: 2010-2016*
<http://nacto.org/bike-share-statistics-2016/>

² Steinberg, S. and Vlasic, B. (25 Jan 2013) *Car-Sharing Services Grow, and Expand Options*
http://www.nytimes.com/2013/01/26/business/car-sharing-services-grow-and-expand-options.html?ref=technology&_r=0

nearly 43,000 in October 2016.³ Ridership, too has grown substantially, averaging 15 million monthly riders by October 2016.³

Potential Benefits

Across the country, this impressive growth in shared mobility reveals the relative appeal of these new options to existing choices. Shared mobility services enables a sense of ownership of one's trip, reducing the need for ownership of a personal vehicle. People are increasingly willing to forgo using a private vehicle for the comfort and ease of a shared option that meets their mobility needs as evidenced by fewer teenagers across the country opting to get a driver's license⁴. The market size for shared mobility is still indefinite but it is likely that this trend will continue to grow. When combined with urban transit, shared mobility offers the opportunity to reduce parking demand, increase developable land available for other more productive uses, such as affordable housing or open space. Less time spent looking for parking will reduce traffic congestion and emissions as well.

Ride-hailing services, which reduce the cost of trips when they are shared with other travelers, may increase vehicle occupancy and reduce the overall number of cars on the road and miles being driven. In a 2014 study among taxi and TNC users surveyed in San Francisco, TNC users averaged a higher vehicle occupancy rate than taxi users and were less likely to have a personal vehicle at home.⁵ In a follow-up study about carsharing, the same researchers found that carsharing also yielded positive results, such as decreased car ownership. Half of the carshare users studied were more likely to sell their vehicle or to postpone a vehicle purchase after switching to carsharing.⁶ The study also found that each carsharing vehicle replaced 9 to 13 vehicles on the road, thereby lowering household greenhouse gas emissions and vehicles miles travelled.⁷

Challenges and Uncertainties

Despite these potential benefits, shared mobility faces multiple uncertainties from an environmental, equity, and regulatory perspective. Despite its explosive growth, increasing brand recognition, and the benefits outlined above, most Americans continue to make the

³Schaller, B. (27 Feb 2017) *Unsustainable? The Growth of App-Based Ride Services and Traffic, Travel and the Future of New York City* <http://www.schallerconsult.com/rideservices/unsustainable.pdf>

⁴ Sivak, M. and Schoettle, B. (2016) *Recent Decreases in the Proportion of Persons with a Driver's License across All Age Groups*. University of Michigan Transportation Research Institute. http://www.umich.edu/~umtriswt/PDF/UMTRI-2016-4_Abstract_English.pdf

⁵ Shaheen, S. (4 Nov 2014) *Transportation Network Companies and Ridesourcing*. University of California Berkeley Transportation Sustainability Research Center.

⁶ Shaheen, S. N. Chan, A. Bansal, and A. Cohen, *Shared Mobility: Definitions, Industry Developments, and Early Understanding* University of California Berkeley Transportation Sustainability Research Center http://innovativemobility.org/wp-content/uploads/2015/11/SharedMobility_WhitePaper_FINAL.pdf

majority of their trips by private car and own at least one vehicle. The evidence is mixed regarding the growth of shared mobility options and implications for vehicle ownership and use.⁷

Shared mobility services also currently attract a very specific demographic – young⁵, urban, and well-educated⁵ users with access to smartphones and credit cards. While it is unclear if shared mobility will spread to other segments of the population, this disparity is raising concerns about transportation equity and access.

Further, while some shared mobility options serve as a complement to public transportation, it is unclear if the growth in sharing will eventually become a substitute for public transportation and reduce the effectiveness of buses and rail. For example, one study found that bikeshare users in larger cities were less inclined to take buses. However, in cities where bus ridership grew, bikeshare was partly attributed to the increase in ridership due to its role in providing increased access to and from transit stops.⁶ Cities with bikeshare systems also saw other positive side benefits, such as a 58% average increase in bicycling throughout the City and a 50% decrease in personal auto usage by bikeshare members⁶. Similarly, while TNCs have shown to displace taxi trips³, it is unclear how the growth of Lyft and Uber have affected transit ridership nationwide.⁸ There have also been numerous challenges to regulating TNCs, with governments and private companies continuing to negotiate licensing, curbside access, data sharing, employee contracting, and requirements for Americans With Disabilities Act (ADA) access.

CONNECTED AND AUTONOMOUS VEHICLES

The promise of connected and autonomous vehicles for use as both personal vehicles (owned and for-hire), as well as for freight and public transit has the potential to fundamentally reshape the landscape of mobility in the United States. The U.S. Department of Transportation defines connected vehicles as technologies that allow a vehicle to communicate with fixed traffic infrastructure (i.e. signals and light poles), with other vehicles and with smartphones using radar, cameras and other sensors in order to increase traffic safety and curb the high amount of traffic fatalities that occur every year in the country⁹. Autonomous vehicles (AVs) use connected vehicle technologies in order to operate on their own without the assistance of a human driver. Although AVs are commonly imagined as completely driverless vehicles, the National Highway Traffic Safety Administration (NHTSA) classifies AVs into a 5-point scale of autonomy with level zero being a completely human driven, traditional vehicle and a level five being a fully driverless vehicle that requires no human oversight. The full spectrum of levels is described below:

⁷ City of New York Office of the Mayor (Jan 2016) *For Hire Vehicle Transportation Study* <http://www1.nyc.gov/assets/operations/downloads/pdf/For-Hire-Vehicle-Transportation-Study.pdf>

⁸ City of New York Office of the Mayor (Jan 2016) *For Hire Vehicle Transportation Study* <http://www1.nyc.gov/assets/operations/downloads/pdf/For-Hire-Vehicle-Transportation-Study.pdf>

⁹ USDOT ITS Joint Programs Office, Office of the Assistant Secretary for Research and Technology. *Connected Vehicle Basics* https://www.its.dot.gov/cv_basics/cv_basics_what.htm

- **Level 1:** One specific function may be done automatically by the vehicle, such as steering or accelerating;
- **Level 2:** A driver assistance system in which the vehicle operates smaller aspects both steering and acceleration concurrently (such as cruise control or lane centering) using computer vision, with the driver constantly monitoring the situation and ready to take control at any time;
- **Level 3:** Driver is still present and ready to intervene, but safety-critical functions are operated by the vehicle and does not require constant monitoring by the driver;
- **Level 4:** The vehicle is fully autonomous for most safety-critical driving functions and major roadway conditions for the entire trip;
- **Level 5:** Fully autonomous performance for every driving scenario, including extreme conditions.

While research and development of AVs has been going on for some time, recent technological advances have allowed companies, including traditional automakers such as Ford, Tesla, Volvo, Audi, and BMW, to start testing AVs. Currently, Level 2 vehicles are available on the market, and Level 4 and 5 vehicles are in testing on public rights-of-way in several cities and private test sites. With technology estimated to evolve to complete autonomous capability by 2022, and 100% autonomous penetration by 2045, cities across the country are beginning to plan now for shifts in parking requirements, street design standards, curbside management, and safety requirements in anticipation.¹⁰

Although the timeline for when AVs will be operating on the street and available for large-scale public use is uncertain, it is clear that this technology is going to reshape the auto market. In 2016, the U.S. Department of Transportation's NHTSA released new policy guidance and a proposal to invest nearly \$4 billion on AV research and development, steering state governments to be flexible and innovative yet show strong leadership in AV regulation. The policy seeks to set general standards for safety, flexibility, data sharing, and ethics, while distributing model policy language and best practices guidance for state departments of transportation.

Benefits

From a policy perspective, connected and autonomous vehicles may offer a number of benefits in the realms of safety, efficiency, accessibility and land use¹¹. Given that human behavior or human error accounts for the vast majority of road collisions¹², AVs have tremendous potential to decrease fatalities, curb drunk and distracted driving, and reduce speeding (currently, AVs

¹⁰ Morgan Stanley. (2013). *Autonomous Cars: Self-Driving the New Auto Industry Paradigm*. <http://orfe.princeton.edu/~alaink/SmartDrivingCars/PDFs/Nov2013MORGAN-STANLEY-BLUE-PAPER-AUTONOMOUS-CARS%EF%BC%9A-SELF-DRIVING-THE-NEW-AUTO-INDUSTRY-PARADIGM.pdf>

¹¹ Anderson, James M., Nidhi Kalra, Karlyn Stanley, Paul Sorensen, Constantine Samaras and Tobi A. Oluwatola (2016) *Autonomous Vehicle Technology: A Guide for Policymakers*. Santa Monica, CA: RAND Corporation. http://www.rand.org/pubs/research_reports/RR443-2.html

are required to follow the posted speed limit). In addition to increasing traffic safety, the ability for vehicles to communicate with each other without relying on human reaction time could increase efficiency in traffic flow through *platooning*, or the ability of multiple vehicles to accelerate or brake simultaneously. AVs may also increase mobility options for those unable to drive, such as children, the elderly, and people with disabilities. Lastly, if used as shared vehicles, AVs also have the potential to decrease auto ownership and free up hundreds or thousands of unused parking spaces in cities, leaving room to repurpose land into open space or affordable housing.

Challenges and Uncertainties

While there has been tremendous speculation about the potential benefits of AVs, questions about the transition to Level 4 and 5 automation while human drivers remain on the road, as well as costs, equity, and safety have intensified in recent years. Though it is expected that safety will be improved because of automation reducing driver error, it will take decades for roadways to become fully automated. In addition, there are concerns of negative impacts AVs may have on VMT and emission levels if empty cars are circulating the roadways while waiting for a user. As technology has the potential to increase the capacity of existing roadways and intersections through more efficient signal timing and tighter vehicle spacing, reducing congestion concerns, lower costs and added convenience may encourage individuals to utilize their own vehicles to live even farther away as opposed to taking transit. There will also be questions of who pays for additional infrastructure required to accommodate the new vehicles and what forms of financing are available. Lastly, AVs will not bring the benefits related to improved public health, economic development, and quality of life, as seen with active transportation. Modal balance of the transportation system and sprawl control will be just as important in the future as it is today to achieve healthy, livable cities.

In order for connected and autonomous vehicles to integrate smoothly into existing infrastructure while promoting local sustainability and livability goals, cities must prepare to adequately regulate emerging technology. While AVs can have immense safety benefits, they need to be deployed in an equitable, sustainable, and efficient manner that aligns with best practices in urban planning. AVs will work best when they promote safety for all street users, including pedestrians, bicyclists, people with disabilities, and transit users, and retrofit excess roadway capacity into increased walking and bicycling facilities. They should complement public transit by providing affordable, shared, electric on-demand service rather than replace transit. To alleviate overcrowding, AVs should pay congestion fees in order to use public roadway for testing, and restrict cruising and exterior ads during testing. Lastly, cities should continue to incentivize urban living and curb sprawl so that the conveniences of driverless technologies do not encourage additional greenfield development.

FREIGHT AND DELIVERY SERVICES

Perhaps in less obvious ways, the delivery of goods and services is also undergoing a major transformation. Automation and new technologies are reshaping the warehousing and shipping industries, allowing efficiencies in products arriving from around the world and delivered to a consumer's home. Major nearby infrastructure projects like the Savannah Harbor Expansion and the Chatsworth Inland Port will continue to place Atlanta at the crossroads of shipping, trade, and transfer.

Our supply chains are more integrated than ever before and there has been a significant increase in just-in-time deliveries, such as Amazon services and grocery and food delivery services. The impact of these shifts on the transportation system will be profound. Shopping, shipping, and freight comprise a major portion of our trips, and these changes have the potential to dramatically reduce consumer trips. While these services primarily currently stop at the curb for delivery, the first wave of robotic sidewalk delivery tools are undergoing testing to extend the delivery systems to the sidewalk and front doors. The ease of delivery services is expected to increase, and consumer travel demand may change.

Challenges and Uncertainties

The increasing delivery of goods and people at the curbside will continue to drive up the demand and value of the curbside space. This space has typically been used for a parking lane, but some of that space will need to be reorganized to serve delivery and pick-up needs, in addition to transit priorities. The value of this curb space is increasing, but this is occurring at a time when the pricing tools typically used to manage on-street parking (parking meters) will begin to diminish in effectiveness. While parking meters are effective in managing demand for trips that involve car storage for some period of time, they are unable to manage demand using price for a deluge of quicker pick-up and drop-off movements by vehicles (whether shared fleet or personal vehicles). Parking pricing is an important tool for both managing access and overall vehicle demand. Finding replacement tools for demand management is an important goal. With so many new curb pressures, there are new conflicts, and thus a need for prioritization among users. The problems of the informality of new curb loading pressures is beginning to show in cities and neighborhoods that have the highest TNC adoption rate. Haphazard loading and unloading of passengers has created street safety issues. For example, unpredictable, frequent unloading of passengers can increase conflicts such as "dooring" incidents for bicyclists.

Opportunities

It is possible that this fundamental shift in how we obtain goods could increase efficiency in our system and reduce trips. Customers have historically not been efficient in their shopping and errand travel behavior. Companies like Amazon have much higher pressure for efficiency, and use highly efficient delivery algorithms to reduce unnecessary trips. This could potentially reduce vehicle miles travelled (VMT) from driving for shopping and errands, as personal trips

shift from human decision making to delivery services that use more rational routing and off-peak delivery windows. Urban freight deliveries during off-peak times have major implications for reducing or avoiding congestion.

City parking departments are reorienting to become “curbside” managers, reflecting the fuller range of their duties that include:

- Managing and pricing parking;
- Managing curbside access for delivery of goods and people (this used to occur more in commercial districts but now will scale to the whole city);
- Managing access for carshare pods and other shared use mobility spaces;
- Organizing TNC and AV pick up and drop off strategies; and
- Dividing curb space to allow creation of high quality bicycle and transit infrastructure.

Some cities are beginning to envision a new curb management zone typology that works more flexibly for short-term parking and deliveries. To manage demand in a way that is scaled up to this level of delivery maneuvers, cities will need to find new payment and charging technologies that can be applied to shorter term curbside access.

There is hope that reducing the demand for long-term parking can open up curb space for shared use and sustainable modes. If the need for off-street parking diminishes as well, cities can become more active, lively places that need less parking separating uses.

FUTURE SCENARIOS

Taken together, the trend toward shared mobility and the rapid advancement of autonomous vehicles raise uncertainties for the future of transportation in cities. On one hand, shared mobility and connected and autonomous vehicles could encourage more driving, which will lead to more congestion, more VMT and emissions, and less equity within metro regions. In this scenario, people would own their own autonomous private car and typically travel alone. Owners would be able to send their vehicles to run their errands and, when not in use, have them circle around or park in remote lots. In this scenario, those who are able to afford an AV frequently choose to live far from their jobs, increasing urban sprawl, vehicle miles travelled, and congestion, as people are willing to commute longer distances while working, sleeping, or exercising in their AV.

On the other end of the spectrum, advances in technology could lead to a greener, smarter city that is better equipped to manage its roads and public space. In this scenario, AVs would dynamically provide first-mile and last-mile solutions at lower cost than traditional transit service, while public transportation connects travelers across longer distances quickly and efficiently. AVs would mostly be owned by private companies providing a suite of mobility services depending on the nature of the trip and while individuals may own an AV, they are likely to share it when they are not using it. Some have also argued that walking and bicycling will also increase for shorter trips as roadways become safer and less congested.

While it is still unclear in which direction we are heading, with proactive planning, industry partnerships, and a culture of innovation, the reality of what happens will likely be a scenario somewhere in the middle. Both scenarios present serious questions about equity. How do cities leverage this opportunity to ensure mobility for lower income people and increase investment in traditionally disadvantaged neighborhoods? As shared mobility and autonomous vehicles reshape our transportation system, they offer a critical chance to redress inequitable development patterns, income disparities, and environmental injustices for historically disadvantaged communities. Without smart policy and planning, however, they may instead widen the access and inequality gap.

As shared mobility and AVs proliferate, we are already seeing potential equity concerns, such as the much longer wait times for TNCs in some areas or the unavailability of carsharing in some communities. Equity concerns also extend beyond the availability or deployment of the technologies themselves, but the availability of information regarding them. Understanding what mobility services work best for different situations is becoming increasingly complex as more entities that are private supplement or even begin to replace public services. Ensuring that residents know and understand their options could become a central issue.

CURRENT ACTIONS

While a new framework for navigating emerging mobility options is necessary, some existing innovation programs, listed below, may have some relevance in approaching these upcoming challenges. Furthermore, ongoing long-range planning efforts and funding available from the 2015 RenewAtlanta bond expenditure also bode well for the strengthening of Atlanta's transit system and vision.

STREET DESIGN TEST SPACE

The City is collaborating with private sector funding partners to create a demonstration area to test "street of the future" concepts. The goal is to gain experience deploying smart cities technologies on a real street in Atlanta, to demonstrate the types of changes that may occur in upcoming years, and to test how these technologies will affect street design and behavior. This pilot area could be used for real-time testing of new mobility services or autonomous vehicles, urban freight delivery, or a mobility hub. By measuring the benefits to people using the system, the City of Atlanta can be innovative and gradually increase the scale of the demonstration until it is available citywide.

INNOVATION DELIVERY AND PERFORMANCE

Atlanta has established itself as a leader in civic innovation by creating an office of Innovation Delivery and Performance within the Mayor's office, charged with driving meaningful progress and tangible results on the Administration's top priorities in partnership with City operating departments and external partners. This unit houses the City's Innovation Delivery Team, created in 2011 with an initial \$3.1 million grant from Bloomberg Philanthropies and intended to create a team and framework for innovation within City Hall. The Innovation Delivery Team has positioned itself as a platform to nurture innovation, and specific efforts have aimed to: modernize the customer service experience; fuel civic engagement and a vibrant startup ecosystem; institutionalize innovation, and leverage partnerships to maximize impact. The team could potentially be leveraged as a resource for transportation-related engagements.

The Mayor's Office of Innovation Delivery and Performance also contains the Focus on Results (FOR) Atlanta program, formed in 2013. This unit serves as the City's performance management program, charged with delivering tangible and lasting improvements across City services. The FOR Atlanta Team works in close collaboration with departments to track key performance indicators and identify opportunities to improve service efficiency and quality through data-driven decision-making, business process efficiencies, organizational strategies, and technology applications. This institutional resource on performance metrics and tracking

could support the performance management framework needed to navigate emerging mobility partnerships and efforts, described later in this chapter. The DataAtlanta Portal may also support some of the transparency and open data components of such programs.

BEST PRACTICES FROM PEER CITIES

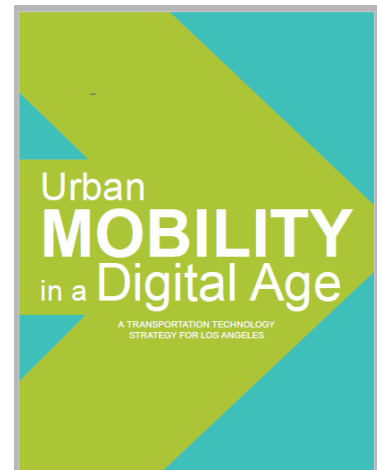
Navigating the emerging mobility landscape requires consistent commitment to goals and innovative, proactive governance. However, some peer cities have begun to create frameworks and tools that may be applicable to Atlanta.

LOS ANGELES

In its concerted effort to invest in sustainable transportation and overcome a strongly ingrained car culture and design, Los Angeles is counting on leveraging technology-based solutions to help speed up its transition to becoming a multimodal city. The 2016 roadmap for the City's transportation future, *Urban Mobility in a Digital Age*, made Los Angeles the first U.S. city to specifically address policies around self-driving cars. This report includes the following key steps:

Today (0-2 years)

1. Develop a business plan for a city AV fleet.
2. Create a dedicated staff position focused on connected and automated vehicle technology.
3. Implement blind spot detection systems for public transit vehicles.
4. Expand Los Angeles Department of Transportation (LADOT) connected bus technologies fleet-wide.
5. Invest in lane markings that enhance effectiveness of lane departure warning and prevention systems.



Tomorrow (3-5 years)

1. Create better access to Automated Traffic Surveillance and Control (ATSAC) data and enhance transparency of network prioritization for planning.
2. Develop an AV road network along transit and enhanced vehicle networks.
3. Launch a Data as a Service program to provide real-time infrastructure data to connected vehicles.

Future (6+ years)

1. Convert the public transit vehicle fleet to fully automated.

The Strategy included a broader roadmap for navigating emerging mobility trends, noting that the LADOT must “position itself as a platform for mobility innovation that supports greater mode options by providing Data, Mobility and Infrastructure as a Service to all Angelenos”. The City is currently moving forward with implementation of the action steps identified.

The City's Los Angeles County Metropolitan Authority (“Metro”) has also been a leader in navigating emerging mobility options. Metro created an Office of Extraordinary Innovation intended to champion new ideas to improve mobility in Los Angeles County. The responsibilities of that office include: inform the high-level vision for LA Metro through exposure to innovative people, organizations and industries; support Metro departments in piloting and implementing new and experimental programs and policy and serve as the primary liaison for new ideas relevant to LA Metro coming from entrepreneurs, private sector entities, academia or individuals. Metro's Unsolicited Proposal program created a model for allowing private sector companies working on transportation innovations to present new ideas directly to Metro for review and evaluation, supplementing the public procurement process for products that may not fit traditional procurement methodologies. The most promising proposals can lead to a demonstration, a pilot project, or potentially even full deployment across the region.

AUSTIN

Facing a mobility crisis that includes painful commutes and the most congested roadway in Texas (I-35), Austin has turned to mobility planning, including a focus on innovation, to improve commutes and speed up the provision of multimodal options. Mobility has been a major focus both within City Hall and in the civic community, with 2016 designated as the “year of mobility” and several planning initiatives underway to bolster transit, expand alternatives to single occupancy vehicles, and improve congestion. On the latter point, Austin invested in transportation technology by creating an Advanced Transportation Management System to better use data to improve travel times.

Austin was one of seven finalists (of 78 applicants) for the U.S. Department of Transportation Smart Cities Challenges program. Austin's plan focused on connected and automated vehicles, intelligent sensors, open data, real-time traveler information, and creation of a suite of mobility options available. The package proposed creation of “connected corridors”, a mobility-as-a-service marketplace app combining the ability to find, pay, and navigate all transportation options, automated shuttles at the airport, mobility hubs, and Electric Bus Rapid Transit (EBRT) networks that use sensors to improve safety. The City has indicated it will continue to pursue these initiatives. Austin plans to begin installing traffic sensors on East Riverside Drive as a first step to deploying electric rapid buses from the airport to downtown Austin, with the aim of turning a congested artery into the “smartest” road in the country.

Partnerships have played a major role. Austin, along with Denver, has collaborated with the Rocky Mountain Institute, as a lead city in an effort to leverage emerging technology and business innovation. This effort involves coordinating data streams to better manage traffic. Austin is also working with the University of Texas' Center for Transportation Research on data-driven traffic management initiatives.

COLUMBUS

As winner of the U.S. Department of Transportation \$40 million Smart City Challenge in June of 2016, Columbus will continue to be at the forefront of thinking about the transition to a smart and connected city. Their submission package centered on implementing a holistic vision for how technology can help residents move easily and access opportunity. Columbus was also awarded a \$10 million grant from Paul G. Allen's Vulcan Inc. Foundation to reduce greenhouse gas emissions through the decarbonization of the electric supply and transportation sectors.

Smart Columbus is comprised of 15 projects that span integrated data and mobility hubs to connected vehicles and Truck Platooning. The first component is building an Integrated Data Exchange (IDE), a dynamic, cloud-based platform that integrates data from multiple sources, including the planned smart city technologies, traditional transportation data, and data from other community partners, such as food pantries and medical service providers. Leveraging the City's high-speed fiber investment, the Columbus Connected Transportation Network (CCTN) focuses on the streets with connected vehicles, smart street lights, Wi-Fi and a transit-pedestrian collision avoidance system.

Other projects are targeted toward specific areas of the City. In Linden, a lower income neighborhood, the City will install trip planning and payment options at mobility hubs, while in Easton a fleet of six electric autonomous transit vehicles will be deployed. Smart Columbus will introduce real-time freight delivery availability technology in the Short North Arts District, along with an enhanced parking permit system and parking management system.

Finally, with truck platooning and oversized vehicle routing, Smart Columbus will improve fuel efficiency, increase safety and improve overall delivery efficiency. Additionally, by integrating truck parking information into the Integrated Data Exchange, Smart Columbus will be able to direct commercial vehicle drivers to safe, convenient parking solutions.



CONSIDERATIONS

PUBLIC TRANSPORTATION

Many emerging mobility products seem to fit somewhere in between a private vehicle and mass transit for consumers. TNCs and microtransit can conduct some of the same trips as public transit, but in general are much more disaggregated than an efficient mass transportation system.

TNC partnerships and microtransit partnerships offer an opportunity to boost public transit. In many cities, transit systems cannot keep pace with the demand for their services due to high costs. Some lower-ridership routes in low-density areas could be better served by shuttle or TNC shared ride alternatives. The ability of TNCs to deliver point-to-point mobility for relatively low costs has the potential to align with public agencies that are struggling to address the mounting costs of demand response services and meet the increasing demand for conventional fixed route services. In the short term, exploring and testing these arrangements can benefit providers and customers in many ways. Indeed, several transit agencies are experimenting with such partnerships, aiming to service underperforming lines and less dense areas, or to provide first and last mile solutions to and from participating transit stations. In the latter model, a customer can access TNC services at a discounted rate within a certain catchment area in accessing their train station or returning home.

Transit agencies may have reason to be hesitant about becoming too dependent on TNCs as a core part of their service model. While there is a lack of information about the financial sustainability of TNC operations, it is clear that large subsidies are supplementing passenger fares for some operators. This matters to the extent that the sustainability and costs of these services will affect future transit partnerships and services. While automation will affect financial models, much remains unknown about their long-term financial sustainability.

The natural conclusion of such private transit partnerships is not always clear. Pilot partnerships may help begin to test the thesis of how to make some underperforming lines more effective, but the broader question of the role of a public transit agency in a more varied future mobility landscape remains. For example, is the role of an agency to subsidize trips regardless of platform?

Some TNC-transit partnerships have fewer risks. Demand response services that provide point-to-point assistance for persons with limited mobility, typically called paratransit or dial-a-ride, are expensive for agencies to provide. TNCs can replicate many of the operations of such programs at a significantly lower cost, by improving on dispatch and deployment methods. For transit agencies, the cost-benefit analysis of such pilots make a stronger case for TNC partnerships than some other models. Even if the TNC partnership costs double, they would still be competitive with traditional services.

TNCs, of course, have provided increased competition for potential transit users, raising the question of how transit can stay competitive. Initial data indicates that Lyft and Uber have already begun attracting rides away from transit in some cities. Our transportation choices are always relative, and some of Atlanta's existing mobility options will need to evolve to stay competitive. Transit agencies that focus on improving service and efficiency of the highest efficiency lines may be best situated to grow ridership. The increasing ease of transit apps and interfaces offered by private mobility services have also raised consumer expectations around ease of transportation. Transit agencies must keep pace and that systematically reduce interface friction. Adoption of a "user centric" perspective and framework can help guide such efforts.

Atlanta should proceed with an openness to piloting new ideas, but within the context of broader goals, including bolstering and protecting the competitiveness of public transit in the long-term planning horizon. While the sharing functionality of emerging mobility products offers a glimpse into how vehicle deployment may work in the future, the efficiency of TNC sharing cannot match that of an effective transit line. The consideration of how a transit system may wish to relate to new mobility tools also depends on land use context. For cities that are too dense to disperse most trips but too sprawling to easily concentrate trips on rapid transit, shared mobility tools may help to expand the definition of what it means to live "near" transit by providing easier connections to high efficiency trunk lines. Based on its land use patterns, Atlanta is likely a good candidate for effective TNC and microtransit partnerships, provided they support rather than detract from public transit and active transportation options.

If autonomy does significantly improve the efficiency and effectiveness of our various transportation options, certainly public transit systems should also benefit. If driving becomes dramatically easier and transit does not, the incentives to use mass transit become relatively worse. However, the automation of public transit raises many hurdles and challenges, including labor concerns. This matter of the role of labor in an automated economy extends far beyond public transit, and is a bigger matter for economic leaders, employers, and workers to consider.

DATA

Data generated by members of the public and by the private services they use is rapidly becoming central to conversations around new mobility initiatives. Atlanta understands the motivations of private companies that view their data as proprietary, potentially competitive in nature, and the need for it to be kept secure. At the same time, government needs certain data sources to plan for the current and future needs of residents and businesses, and to assure that safety is central to the transportation system. For example, services like TNCs and future autonomous taxis will produce vast amounts of data that is critical to everything from origin and destination of passengers, safety of different private technology systems, and the equitable distribution of service. If these services want to move from niche to a mainstream, a level of transparency and partnership will be expected.

Together, Atlanta and the private sector will need to strike the right balance to further innovation, but with the understanding that data produced by members of the public needs to be made available in some level of detail for the betterment of the City systems. In the same way, government owned data should be made available to the public and businesses to further innovate and develop solutions to serve Atlantans. To this end, Atlanta should establish a transparent and accountable approach to data sharing, privacy, and security policies.

While the idea of more data is attractive, data is only meaningful when it is accurate and well understood. It takes significant analytical resources to make use of large data sets. Most governments have a great deal of data that is never looked at and does not produce insights. Atlanta must work to better utilize the data currently generated, and prioritize analytics services and platforms that help Atlanta make better decisions on behalf of taxpayers and toward the City's larger goals – in as short a timeline as possible.

Pilot Approach

Test-marketing, iterating, fine-tuning, going to market, and mainstreaming for wider adoption are all terms that you might hear within a start-up company that is bringing a product to market, and taking an “agile approach” to get there. In 2017, city governments are working at much faster speeds than they did a decade ago, and much faster than state or federal governments do today. Why is this? Atlanta's mayor, agency directors, and their teams are directly responsible to the public every day. City government is the closest form of government to the people. As such, they must continually demonstrate effectiveness rather than simply communicate about ideas.

Atlanta has a history as a good steward of taxpayer dollars, and has earned a AAA bond rating across the last decade. Piloting programs on a small scale, and testing them for bugs, adoption rates, and necessary tweaks is the responsible way to make sure that an approach will work before committing substantial resources to it. This could manifest in many ways, such as trying a new real-time rate-adjusting demand based parking program, or trying a separated bus or bike lane with paint and planters before making it permanent with granite and concrete.

Finally, there are many private sector players, large and small, that desire and need to have access to real streets and customers to know if their systems will work in Atlanta. The City wants to support and grow business, and gain the correlating jobs. Atlanta wants recent college graduates to stay in town to work or grow businesses, because of the rich innovation ecosystem. This means pushing the envelope on innovation within government, city streets, and in Living Labs.

The Living Lab

The terms “Living Lab”, “Innovation Zone”, or “Sandbox” are often used interchangeably to refer to opportunities to try, fail, iterate, and try again. Regardless of the terminology, the idea is to create a place and space for pilot projects to allow for innovation. Piloting in a confined

environment is essential for both the private and public sectors, particularly for potential public-private partnerships involving cutting-edge technology such as autonomous vehicles.

Government has the ability to utilize private sector services to test concepts at low cost and risk. Government also wields the power of space and policy, and if it can communicate the desired outcomes effectively and have the private sector provide the horsepower for solutions, a win-win can be achieved.

A Living Lab can be a geographic zone within a city, or apply to the entire city if certain requirements are met. What is appropriate often depends on what technology or business model is being piloted. It is most common to set aside one or multiple districts, neighborhoods, or down to the block level for testing. Examples of effective pilots are:

1. Comparing different types and configurations of technology and/or business solutions for a function, like parking (sensors, meters, pay-by-phone). This was done in Washington D.C. testing eight different technologies in multiple zones within Washington before a major implementation citywide.
2. For autonomous vehicles, the trend is to start small, in an area with little human interaction, and then upon city and state safety standards being met, gradually move into districts of a city with more vehicular, and bike and pedestrian interaction.

Procurement Reform

The pattern of procurement challenges is familiar to many: companies would like to provide their innovative technologies and services to government, but it is often not worth the headache to go through the Request for Proposals (RFP) process, spend significant time and money, and feel arbitrarily excluded at the end of the process, receiving no feedback. This may not be as common as it used to be, but Atlanta government has an opportunity to flip that narrative, and to open up to innovation – something the City has been working on for several years.

More jurisdictions are putting out requests for information, or requests for qualifications to get feedback from the private sector on what the best approach would be, how they would approach a problem, and what solutions are available. This approach allows flexibility in the exchange of information, as well as the ability to move to negotiation for best value with specific vendors that are potentially prequalified. Additionally, when paired with a Living Lab initiative, vendors may also have been invited to pilot their products or services.

Unsolicited Expressions of Interest and Bids

Atlanta should maximize the input received from the private sector to accelerate the pace of change in government. Organizations like the Los Angeles County Metropolitan Transportation Authority (LA Metro), has put an “unsolicited” policy in place whereby it accepts proposals from anyone, promising to consider all ideas within 90 days. This ensures that they get the best and the brightest ideas from start-ups and smaller companies, as well as multinationals for mega projects. Atlanta should encourage the same level of input and innovation and should be able to

feed the most promising of the ideas into the pilot program/Living Lab structure that is developed to prove out concepts, while other concepts can go through a formal process for consideration.

AN ATLANTA ACTION PLAN

What can Atlanta do to prepare? The following actions provide next steps for the integration of emerging mobility into the City's transportation system.

INFRASTRUCTURE

1. Increase funding for road maintenance, as AVs will need clearly marked and signed streets, and increase the use of marked bicycle facilities that separate vehicle from bicycle traffic. Consider congestion fees as a source for this increased funding.
2. Ensure that high capacity transit is available, especially along major corridors, as quality will be more important than ever to encourage ridership.
3. Use technological deployments as opportunities for multimodal street improvements (i.e. installing automatic pedestrian phases and audible capabilities to new signals, upgrading crosswalks, hand rails and curb ramps, and reconfiguring streets slated for repaving or utility replacements to include road diets, walking or bicycling facilities, and pickup/drop off areas that don't conflict with transit, bike, and pedestrian traffic.
4. Create mobility hubs to provide convenient, clustered gathering spaces, particularly in areas of Atlanta with lower rates of smartphones and households with high-speed internet. Hubs should have multiple travel options for first mile/last mile connectivity and provide good bicycle and pedestrian access on-site and along travel corridors.
5. Encourage technology companies to operate within the existing transportation system rather than building additional roadway capacity.
6. Avoid building or requiring new parking garages, as future demand is uncertain, and the risk profile of long-term financing of new parking is changing. Allow and encourage innovative parking infrastructure, such as adaptable floor plates that are convertible to an active use, or easily de-constructible/recyclable materials should a facility have a much shorter lifespan than past parking structures.

POLICY AND PLANNING

1. Plan for phased revenue generation as demand for parking wanes. Ensure that the private parking operations contract does not negatively harm the City's finances when parking revenues diminish.
2. Use demand management tools, such as robust transportation demand management (TDM) programs, to help manage demand, particularly in times of uncertainty, as an alternative to supply-oriented solutions such as building new parking or roads. TDM programs can create incentives to shift time of travel away from peak hour; shift the mode of travel away from Single Occupant Vehicles; and shift routes traveled.

3. Plan for AVs to support Vision Zero principles that ensure the safety of vulnerable road users (i.e. setting speed limit caps on new vehicle testing).
4. Encourage AV deployment for transit and shared mobility fleets over personal private vehicles.
5. Develop curbside management policies and start actively managing parking supply. A robust curbside management program manages the parking supply to create available spaces and reduce circling, and manages other curbside uses such as carshare pods, public space programs that use the curb, bikeshare pods, curbside bike parking, and other uses that are newly gaining access to the parking curb area. Similarly, TNC pick-up and drop-off locations in the curb space may become necessary in creating more orderly and predictable loading behavior. The goal of a curbside management program is to systematically ensure, permit, and administer access to the parking/loading curb in an organized fashion that reflects Atlanta's priorities of encouraging shared use mobility tools and creating vibrant streets.
6. Create an on-street carshare pod program, to allow more types of carsharing to operate in Atlanta and to increase the visibility of carshare options.
7. Consider pricing policies to curtail VMT in the presence of autonomous vehicles. Pay-per-mile is a potential pricing mechanism that could prevent increases in VMT.
8. Develop street design guidelines based on form and function that clearly identify where each mode should be and where networks are, including ancillary smart infrastructure such as sensors, signals, and/or counters.
9. Better integrate existing and future modes to encourage the concept of 'mobility as a service'. Create a framework for deciding when to collaborate with one mobility provider (or one type of mobility service) versus creating open competition or marketplace for many providers. Level the playing field to ensure access for new ideas and providers – not just those who are already adept at navigating city procurement processes.
10. Identify lower income and mobility challenged areas and encourage, invest, and/or subsidize mobility services there.
11. Prioritize automated and modernized freight and delivery. Atlanta should support safer, more efficient, environmentally sustainable freight systems by fostering consolidation of shipments to boost average load factors, non-peak hour deliveries in congested areas, automated truck route enforcement, and use of best available clean truck technologies.
12. Invest in fare payment systems that can be flexible across modes and platforms (i.e. integrated fare payment for bikeshare, carshare, transit, and parking) and are also accessible to people without smartphones or credit cards.
13. Adopt a "pilot and test" mentality to tackling new mobility ideas – a willingness to trying new approaches and a commitment to performance metrics to see what works.
14. Incentivize the sharing economy and "super sharers" as much as possible in order to best position Atlanta for a low-impact automated future.

15. Coordinate with civic and economic development leaders to proactively address matters of the role of labor in an automated economy, including City workers but also broader employment trends.

DATA MANAGEMENT

1. Publicly set a timeline for setting out specific data principles. These principles should center on National Association of City Transportation Officials (NACTO) city data sharing principles. NACTO focuses on better data for transportation planning; inclusion in mobility options; and better tools for safety. For mobility service providers, the following data will be prioritized, per the NACTO standards Atlanta uses as minimum adherence.
2. Collaborate with NACTO cities to require access to Origin-Destination data from private mobility providers.
3. Map broadband networks in Atlanta and the region.
4. Develop and enforce data sharing agreements and protocols (i.e. invest in municipal data management systems to track and follow trends over time; ensure the ability to share data out and receive data in from private service providers).
5. Track key performance metrics of transportation networks to monitor the effects of the changing mobility landscape as this change occurs, and to get ahead of key trends, such as parking demand and revenue.
6. Set performance measures and targets to compare alternative strategies and track return on investment and qualitative progress over time.
7. Understand the universe of data already in place. The Department of Planning and Department of Public Works will work with the Atlanta Office of Innovation Delivery and Performance and the DataAtlanta office to conduct a full inventory of public data they have currently, they should have, and what private data is accessible, and/or should be to meet public needs.
8. Create a list of public and privately held data that the City needs to fulfill planning, equity, and safety needs, considering that:
 - a. Thinking more broadly about transportation and land use requires breaking down organizational silos.
 - b. The City may be as interested in removing trips from the system as in migrating trips to different modes.
 - c. The question of whether or not existing services meet the needs of vulnerable populations is essential.
 - d. There may be data that can be obtained from the public through opt-in applications or services that exist or could be developed.
9. Standardize data sharing agreements. Atlanta has an innovative partnership with Waze that includes a data sharing agreement. This can provide a benchmark for a standard

that can be applied to other technology companies and service providers, reducing time and effort to start incorporating data into real time operations and planning efforts.

10. Standardizing how to receive data. Data needs to be received via an API (application protocol interface), stored, cleaned, and made available to the public. There are also opportunities to overlay interfaces and analytics to give City leadership, management and staff actionable data for decision-making. Considerations include:
 - a. Data leaders and departments must coordinate with City leadership to make sure they are operating in a coordinated effort.
 - b. There are low-cost, software-as-a-service platforms that can allow staff to move quickly to meet these data goals.
 - c. As much as possible, the City desires to encourage open APIs with machine-readable data, even with private sector partners so that all may benefit from data.
11. Find and organize data to specifically understand parking and public space. Atlanta desires to better understand the full landscape and inventory of parking in Atlanta, from curbside usage and availability, to public and private surface lots, and structured parking facilities. A comprehensive database should include:
 - a. All curbside parking supply in Atlanta
 - b. All surface lot parking supply, private and public
 - c. All structured parking supply, public and private
 - d. Utilization rates for curbside, then surface and structured parking
 - e. Turnover rates for parking spaces
 - f. Revenue generated per space
 - g. Data to calculate ROI per space and cost-benefit

ENGAGEMENT

1. Develop public and private mobility councils and advisory groups to provide opportunities for collaboration, shared problem identification and solving, and policy coordination.
2. Education and awareness training for the traveling public about mobility options, benefits, and challenges.
3. Acknowledge the uncertainty of new mobility concepts during public conversations. Create a Living Lab subset of Atlanta to allow piloting of innovative concepts and policies, to embrace success or failure as learnings before wider rollouts citywide.

TESTING

1. A process should be set up by Atlanta in fall 2017 to allow unsolicited inquiries for pilot programs that will be organized by type and technology.

2. An “innovation zone” or “Living Laboratory” will be established for multiple technologies to be tested in a fully urbanized context, with bicycles, pedestrians and vehicles present. This zone should allow expedited permitting and a methodology for assessing performance and ROI should be in place. Partnership with business improvement districts and local developers should be prioritized to administrate the program.
3. The Department of Public Works and Department of Planning should make an effort to understand the details of new mobility business models.
4. Work with the Georgia Department of Transportation (GDOT) and the Georgia Department of Motor Vehicles (DMV) on refining policies and procedures for autonomous and connected vehicle testing, focusing on a 3-tier testing system:
 - a. First, an environment will be utilized with little to no interaction with other vehicles or modes (test track or campus).
 - b. Second, a vehicle only environment will be utilized, likely highway or major arterial in nature. A dedicated lane will be considered to limit interactions.
 - c. Lastly, if considerable safety standards are met as agreed upon with GDOT, a mixed, real-world urban environment will be utilized for testing after consultation with NACTO on the latest urban testing guidelines.
 - d. Pilots will be prioritized that provide first and last mile service to Metropolitan Atlanta Rapid Transit Authority (MARTA) stations and strengthen the transit network.

PROCUREMENT

1. Adopt performance based procurement mechanisms. New technology products and partnerships often involve an increased level of uncertainty. Writing contracts that are performance-based ensures the City is able to ultimately achieve a workable product that meets the performance criteria they need. This also allows vendors much-needed flexibility in determining how to meet the City’s clear goals, as application of new technologies often involves some ongoing learning and responsiveness.
2. Develop policy for evaluating when to partner with a private provider and when it makes sense for a public agency to provide services. Companies should be able to enter the transportation market, but the City needs to determine when it makes sense to do an RFP and when it makes sense to create a marketplace. For example, if starting a new bikeshare program, it may make sense to use one provider to build the system. However, for setting up a new alternative paratransit program, the City could set guidelines for what type of service and baseline service quality will be needed and then allow a market to form for any provider to participate.
3. Set clear guidelines so providers know what to expect and when. Whether dealing with permitting a new type of product for operation in Atlanta, or procuring a new type of technology product, setting clear goals and guidelines that stake out the City’s needs help create transparency, and create clarity for new players.

4. In approaching partnerships, play to the strengths of the City when deciding whether to operate versus administrate versus coordinate versus integrate new tools and technologies.

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