The past decade has seen dramatic changes in the ways many Massachusetts residents travel. Real-time information on traffic and transit conditions is now delivered right to our smartphones. Emerging shared mobility services – from Uber and Lyft to Zipcar and Hubway – have created a new array of daily travel options.

And the changes are just beginning. New shared mobility services are emerging each year, older services are expanding their footprints across the Commonwealth, and the most potentially transformative change of all – the widespread adoption of autonomous vehicles – is growing closer by the day.

How are these new technologies and services affecting Massachusetts today? How might they affect our transportation system, our economy, our climate, our environment, and our health and safety in the future? And what can we do now to ensure that they deliver the greatest possible benefits for the largest number of people, without leaving the most vulnerable behind?

**FAST FORWARD: The Technology Revolution in Transportation and What it Means for Massachusetts** reviews the current state of innovative mobility in the Commonwealth, explores the implications of innovative technologies and services for our communities and our transportation system, and proposes a public policy framework for the integration of these services into our cities and towns.

By taking a smart, proactive approach to innovative mobility, Massachusetts can build a healthier, more equitable and cleaner transportation system – and avoid many of the pitfalls that might emerge as innovative technologies and services find their way into our communities.

**Innovative mobility services are spreading rapidly in Massachusetts**

- The MBTA was one of the first public transit agencies in the United States to provide open access to the data needed to construct real-time transit apps for smartphones. Since then, transit agencies in Lowell, the Pioneer Valley, Worcester and elsewhere have moved to provide real-time
transit data and the MBTA has joined other agencies in exploring new payment options for transit.

- Boston-based Zipcar pioneered round-trip carsharing in the United States when it launched in 2000. Today, Zipcar serves communities across the Commonwealth, while newer models of carsharing – including one-way and peer-to-peer services – are also taking root.

- Hubway was one of the nation’s first modern bikesharing systems when it launched in 2011. Since then, it has provided more than 4 million trips and is gradually expanding in the Boston area.

- Lyft, Uber, Fasten and other ridesourcing services have grown dramatically in recent years, expanding their coverage to wider areas of the Commonwealth and adding new options such as the potential to share rides with other passengers headed in the same direction.

**Automakers and tech companies are working to bring autonomous vehicles to the roads soon.**

- Fully autonomous vehicles are those in which technology takes over the tasks of monitoring roadway conditions and operating the vehicle under all circumstances. The next several years will likely see increasing automation of the vehicle fleet, as partially autonomous cars hit the roads in greater numbers and fully autonomous cars are piloted in controlled environments.

- Autonomous vehicles may be connected to one another or to roadway infrastructure, enabling vehicle movement to be coordinated in ways that improve efficiency.

**Innovative mobility can play a role in solving many of Massachusetts’ biggest transportation challenges, if intentionally shaped by public policy to protect the public interest.**

**Congestion** – Shared mobility services can reduce the number of vehicles on the road, encourage people to share rides, and in some cases promote the use of low-carbon modes of travel such as bicycles. Traditional round-trip carsharing has been shown to remove 9 to 13 vehicles from the road for every carsharing vehicle. Autonomous vehicles provide an opportunity to manage vehicle use so as to reduce congestion, and may reduce the amount of space devoted to parking.

**Climate and Pollution** – A future of shared, autonomous and electric vehicles has the potential to dramatically reduce greenhouse gas emissions by improving the efficiency of the transportation system. In the short run, innovative mobility services can make it easier to use public transportation by providing accurate, up-to-date information for would-be transit users as well as “first-mile/last-mile” connections to transit services.

**Economic Opportunity** – By empowering people to live car-free or car-light lifestyles, shared mobility services can relieve households from the significant financial burden of car ownership. Massachusetts is also well-positioned to benefit economically from the introduction of autonomous vehicles, given the strength of the Commonwealth’s high-tech economy.
Social Equity – Shared mobility services have the potential to break down traditional barriers that limit access to jobs, schools and opportunities for low-income people, communities of color, the disabled, elders and youth. Ridesourcing services such as Uber and Lyft have expanded access to on-demand mobility in communities that often struggled with poor taxi service, and smartphone transit apps have improved quality of life for those who rely on public transportation.

Public Health and Safety – Autonomous vehicles hold the promise of dramatically improving transportation safety, with the potential to eliminate the 90 percent of motor vehicle crashes that are caused by human error. By supporting the integration of electric vehicles into vehicle fleets, shared mobility services can reduce local air pollution, improving quality of life in communities.

Few of the benefits of innovative mobility are guaranteed. Without smart public policy, innovative mobility has the potential to undermine key societal goals and values.

- Shared mobility services might divert some passengers from public transportation – reducing fare revenues and transit’s base of political support. The result could be a downward spiral in which transit networks continually weaken, leaving those who rely on them for affordable, convenient transportation with fewer workable options.

- The emergence of autonomous vehicles could lead to an explosion of vehicle travel and resurgence of sprawling development – undermining the benefits of automation for reducing congestion and greenhouse gas emissions.

- A transition to autonomous vehicles could reduce quality of life in our communities if autonomous vehicles are given priority over pedestrians and bicyclists, or are implemented in ways that make it harder for those who do not use automobiles to get around our cities and towns.
Innovative mobility services could perpetuate a two-tiered transportation system, with ever-expanding options for convenient, fast travel for the well-to-do matched with declining access for others. Current disparities in access to some shared mobility services in low-income neighborhoods are a cautionary sign.

Governments may face new demands for infrastructure investment to accommodate autonomous vehicles, arriving at the same time we experience declines in traditional sources of transportation revenue such as gasoline taxes, vehicle excise taxes, and revenue from parking meters and tickets.

Transitioning to autonomous vehicles could result in the loss of tens of thousands of jobs among drivers of trucks, taxis, school buses and other workers in the transportation industry.

To get the most out of innovative mobility technologies and services, Massachusetts should embrace a set of common-sense principles and adopt a series of forward-looking public policies, including:

- Setting goals for mobility to guide integration of new technologies.
- Using innovative mobility to enhance existing transportation networks.
- Encouraging the development of fleets of electric, shared and autonomous vehicles that serve everyone.
- Supporting pilot and demonstration projects.
- Providing regulatory and other support for autonomous vehicle testing in Massachusetts.
- Requiring the provision of selected standardized, open data.
- Updating transportation models to reflect emerging technologies and trends.
- Encouraging regional regulation of taxis and coordination of policy around innovative mobility.
- Limiting zero- and single-occupancy use of autonomous vehicles.
- Empowering municipalities to maximize the local benefits of innovative mobility.
- Anticipating innovative mobility tools and services in the design and maintenance of public infrastructure.
- Updating minimum parking requirements and fee structures to reflect new mobility models.
- Supporting innovative programs to promote bicycling.
- Adopting pricing policies to discourage a rapid increase in vehicle travel following the introduction of autonomous vehicles.
- Creating virtual pop-up “mobility hubs” to support integration of shared mobility modes and transit.

About Fast Forward

Led by Transportation for Massachusetts, the Fast Forward white paper is the result of a year-long collaboration among numerous organizations, informed by conversations with leaders in innovative mobility industries, a review of the latest research on the impacts of innovative mobility technologies and services, and feedback from a series of roundtable discussions involving leaders from Massachusetts business, academia, government, community-based organizations and other nonprofits.

To obtain the full Fast Forward white paper, visit www.t4ma.org/fastforward.

For more information on Transportation for Massachusetts, visit our website at www.t4ma.org.