

THE FUTURE OF TRANSPORTATION

A BETTER CITY'S VISION





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September 24, 2018

Steve Kadish
c/o Governor Charlie Baker
State House Room 360
Boston MA 02133

Dear Members of the Commission:

I am pleased to submit comments on the Future of Transportation Commission.

A focused group of A Better City staff and outside colleagues from the private sector collaborated to produce this document. We understand the value in identifying the obstacles and challenges facing Massachusetts in both the short and long-term future and hope this letter informs your work.

The future in transportation will have a direct relationship on the quality of life and future prosperity of Massachusetts. Setting a horizon of 2040 will give elected officials, the business community, advocates, and stakeholders' enough time to design policies necessary to reach our shared objectives. We all share a goal of creating the transportation system in Massachusetts that will someday become a model for the nation and the envy of communities throughout the world. Our residents, businesses, and visitors to the Commonwealth deserve nothing less.

Please know that the A Better City and leaders from the business community are ready to assist the members of the commission in any way that we can. We look forward to collaborating with you again when your report is released.

Thank you for consideration of our views.

Sincerely,

Richard Dimino
President and CEO



We are encouraged by Governor Baker's creation of the Future of Transportation Commission to focus on long-term visioning and planning. Transportation and infrastructure investments may be 20+ years in the making and are subject to changing demographics, technologies and aspirations, but the visioning needs to be proactive and continuous.

An important part of this broader discussion is how Massachusetts chooses to approach the wave of emerging changes in transportation technology. It is easy to look to the future and be seduced by the seemingly apolitical promise of technology to guide us away from difficult policy decisions. But technology is not an antidote to public policy. While we are certainly on the cusp of technological change, our overarching goals for the citizens of this state are more enduring. The Future of Transportation is not about technological disruptions that *will happen to us*; rather, it is about harnessing technological innovation to meet our common goals.

This Commission presents an opportunity to shift the transportation conversation from its purely physical and operational dimensions to the role that **transportation infrastructure can play in achieving a broader set of public goals**. Whatever the various scenarios presented by the Future of Transportation Commission, they should all be set-up to advance the following goals.

LET'S ACCEPT OUR COMMON GOALS

By definition, enhanced, efficient mobility and the reduction of congestion head the list of transportation-related goals—but they are not alone and serve a far greater set of public interests. From our work with our 130 business members, as well as regional stakeholders and elected officials, we believe there is common agreement in these areas:

MAXIMIZE ECONOMIC VITALITY

The current success of the Massachusetts economy is based, in large part, on our ability to move people and goods effectively and efficiently. The 2013 study *The Cost of Doing Nothing* demonstrated the indispensable role of our statewide, multi-modal system—highways and transit, passenger movement and freight—in supporting our economy, and the risk created by under-investing in the capacity and reliability of that network.¹

The Commonwealth's transportation system is a key component of the state's ability to remain economically competitive in a fast changing global context. Whether it's the \$5+ billion of goods that move through the state's ports,² the 15+ million³ people accessing our state through the airports or the cross-state connectivity of our highway system, our economy cannot thrive without its transportation backbone.

As one significant example, the 2018 study *The Transportation Dividend: Transit Investments and the Massachusetts Economy* details the role of the MBTA in supporting and sustaining the Boston region's current prosperity and future growth. Access to jobs, housing, healthcare and other services, and university brainpower is dependent

1 The Boston Foundation, in partnership with the Massachusetts Competitive Partnership and A Better City, Inc., [The Cost of Doing Nothing: The Economic Case for Transportation Investment in Massachusetts](#), 2013.

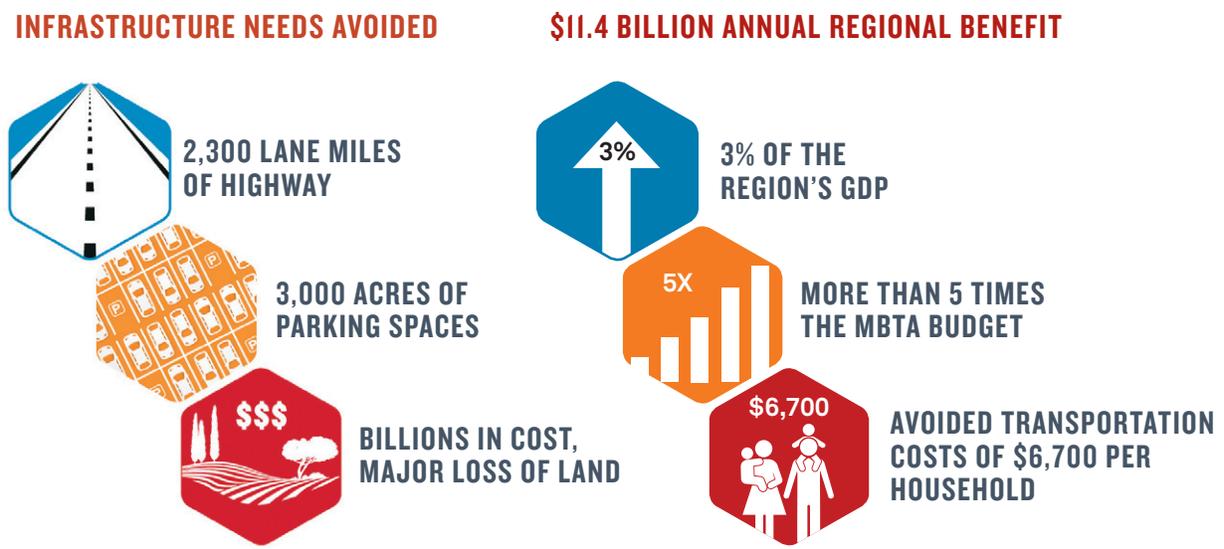
2 Ibid.

3 MassDOT. [Massachusetts Statewide Airport Economic Study Impact](#), 2014.



upon an efficient, accessible and equitable transit system. Prior transportation investments have paid significant dividends for our economy and justify a robust investment plan to meet our current and future needs. It is estimated that the MBTA system provides \$11.4 billion in annual regional economic benefits, a more than five-to-one return on its annual \$2 billion budget.⁴ Through strategic investment, we have the opportunity to consolidate our recent economic gains and ensure future progress.

FIGURE 1: Economic Benefits of the MBTA



Source: AECOM. Note: Analysis based on a hypothetical "No MBTA" scenario.

PRIORITIZE SOCIAL EQUITY

Given the importance of transportation for access to jobs, housing, education, healthcare, and quality of life, we recognize that transportation **can provide** opportunity and cohesion for communities or **can impede it**. The 2017 MAPC "State of Equity" report shows continuing disparities in economic mobility and health outcomes in historically underserved communities. Achieving social equity requires prioritizing the needs and aspirations of those most harmed or unserved by past decisions.

In terms of transportation infrastructure, we can and should focus on these areas including:

- Improved accessibility to jobs, services, and other desired destinations, especially for disadvantaged groups and neighborhoods
- Travel time equity between modes (e.g.: car vs. transit vs. active)
- Narrowing the gap between income brackets in the proportion of household expenditures spent on transportation

4 A Better City. *The Transportation Dividend*, 2018

- Improved safety figures regardless of mode (i.e.: make our streets as safe for pedestrians and bikers as they are for car-users)
- Safety Equity and achieving Vision Zero goals
- Reduced impact of transportation related pollution on environmental justice and disadvantaged communities.

ENCOURAGE SMART GROWTH

Broadly speaking, smart growth refers to the clustering of development around transit corridors, multi-modal nodes, and city, town, and neighborhood centers. In the 20-community Inner Core of Metropolitan Boston, and in the cores of the Commonwealth's other metropolitan areas, smart growth is closely intertwined with transit-oriented development (TOD) and density. As a basic policy goal affecting the future of transportation in Massachusetts, smart growth is critical for several reasons:

- It is a key to our current and future economic vitality. Numerous national and Boston-area studies have shown⁵ the connections among compact TOD, transactional efficiency, economic agglomeration, and regional economic success.
- Smart growth is growth without sprawl, preserving parkland, green space, and agricultural land for generations to come.
- Smart growth reduces VMT and resultant GHG emissions, not only through a higher reliance on transit than cars, but through “trips not taken”—the ability of some everyday trips to be taken not by car or by transit, but on foot or by bike.
- Beyond VMT reduction, in a denser, mixed-use environment the built environment itself—its construction and on-going operation—has a proportionately smaller carbon footprint.⁶
- Smart growth enables the efficient use of infrastructure dollars, by reusing and reinforcing legacy investments in streets, sidewalks, utilities, and transit. Where new infrastructure investments are needed, they are more compact in form and less distant from existing networks.
- Smart growth is entwined with the community character and distinctness that we value in Massachusetts. The paradigm of walkable, mixed-use place-making means that less time is devoted to driving and less land is devoted to parking. This type of community character contributes to healthy lifestyle outcomes and is hospitable to the lifestyle choices of millennials and retiring seniors—the two demographic cohorts fueling our state's population growth. Smart growth policy does not mean compelling people to live in walkable, transit-oriented environments, or even “engineering” their choices to do so. Rather, it seeks to accommodate a generationally significant change in market behavior that is already occurring.⁷
- Smart Growth encourages compact urban town centers, urban villages and live- work-play orientation in zoning. These types of zoning changes should be incentivized.

5 For discussion of some of these studies, see A Better City. [The Transportation Dividend](#), 2018. Chapter 1.

6 On VMT reduction and the built environment footprint, see the body of research literature beginning with seminal *Growing Cooler: The Evidence on Urban Development and Climate Change* (ULI, Reid Ewing, Keith Bartholomew, Steve Winkelman, and Jerry Walters Don Chen, 2008).

7 Christopher Leinberger and Patrick Lynch, [The WalkUP Wakeup Call: Boston](#) (by LOCUS Development, 2015;).



IMPROVE PUBLIC HEALTH

Because the transportation system helps shape how communities are designed and operate, it can have a profound influence—both positive and negative—on public health. As such, transportation infrastructure, choices and access are key determinants of health and quality of life and figures into our broader public health in three key ways:

1. **Physical Health:** Active transportation (walking, biking and using public transit) directly benefits the physical health of populations. Where transportation infrastructure is designed to accommodate or even encourage non-motorized transportation, such as through complete streets policies, it will have a positive effect on physical health. Conversely, each additional hour spent in a car per day increases the likelihood of obesity.
2. **Pollution Impacts:** Reducing emissions from transportation vehicles improve air quality and reduces respiratory problems and diseases.
3. **Safety Impacts:** In 2015, the Centers for Disease Control (CDC) calculated that the costs of medical care and lost productivity associated with motor vehicle crashes exceeded \$63 billion.⁸ Historically, transportation decision-making—what projects to invest in, what kind of design to create—focused on improving car Level of Service (LOS), essentially how quickly and unobstructed are vehicles able to move through an area. The slow embrace of [Complete Streets](#) design guidelines and Vision Zero commitments highlights transportation policy and design on the safety and, therefore, health of our population.

Technology may provide us with an efficient, affordable and clean option to move around from point A to point B in autonomous vehicles, but what impact would that have on our overall health outcomes from lower activity and fewer social interactions?

DELIVER A MORE RESILIENT AND CLEANER ENVIRONMENT

Massachusetts is already experiencing the negative effects of climate change as higher sea levels and more extreme weather threaten our coastal communities. It is imperative, for our health, our infrastructure and our economy that we address pollutants that damage our environment and our health, and work to stem the tide of climate change.

Transportation now accounts for the largest share of carbon dioxide (CO₂) emissions in Massachusetts,⁹ the region, and the country. Like its neighbors in the Northeast and Mid-Atlantic, Massachusetts will be unable to meet 2030 and 2050 economy-wide greenhouse gas (GHG) emissions reduction requirements without making substantial progress in fully decarbonizing the transportation sector. If well designed, measures to reduce carbon emissions should also lead to reductions in other harmful air pollutants, such as soot and smog, which are linked to premature deaths, asthma, heart attacks, and other negative health impacts.

MAINTAIN A HIGH QUALITY OF LIFE

Economic vitality, social equity, smart growth, enhanced public health and safety, and a cleaner and more resilient environment—these long-term goals are overlapping and complementary. Together, they go a long way to describing the quality of life that the people of Massachusetts will experience in the decades to come. ABC's recommendations to the Commission on the Future of Transportation reflect the belief that our long-term transportation vision is about more than reacting to technological change or cataloguing worthwhile projects. It is about ensuring that transportation optimally serves these over-arching quality of life goals.

8 "Motor Vehicle Safety: Cost Data and Prevention Policies." Centers for Disease Control, 2015

9 "MA GHG Emissions Trends." Mass.gov, 2018.



WE CAN MAKE EDUCATED ASSUMPTIONS ABOUT THE FUTURE

While it is impossible to know the precise timing of widespread technological interventions on our transportation system, we do expect that by 2040:

AUTOMATION OF TRANSPORTATION IS WIDESPREAD

We expect that by 2040, there will be saturation of autonomous vehicle (AV) technology throughout the system, including the transit system. Private and shared-vehicles will have autonomous capacity as will the current bus infrastructure.

The advent of autonomous vehicle technology across vehicle types necessitates a review and update of current public policy structures. Based on recent experience, if AVs are allowed to operate under the current policy and regulatory regime, there is the likelihood for increased vehicle miles traveled (VMT) and decreased transit usage.

AVs will also change the way we use our streets and public spaces. While one of the oft-mentioned benefits of the AV revolution is a decreased need for parking spaces, it may also increase the need and competition for curb space. How we design and allocate important public space will determine how ride-hailing and autonomous vehicle services can penetrate our streets. AVs may allow us to redevelop large parking structures for other uses but then may take over all curb space in order to provide constant access. AVs will need to have space parameters and be prioritized as part of a shared system as local roads cannot accommodate increased AV VMT.

ELECTRIFICATION OF TRANSPORTATION IS POSSIBLE

We expect a continued improvement in electrification in the transportation sector. A recent Bloomberg report¹⁰ forecasted:

1. **By 2040**, 55% of all new car sales and 33% of the global fleet will be electric.
2. **EV costs.** The upfront cost of EVs will become competitive on an unsubsidized basis starting in 2024. By 2029, almost all segments reach parity as battery prices continue to fall.
3. **E-buses.** Buses go electric faster than light duty vehicles
4. **Displacement of transport fuel.** Electrified buses and cars will displace a combined 7.3 million barrels per day of transportation fuel in 2040.

We expect electrified vehicle infrastructure will increase as market demand increases. However, the market penetration of these vehicles will depend on the pricing of fossil fuels, the incentives for vehicle purchase and power and charging station infrastructure build-out, all of which can be impacted with policy.

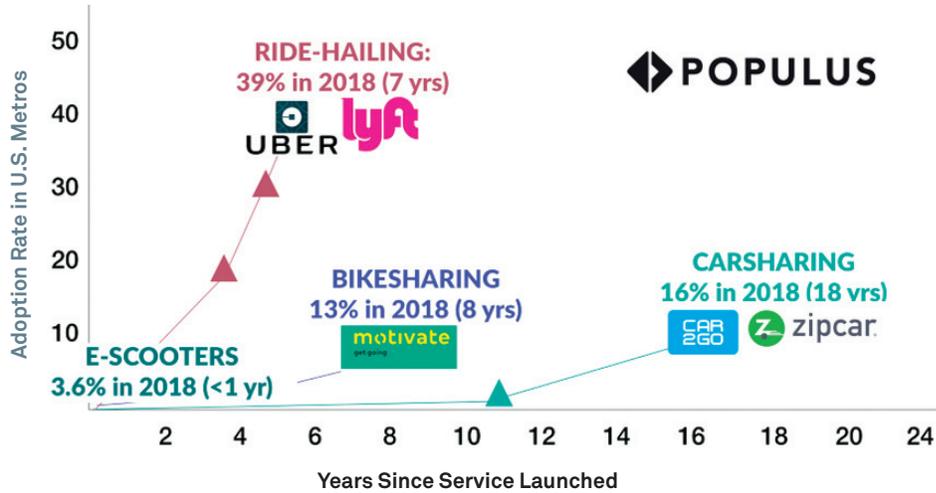
¹⁰ "Electric Vehicle Outlook 2018." Bloomberg NEF.



MICROMOBILITY OPTIONS ARE POPULAR

The current influx of dockless bike share and electric scooters is showing remarkable adoption and support. A recent nationwide survey, *The Micromobility Revolution: The Introduction and Adoption of Electric Scooters in the United States*, found that 70 percent of respondents like and support these new mobility options and that these services have remarkably high adoption rates. As more and more options become available, their widespread adoption will necessitate a different structure for space sharing.

FIGURE 2: Mobility Service Adoption Is Spreading Faster



Source: Populus Groundtruth; Clewlow & Mishra, 2017; Clewlow, 2016.

This analysis of national transportation data found that roughly 45 percent of trips made in the United States are three miles or less, and 78 percent of those trips are made by personal vehicle. Since scooters are often faster for short distances than taking a car or ride-hailing trip, and the flood of capital into the industry has enabled companies to deploy large fleets relatively fast, startups are quickly establishing a relatively useful network of dockless vehicles in many neighborhoods.



WE NEED TO CONFRONT SOME HARD CHOICES

Given our common goals and our understanding of future technological innovation and disruption, we need to acknowledge some hard truths and make important choices regarding the challenge and opportunities facing us. What choices we make between now and 2040 will determine our success in achieving our societal goals.

The reality is that we cannot build a transportation system that supports and advances our goals for the Commonwealth without behavior change. Travel mode, location choices, zoning, infrastructure and funding mechanisms have the ability to change people's behavior. The good news is that behavioral choices are not immutable but rather are a result of past policy decisions. If we make some of the tough political decisions now, new norms are a natural and less difficult result. Making these choices now will ensure that we use our system to its full potential and support it in a sustainable way.

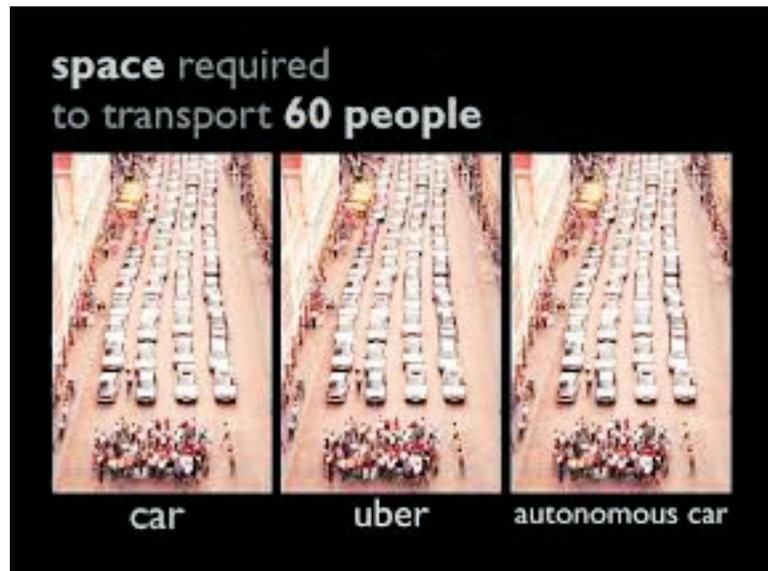
Autonomous Vehicles AND/OR Transit? Massachusetts must confront and manage a core technology issue: how AV technology will interact with public and private transportation and affect its long-term future. Will AV technology simply make it easier and less expensive to commute by single-occupancy car, thereby increasing aggregate VMT and diluting the smart growth and healthy lifestyle benefits of transit-oriented placemaking? Or will market behavior, a sound regulatory framework, and improved transit combine to help AV technology complement, expand, and reinforce public transit?

In collaboration with the MBTA and our other regional transit systems, AV technology and increasingly sophisticated TNC platforms could:

- Provide everyday first-mile/last-mile transit connectivity, using shuttles and shared vehicles;
- Identify and operate bus routes—both origin-destination and feeder—that are too small and specialized for regular bus operations;
- Provide para-transit and other specialized services.

Mass Transit must remain a key part of the solution. While burgeoning technologies may provide seductive new means of travel, an urban-based regional area cannot rely on single or low-occupancy vehicles as a main mode of mobility.

High-capacity transit will remain the most efficient use of scarce urban space, making cities more affordable and sustainable. Even if some trips in autonomous vehicles are shared, transit (whether autonomously propelled or not) will always offer more capacity. Furthermore, if we pretend that future disruptive technologies will solve mobility problems we're experiencing today, we risk choking off our interim growth potential.



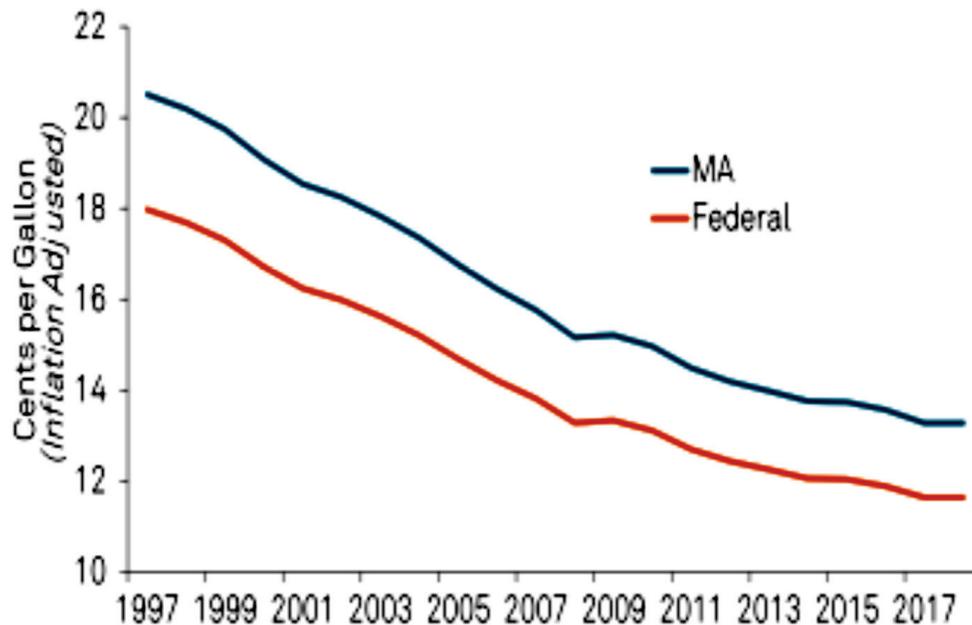
Source: TransitCenter, 2018



HOW DO WE BEST RAISE REVENUES TO SUPPORT AND IMPROVE OUR TRANSPORTATION INFRASTRUCTURE?

Not only are traditional revenue sources shrinking, but future investment will require more resources. This will require increasing the yield of existing sources and/or introducing new ones.

FIGURE 3: Gasoline Tax Revenue Eroded by Inflation



Source: Bureau of Labor Statistics and Wikipedia

As vehicles become more efficient and shared mobility services more widespread, gas tax revenue will continue to diminish. It has already lost significant value to inflation.

Furthermore, if, as we expect, the autonomous vehicle revolution precipitates a “transportation as a service” model (i.e. more shared fleets of single and low-occupancy vehicles, similar to our current experience with Transportation Network Companies (TNCs) like Uber and Lyft), revenue currently received from RMV fees, motor vehicles sales tax, excise taxes and parking fees will likely diminish as fewer people own individual vehicles.

We need to rethink our transportation funding mechanisms. This is an opportunity to be bold with respect to transportation infrastructure but also advance other goals like cleaner air, less congestion a healthier population and more equitable mobility access. Right now, the true cost of transportation is being subsidized by those who can least afford it. For example, we’ve underpriced parking in our urban centers so that more people own cars and drive them. If we more accurately priced the use of valuable space (smart metering, congestion pricing, curb pricing, etc...), we could use the funds to support infrastructure but also to help lower-income groups impacted by new pricing schemes in a more effective way, similar to how our other utilities operate.



We need to create a statewide and system-wide approach to funding. By 2040, the Commonwealth will have completed debt repayment associated with the Central Artery Tunnel Project, currently being supported by toll revenue collected along the Turnpike and Boston Harbor. We can anticipate the debate over the future use of toll revenue, because there are opportunities to improve the relationship between pricing of our roads and financial support for both transportation infrastructure maintenance and subsidies for mass transit. Tolls and parking revenues can and should support mass transit, complete streets, etc. . . . In addition, passenger facility charges should be examined and analyzed relative to supporting further enhancements in transit to access airports. Maritime surcharges should be considered to help offset their related transportation impacts, etc. . . .

It should be the goal of the Commonwealth to treat every state road equally in terms of user-fees and cost and to maximize opportunities available by current technology and AET system. Today, the rate charged to a passenger taking a ride in a Lyft or Uber is essentially paying a VMT, therefore there is no reason why we cannot harness this technology to end Massachusetts' regional inequality of our current tolling system.

Following are some funding mechanism changes that should be explored and/or implemented before 2040:

- **VMT-based pricing** as a long-term supplement or replacement of the gas tax.
- Apply **all-electronic tolling** to additional highways (as federal law now allows) and incorporating time of day pricing to better price the impacts of transportation choices.
- **Value capture** for transit such as in an expanded I-Cubed model.¹¹
- **Regional tax** initiatives to fund key priorities.

GOVERNANCE STRUCTURES MAY HAVE TO CHANGE

Our current government structure for transportation is neither integrated, nor forward-looking, with a myriad of agencies having responsibility for or control over various parts of the system. The federal government dictates our ability to price some roads, the MBTA owns buses but the cities and towns control how the buses use them. RTAs fill in where other systems end. And all of the various stakeholders may have different priorities for dealing with technology and climate disruptions.

Truly integrated/multi-modal/smart transportation will require a level of government coordination (or reorganization) that we have not had yet in Massachusetts. It will likely require someone to function as a holistic mobility advocate that can see and guide the bigger picture from the sometimes competing mode choices. And it will require giving up control in certain areas to expand better mobility overall.

CLIMATE CHANGE CANNOT BE IGNORED

As a coastal state, Massachusetts is more prone to the flooding that comes from sea level rise, precipitation and storms due to climate change. Our transportation infrastructure must acknowledge this truth both in terms of reducing the system's contribution of greenhouse gases but also building our transportation infrastructure itself to remain resilient in the face of more extreme tidal and weather conditions.

¹¹ Described in more detail in the section below.



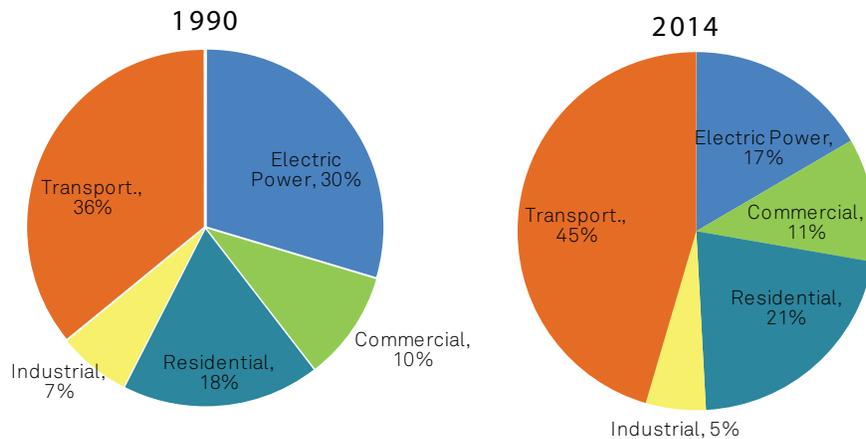
This is not a 2040 problem. It is already a 2018 problem. As the early-2018 nor'easter storms showed, our infrastructure is already vulnerable with Blue Line trains in Boston unable to stop at Aquarium Station and many other roads impassable due to flooding. Resilience must be a core criteria of all capital improvement and replacement programs from now on or we will not be able to mitigate the impacts.



Photo: Boston Herald/Nancy Lane

We need to make transportation part of the GHG/climate change solution, rather than merely mitigating the extent to which it is part of the problem. Transportation is now the leading source of greenhouse gas (GHG) emissions in Massachusetts. Over the past decade, Massachusetts has made significant progress in reducing its carbon emissions, primarily by curbing pollution from power plants.

FIGURE 4: Share of Total Massachusetts GHG Emissions by Sector



Source: CAIT Climate Data Explorer, 2015. Washington, D.C. World Resources Institute



And while this is one area where technological advancements are likely to make a big impact, as we've seen in other markets, public policy and economic incentives can aid the widespread adoption of these technologies. In order to reach our goals, we need to:

- **Electrify** and use other clean emission technologies—both in cars and in transit systems.
- **Price emissions.** States in the Northeast and Mid-Atlantic have already demonstrated success with regional, market-based climate policy through the Regional Greenhouse Gas Initiative (RGGI). To enable necessary investments and reduce emissions, Northeast and Mid-Atlantic states should establish a regional cap-and-invest program for transportation fuels or “RGGI for Transportation.”
- **Price Congestion/Implement Smarter Tolling**
- **Market-price parking**

THERE ARE GREAT OPPORTUNITIES TO BE NATIONAL LEADERS

GROWTH CLUSTERS & CORRIDORS IN METRO BOSTON

In its 2018 study, *The Transportation Dividend: Transit Investment and the Massachusetts Economy*, A Better City (ABC) documented the strong relationship between the MBTA transit system and the health of the statewide economy. Metropolitan Boston dominates and drives the Massachusetts economy, with 69% of the state's population, 74% of its jobs, and 84% of its gross domestic product. As noted previously, a key finding of ABC's analysis was that existing MBTA operations, warts and all, return measurable, monetizable annual benefits worth \$11.4 billion to the metropolitan economy, more than five times the MBTA's annual operating budget. The existing MBTA system also avoids at least \$15 billion in additional roadway and garage costs, not to mention an unimaginable dislocation of land use.¹²

Within Metropolitan Boston, recent and future growth is focused on the MAPC Inner Core—the 20 transit-rich communities that contain a quarter of the state's population and a third of the state's jobs, and where MAPC's projections for 2030 and 2040 predict that most regional growth will occur. Within the Inner Core, the ABC analysis found current and future growth concentrated in “Transit Growth Clusters”—districts where state economic policy, local land use policy, and market interest converge around rail or bus transit. ABC identified 24 such clusters, a representative subset of such places in the Inner Core.

FIGURE 5: The Hub and the Strategic Corridors



Source: AECOM

12 A Better City. *The Transportation Dividend*, 2018. Pg. 5.



Most of the Transit Growth Clusters are already growth “hot spots” with room to grow further with increased density. Some are on the threshold (for example, Suffolk Downs or the Somerville Green Line stations); others are still aspirational (for example, Mattapan/Lower Blue Hill Avenue or the string of Newton rail villages). The Transit Growth Cluster concept aligns very well with similar concepts in other recent planning efforts. The three “place types” identified in Focus40 (Major Employment Districts, Inner Core Communities Lacking Rapid Transit, and Urban Gateways) generally describe the Transit Growth Clusters. Within Boston, the Transit Growth Clusters reflect the neighborhood expansion and TOD housing priority districts identified in ImagineBoston 2030.

In the aggregate, the 24 Transit Growth Clusters contain approximately 49,000 housing units recently built, under construction, or in the approval pipeline, and the potential to accommodate roughly 49,000 more. They also contain enough commercial and industrial space newly built, under construction, or in the pipeline to accommodate some 146,000 jobs, and potential space for 116,000 more. These 24 clusters, and others like them in the Inner Core, can accommodate essentially all of the metro region’s projected growth between now and 2040, as well as the market’s natural replacement of some existing housing and employment stock in more transit-oriented settings.

Moreover, the ABC analysis showed that the Transit Growth Clusters dramatically outperform the metro region as a whole in outcomes that are essential to the broad public policy goals identified earlier in this paper—job access and overall labor market connectivity and reduced automobile use and VMT.

One look at the map shows that these Transit Growth Clusters are not 24 stand-alone districts. Rather, they form a regional Hub and five strategic corridors, linked by geographic proximity, transit connectivity, and current or potential economic synergy.

The transportation implications of The Hub and Strategic Corridors, and the Transit Growth Clusters that comprise them, are far-reaching. *The Transportation Dividend* identified, in qualitative terms, the specific mobility challenges affecting each corridor and its Growth Clusters. These fell into three common themes:

- the need for greater **reliability** throughout the system;
- the need for greater **capacity** in the system’s rapid transit backbone;
- the need for more nimble and convenient **connectivity** between Growth Clusters within a given corridor and those in neighboring corridors.

Reflecting these findings, the transportation recommendations of the ABC study include three over-arching ideas:

The MBTA must complete the State of Good Repair and Core Capacity investments it is currently making on the rapid transit system. The critical effort now underway to replace the entire Red and Orange Line fleets, and to upgrade those lines’ signal systems and vehicle repair facilities, is fundamental. Corresponding improvements to the Green and Silver Lines, as outlined in Focus40, are no less essential.

To better connect Growth Clusters **within** the Strategic Corridors, our legacy commuter rail system should be reimaged to provide high-frequency urban rail service within the Inner Core and robust *regional rail* service on the outer spokes of the system.

To better connect Growth Clusters both **within** Strategic Corridors and **between** them, new bus connections should be implemented. These could be both radial and circumferential in nature, using full-featured Bus Rapid Transit where possible and other forms of enhanced bus service where required.

For purposes of high-level discussion, idea number one—State of Good Repair and Core Capacity enhancements in the existing rapid transit system—may be considered self-explanatory. Ideas number two and three are summarized in the pages that follow. So is a strategy for value capture, rooted in the economic power of the Transit Growth Clusters and Strategic Corridors.



REIMAGINING COMMUTER RAIL

This concept, which has begun to gain currency in recent months, would benefit mobility and economic development both inside the Inner Core and in the Gateway Cities and other regional centers that lie at the outer ends of the commuter rail system. Massachusetts has a broad, deep, and largely intact legacy commuter rail system, one of the largest in the US—but it is often said to be operating a mid-20th century service and business model.

Reimagining the commuter rail system was one of the major strategic recommendations of ABC's *The Transportation Dividend* (February, 2018). The report envisioned two forms of enhanced service:

Urban rail on the Inner Core segments of the Strategic Corridors, featuring shorter and more nimble trains made up of “multiple unit” vehicles; more frequent, rapid transit-like headways; and new TOD-driven infill stations, specifically including West Station. This becomes feasible as we build out corridors as referenced above.

Regional rail on the longer-haul services to the outer ends of each line, reinforcing Gateway City and other regional center development efforts. These longer haul trains would make only selected Inner Core stops.¹³

The Transit Matters report *Regional Rail for Metropolitan Boston* (March 2018) presented a more fleshed out conceptual plan. This report uses “regional rail” to describe an all-electric, high-platform service, providing 15-minute service in the Inner Core segments of each line and 30-minute service in outer segments.¹⁴

MassINC's report *The Promise and Potential of Transformative Transit-Oriented Development in Gateway Cities* (April 2018) uses new economic research and buildout analysis to show the large downtown revitalization potential in the commuter rail Gateway Cities, including those: (i) within the Inner Core (Lynn); (ii) on the periphery of Metro Boston (Lowell, Lawrence, Haverhill, Salem, Brockton, Taunton, Attleboro), and (iii) outside the Metro Boston region (Worcester, Fitchburg, New Bedford, Fall River). It also calls for “transformative” TOD policies. While the MassINC report does not address commuter rail technology, it calls for lower fares and more frequent service and implicitly supports a strategy of reinvesting in the system and repositioning how it serves Gateway Cities.¹⁵

MassDOT's *Rail Vision Study*, currently underway and referenced in *Focus40*, is using transportation analysis and economic development scenarios to evaluate the Urban Rail and Regional Rail ideas.

A long-term, strategic repositioning of the commuter rail system is essential for future mobility and economic growth. Once MassDOT has determined a preferred rail technology and basic service philosophy, the Commonwealth should get the ball rolling: pick a corridor and implement it.¹⁶

The interest in regional rail, and its importance in advancing economic growth, extends across all of Massachusetts, to regions not now served by commuter rail:

- South Coast Rail, which will operate as part of the MBTA system, has been conceived from the outset as a strategy to bring New Bedford, Fall River, and Taunton into the economic ecosystem of the metropolitan region.
- In Western Massachusetts, the new bi-state New Haven-Hartford-Springfield service and its potential extension northward as the Knowledge Corridor would intersect the enhanced east-west regional service connecting Pittsfield, Springfield, Palmer, Worcester, Framingham, and Boston now under study by MassDOT.

¹³ A Better City, *The Transportation Dividend*; see pp. 47-49.

¹⁴ Transit Matters, *Regional Rail for Metropolitan Boston*.

¹⁵ MassINC, *Transformative TOD in Gateway Cities*

¹⁶ The North-South Rail Link would enhance a repositioned regional/urban rail system, but the corridors of such system can be developed independent of NSRL.



- The MassINC TOD report (see above) highlights the downtown station areas of Springfield and Worcester as rail/TOD growth opportunities of regional scale. This vision is reinforced by events in Springfield (the Union Station redevelopment and the MGM Casino) and in Worcester (the City Square redevelopment program just west of Union Station and the revitalization of the Canal District, including the Worcester Red Sox ballpark, just south of it).

A CROSS-CONNECTIVE BUS NETWORK

Identified as a key strategy in ABC's *The Transportation Dividend*, a 21st-century MBTA bus network is a fusion of two key ideas:

- The enhancement of bus service from a technology and performance standpoint, collaborating with cities and towns to install dedicated bus lanes and signal prioritization and, where possible, full-featured Bus Rapid Transit. The current effort of the Barr Foundation and others to explore these solutions should be the prelude to widespread adoption over the next two decades and fits with the choices we need to make about land-use and development.
- The need for high-functioning connections among Transit Growth Clusters, especially those in different Strategic Corridors which lack direct rail transit connections to one another. These cross-corridor connections are historically described as “circumferential”—not because they are far from the hub of the system (in general, they are not), but because they connect key destinations without having to make radial trips into and out of downtown Boston.

The new Silver Line Gateway represents the composite of these two ideas: a high-performance service (employing full-featured BRT for most of the route) connecting multiple Transit Growth Clusters in The Hub and the Near North Shore Strategic Corridor and extendable to the North Strategic Corridor at Everett. The Silver Line Gateway is essential to sustainable growth in the Chelsea and Seaport Transit Growth Clusters and provides new connections between the Newburyport-Rockport commuter rail line and key Inner Core destinations—all for under \$90 million. While the Silver Line Gateway is not necessarily a literal template for other corridors, it demonstrates our ability to use high-capacity, high-functioning bus connections to fill important strategic gaps in our Inner Core mobility network.

A number of other corridors, with similar potential benefits, have been identified in *GoBoston 2030*, *Focus40*, and ABC's *The Transportation Dividend*. Three examples are noted here, not as a prioritized list of projects (and not as specific alignment or technology solutions, which do not yet exist) but as illustrations of this “big idea”:

- West Station to Harvard, Kendall, and the Longwood Medical Area;
- Mattapan-Blue Hill Avenue-Grove Hall-Dudley and Mattapan-Blue Hill Avenue-Grove Hall-Egleston-Longwood Medical Area;
- Assembly-Sullivan-Green Line Washington Street-Lechmere-Kendall.



A STRATEGY INTEGRATING TRANSIT, LAND USE, AND VALUE CAPTURE

There has been increasing attention in recent years to value capture as a way to help fund transportation projects—particularly transit—that are associated with planned economic development. By “value capture” we mean two broad ideas: raising revenue directly from transit-oriented development, or using a portion of future revenue yields attributable to the transportation project to help pay for it in the first place.

Value capture is a logical and appropriate way to help fund project costs. Moreover, federal policy (although incoherent and hostile to new rail transit investments at the moment) has increasingly favored value capture as a positive factor in evaluating projects for FTA support. That said, it must be understood that funding all or most of a corridor-scale investment through value capture would be impractical (if the full development yield lies well in the future) or inequitable (if the host municipalities would have to sacrifice an unreasonable share of future net revenues).

As *part* of the solution to funding future transportation needs, the Commonwealth should develop an equitable and creative set of value capture concepts and revenue sources, including the following:

- The net new ridership and farebox revenues that arise from economic growth through transit-oriented development—regardless of whether that development directly involves MBTA or MassDOT land.
- Traditional **joint development**—that is, development of MBTA or MassDOT land, air rights, or commercial space, resulting in lease or sale payments, park-and-ride capacity built or rebuilt at developer expense, in-kind contributions to transit facilities and services, or a combination thereof. While joint development opens up interesting possibilities, we must also remain conscious of the need for supportive services (public works building, rail yards, bus maintenance facilities and gas/charging stations and incorporate those into development plans or risk losing key support for the system).
- The emerging paradigm of developers or institutions funding **infill stations** or the enhancement of existing but underutilized stations. The breakthrough examples are Assembly Square and Boston Landing. The model is further reflected in the proposed new Lynn River Works Station, the rebuilding of Back Bay Station, the Yawkey Station enhancements, and the institutional funding commitments to West Station. Other locations are possible, both in the Inner Core and in the outer reaches of the commuter rail system—particularly if the **urban rail** and **regional rail** service concepts described earlier were undertaken.
- **District value capture** at the station, multi-station segment, or whole corridor level. The existing **District Improvement Financing (DIF)** mechanism, which relies on the future property tax increment, has been used to finance development-related infrastructure in a number of station area settings as have **Business Improvement Districts (BIDs)** in helping fund more of the discretionary maintenance costs that improve the customer experience. Another successful model, the **I-Cubed mechanism**, uses the state's projected net new income and sales tax yields. The Commonwealth should consider legislation along the lines proposed in recent sessions that would enable municipalities along a transit corridor to create a multi-station, multi-municipality DIF-like district to help finance transit improvements. The I-cubed model might also be adapted to help finance transit improvements, by creating a multi-station option or by considering additional, project-appropriate revenue streams, as in the Boston Convention and Exhibition Center financing package.

A strategy of integrating transit, development, and value capture implies a conscious policy of encouraging density—in the 20-community Inner Core of Metropolitan Boston, and in rail communities in the outer parts of the metro region, and in other regions of the Massachusetts. The Commonwealth itself, MassDevelopment, the Metropolitan Area Planning Council, MassDOT and the MBTA, and numerous cities and towns have adopted TOD policies and are pursuing specific TOD plans and projects. The list is very long, reflecting the smart growth bond between our transportation and economic development legacies. State policy—at MassDOT and in other Secretariats—should reinforce this connection as an underpinning of our long-term transportation future.



HOW DO WE GET FROM TODAY TO 2040?

INVESTMENTS TODAY WILL BE THE FOUNDATION FOR 2040

The condition of our transportation network in 2040 will depend on our level of commitment and investment today and the next ten years. Massachusetts is certain to evolve, but consideration of the transportation system in 2040 must acknowledge that we are underinvesting in transportation infrastructure today, at all levels (federal, state and local) and that we must find ways to increase capital and capital deployment across the system.

Although MassDOT has developed a five-year capital plan that includes budget estimates for programs through 2023, it remains inadequate. The Governor's Commission is looking 22 years into the future, but this leaves a window of seventeen years that will have a much greater impact on Massachusetts residents, our economy, and quality of life. We cannot talk about decades into the future by overlooking the challenges of the next decade.

BIG PROJECTS TAKE TIME

Today, we are not properly building transportation infrastructure needed for the future. The only significant expansion project funded in the current Capital Plan is the Green Line Extension plan, a project that former Gov. Mitt Romney signed as a legal commitment of the commonwealth in 2006.

The next expansion projects need to be started immediately because our economy is rapidly growing and housing costs continue to push workers further away from job centers. Meanwhile, our roads and highways are among the most congested in the nation. Major new transportation investments that can help address these challenges are not being moved forward even through there is an urgent need. Please don't look at 2040 without acknowledging the current approach is insufficient.

We needed new MBTA Red and Orange line vehicles decades ago, but the contract to acquire these new vehicles was executed in 2014, after a procurement process that took several years. It will take until 2022 for us to benefit from a completely new Orange Line fleet, and 2025 for the full new Red Line vehicles. These projects **that were initiated years ago** are the heart of today's five-year capital budget.

EXPERIMENT WITH TODAY'S TRAFFIC PROBLEMS TO SET THE STAGE FOR LARGER POLICIES

Congestion on the roads in Massachusetts is already a growing risk to both our economy and quality of life. The transportation research firm INRIX now ranks Boston as the seventh worst place for overall traffic in North America and estimate that Boston drivers spend 14 percent of their driving time stuck in congestion, the highest percentage in the United States. The high cost of housing in the region is another factor that contributes to longer commuting times, as affordable housing options are located further away from job centers and public transit options. All of these trends signal it is time for some new actions and strategies

An evolution in how we use our roads is essential to meet the challenges of our modern economy and the reality of our current transportation system. This includes consideration of bold ideas such as smarter tolling and congestion pricing; dedicated lanes for Bus Rapid Transit service; appropriate restrictions, limits and additional surcharges on TNC services like Uber and Lyft; and improved management, increased capacity and revenue for our public transportation system, particularly to deliver an affordable and reliable alternative to driving into Boston's central business district and region's inner core. **We should start testing these ideas and others in order to evaluate their impact and benefits to the region.**



LET'S LOOK TO BEST PRACTICES TO GUIDE US

In order to meet the goals of the Commonwealth in regards to transportation by 2040, we must embrace the opportunities we have at hand that may be able to meet those goals. Below, we summarize some ongoing, cutting-edge research and technology breakthroughs that may be able to assist the Commonwealth in achieving our goals, but are implementable in the near term. Embracing technology, but not relying on it, will help the Commonwealth grow in a responsible manner.

DRIVER BEHAVIOR

Changing driver behavior will have an impact for all roadway users, including pedestrians, bicyclists and transit. Behavioral changes by drivers are necessary to accommodate the technological advances and uses of roadway pricing that are coming to the transportation network. **In August 2015, New York City Department of Transportation (NYCDOT) began a one-year pilot test (called Drive Smart)** with 500 drivers who live or work in New York City. The objective of the project was to reduce traffic jams, improve driver behavior and to implement a fair fee system. NYCDOT partnered with several technology companies to provide drivers with mobile apps that draw on data produced by their car's diagnostic port. These applications provide drivers with feedback on how to drive more safely, use less gas, and avoid traffic, as well as reward drivers for driving during off-peak hours or on less congested routes.

The pilot project gave NYCDOT the opportunity to test the concept and technology in a large-scale market, while providing insights into user preferences and market response. Drivers who volunteered for the demonstration project were given access to the Drive Smart package of services and mobile apps supplied by NYCDOT and the program partners. Data used in analysis was collected from the diagnostic ports of selected (volunteer) vehicles in the NYC area, and included speed, engine rpm, engine temperature, GPS location, and accelerometer readings. The demonstration project helped NYCDOT evaluate the immediate effectiveness of Drive Smart in support of its current vision zero policy for safe, focused, and responsible driving.

Driver behavior can also be impacted by technology outside of the vehicle. The I-287 corridor in the Lower Hudson Valley of New York is a major regional route operating at or close to capacity during key segments. This makes the corridor prone to disruptions that can have long-lasting and wide-ranging effects. Implementing **Integrated Corridor Management (ICM)** along the I-287 corridor helps to mitigate many of those challenges. Given the multiple stakeholders and operational agencies administering segments of the I-287 network, an integrated approach allows operators to coordinate long-term strategy decisions and resources at a regional scale, and share relevant technical knowledge. Additionally, the use of information sharing and integrated systems and technologies helps operators identify and respond to incidents and special events such as traffic crashes and lane closures. Real-time traffic updates to travelers informs commuter decisions about trip timing and routes, redistributes traffic demand, and maximizes the capacity of existing infrastructure. Along with intelligent transportation technologies to streamline traffic flows, redirect traffic to alternative routes along the corridor, improve tolling and pricing practices, and manage ramp metering, these improvements help operators and improve regular low peak-traffic speed along the corridor. ICM allows operators to encourage modal shifts by promoting faster bus service and improved access to commuter rail lines connecting to the corridor. Increased control over the network allows managers to prioritize these alternative modes, with significant savings in passenger time and ease of travel. Decreasing the use of private vehicles will also reduce traffic along the corridor.

AUTONOMOUS' IMPACT ON REGIONS

The regional metropolitan planning organization of the San Francisco Bay Area (MTC) is examining autonomous vehicles (AVs) and conducted a research program to consider the impact of autonomous vehicle on greenhouse gas emissions. This project involves identifying and estimating possible transportation and air quality impacts associated with the introduction of autonomous vehicles into the Bay Area's car and light truck fleet. The report identified additional GHG reduction initiatives above those already in the MTC's current plan, and estimated



potential GHG reduction impact for those additional initiatives. A literature review on best-practice low carbon transport policies and plans was undertaken, as was a review of MTC's approach to simulating autonomous vehicles within transport models.

Boston can build upon these models to best simulate AV impact on travel demand. It must involve simulating changes in key variables to estimate the ensuing regional effects on travel at key intervals over the planning horizon, and include a roadmap for executing an experimental design process to test various AV scenarios. The experimental design outlined by the MTC provides an incremental approach that enables new research into AV technology, business models, consumer preferences, and optimization processes to be incorporated into the modeling system.

OUR FUTURE STREETS

At a hyper local level, the coming technology changes give the Commonwealth an opportunity to examine our street networks and curb usage, and evaluate how we utilize and price this space. AVs offer an opportunity to significantly reshape and reprice urban streets.

However, much like predictions of AV uptake and usage patterns, the form and extent of this street reshaping is highly uncertain. While numerous studies identify the impact AVs may have on street operations and policy, few case studies investigate AVs' potential influence on street design. The global design firm, Arup, has examined one such location. As an auto-oriented thoroughfare slated for significant redevelopment in the coming decades, **4th Street in San Francisco provided an ideal case study for future-proofed street design.** The 4th Street new mobility street design process looked at future and existing conditions on the street and the impacts on the land use around it.

This research produces two key findings. First, in urban areas, the curb will be the center of increasing levels of conflict. As AV services escalate passenger loading demand, on-street parking will remain in high demand if legacy vehicles remain in circulation. Balancing passenger loading with on-street parking will be crucial. Additionally, building more high-quality bicycle facilities will remain critical to achieving safer, more sustainable communities. Second, AVs are highly likely to bring greater efficiencies to roadway operations, presenting a significant opportunity to repurpose this regained road capacity for other modes. This study developed one of the first autonomous vehicle street concepts to create livable streets in the context of a near exponential increase in demand for curb space. Massachusetts should utilize this type of examination to explore the coming changes to our urban and suburban streets, and what steps we need to accomplish in order to reach those goals.

One approach is to utilize a concept called **FlexKerbs**. FlexKerbs look at how AVs can co-exist with all road users, and imagine the future management of the side-of-the-road through the introduction of flexible curb space. Driven by real-time data and local policy, FlexKerbs will intelligently adjust permitted curbside uses throughout the day and week to ensure that space both meets demand and achieves local transportation goals. Over the course of a day, for instance, a single FlexKerb segment could function as a cycle path at rush hour, a pedestrian plaza at lunchtime, an AV rank in the evening and a loading zone overnight. Developed for the UK's National Infrastructure Commission's Roads for the Future competition, FlexKerbs provide an opportunity to enhance the urban environment for pedestrians, cyclists, and other transportation users, while simultaneously examining the pricing models for such a scheme.

Beyond the roadway, our sidewalks must grow with technology in order to meet the needs of future pedestrians, be they local or visitors. An important component of this will be improvements to wayfinding. The Smart Streets Pittsburgh project addressed some of challenges of wayfinding development and prototyping by creating an augmented reality model that places signage in any physical setting, allowing design review and collaboration from afar, without the need for a life-size physical mock-up. The app works by using the device's camera to scan the space and establish the geometry of the proposed location. Then you simply tap the screen to place your 3D model which stays in position as you walk around it, allowing inspection from any angle. This technological advancement, while not critical to the throughput of our roadways, will assist in limiting construction periods and allow faster development of improvements for all users.



TRANSIT AND TECHNOLOGY

In a future where 75% of people live in cities, the world's population stands at 9.5 billion, and there are advances in technology that can only be dreamed about today, rail travel will play a critical role in the movement of passengers and freight. **The Future of Rail 2050 study**¹⁷ takes a user's perspective and explores how rail travel might change. The rail and transit industry is often thought of as old-fashioned; however, there is a need to proceed with foresight, to embrace creative thinking beyond projecting the present into the future. The impacts of this work on the Massachusetts context is striking for those who aim to see a truly paradigm-changing impact of transit. The user journeys examined in the study are intended to generate a conversation about the world ahead and provide the big picture context for future planning and decision-making by governments and the industry. The hope is that the industry will move forward with innovation based not solely on past experiences but also on future possibilities and preferred outcomes. The case studies indicate trends taking place in rail, are early signs of possible directional change, and reveal directions in which the future could be heading. Boston and the metro region must build upon these conversations to help drive the future of the MBTA.

At the street level, autonomous buses have already arrived around the globe. **UK AutoDrive** provides a practical demonstration in Milton Keynes and Coventry, where the city councils are taking the lead in developing the urban infrastructure technologies required to support driverless mobility. The aim of the project is to establish the UK as a global hub for the development of autonomous vehicle technologies and to integrate driverless vehicles into existing urban environments by trialing them in two major UK cities. Not only will the program help develop the new protocols and connected infrastructure required for future autonomous mobility, it will allow the UK Autodrive team to test public reaction to both driverless cars and self-driving pods.

The impact of this to Massachusetts cannot be understated, as elements of driverless transit are already coming to our shores. **Union Point**, at the former Weymouth Naval Air Station, aims to be the US' first smart city, populated primarily with autonomous vehicles, including shuttles. The project focuses showcasing best practices: an educational Mobility Living Lab, pilot projects and services, a comprehensive travel demand management program, designing for active mobility, a robust Mobility-as-a-Service package, with expanded mobility services, preserving space through land banking, and widespread automated services carrying real passengers. With roadways and buildings already under construction and in use, these technologies are coming to the Boston market, and the Commonwealth should continue to lead the way.

MOVING FORWARD

This is an exciting time of growth for the Commonwealth, which makes the work of this commission so critical. We can take advantage of our growing prosperity to build better, healthier and more equitable communities by embracing and supporting the important role of transportation in our economy and lives. By working towards our common goals, understanding technological change and addressing some hard choices now, we can make great strides toward our 2040 goals. We look forward to working with you on advancing these ideas.

17 Arup. *Future of Rail 2050*. 2014.



THE FUTURE OF TRANSPORTATION

A BETTER CITY'S VISION



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A Better City is a diverse group of business leaders united around a common goal—to enhance Boston and the region's economic health, competitiveness, vibrancy, sustainability and quality of life. By amplifying the voice of the business community through collaboration and consensus across a broad range of stakeholders, A Better City develops solutions and influences policy in three critical areas central to the Boston region's economic competitiveness and growth: transportation and infrastructure, land use and development, and energy and environment.