Choices for Stewardship: Recommendations to Meet the Transportation Future

EXECUTIVE SUMMARY

Submitted Pursuant to
Executive Orders 579 and 580

★ COMMISSION ON THE FUTURE OF TRANSPORTATION IN THE COMMONWEALTH

The Commission's Charge

This report fulfills the requirements of Governor Charlie Baker's Executive Order 579 (January 23, 2018), which established the Commission on the Future of Transportation in the Commonwealth and required that, "The Commission shall, at a minimum, investigate the following topics… that may affect transportation.

1. Climate and Resiliency
2. Transportation Electrification
3. Autonomous and Connected Vehicles
4. Transit and Mobility Services
5. Land Use and Demographics

The relevant time frame for this analysis shall be 2020-2040."

Report Overview

The report is presented in two parts:

- Volume I. Choices for Stewardship: Recommendations to the Meet the Transportation Future

- Volume II. Choices for Stewardship: Background Books – Facts, Trends, & Issues
  - Demographics and Land Use
  - Transit, Active Transportation, and Mobility Services
  - Autonomous and Connected Vehicles
  - Climate Change and Resilience
  - Transportation Electrification

Volume I Highlights

Section One: Facts, Trends, & Issues

The work of the Commission was informed by a study of current trends related to five topic areas identified in the Executive Order. Highlights include:

Demographics and Land Use

- The Massachusetts population is expected to grow by 600,000 residents between now and 2040.
- Population growth is concentrated in the eastern part of the state. Greater Boston is home to 45 percent of the state's population, but has seen 67 percent of all statewide population growth since 2010. The Greater Boston region is one of a few metropolitan areas in the nation where the central city is growing more quickly than is its suburbs.
- The state workforce has already grown by over 350,000 jobs since 2010, and job growth is expected to continue. Municipalities with high-frequency subway service accounted for 42 percent of the state's net job growth in the last decade.
- The state's population is, on average, older than that of many other US states, and projections indicate that those over 65 are poised to be an even bigger share of the state population.

Transit, Active Transportation, and Mobility Services

- As is true nationally, ridership on the Massachusetts Bay Transportation Authority (MBTA) and on most of the state's Regional Transit Authorities (RTAs) has been declining for the past several years.
- However, this trend is not uniform: MBTA Blue Line and Commuter Rail ridership has increased since 2015, as has ridership for MetroWest Regional Transit Authority.
- Though they represent a small percentage of total trips in the Commonwealth, use of transportation network companies (TNCs) has exploded over the past several years, primarily within Greater Boston and among those under 40 years old.
- Bicycling and walking as forms of transportation have increased since 2017, particularly in communities close to Boston.

Autonomous and Connected Vehicles

- Connected vehicles – still an exploratory technology – are able to communicate with road and traffic infrastructure for the purposes of safer and more efficient driving.
- Autonomous vehicles – also still in various phases of testing – offer the promise of fully self-driving vehicles in which humans are freed from the tasks of driving. Today, however, the most advanced autonomous vehicles only feature 'Level 2' automation, which includes features such as simultaneous cruise control and lane-centering.
- Projections vary as to the extent and pace of connected and autonomous vehicle (C/AV) adoption, and suggest that anywhere from 19 to 75 percent of all vehicles on the road in 2040 could feature Level 4 automation which would not require human drivers.
- C/AVs have the potential to radically change transportation and mobility, and have a myriad of both positive and negative possible implications for society.
- At least 42 states have enacted legislation and/or signed executive orders that address testing of C/AVs, including Massachusetts.

Climate Change and Resilience

- A recent report of the United Nations' Intergovernmental Panel on Climate Change (IPCC), a leading authority on climate science, warned that the impacts of climate change are happening both sooner and more intensely than originally thought with significant implications by 2040 without strong actions now
- The US Fourth National Climate Assessment report released in November 2018 also projects significant climate change and that, by 2035, the Northeast will see the largest temperature increases in the contiguous United States, among other changes.
- Transportation infrastructure is affected by climate change. People travel differently in extreme weather, and weather not only wears on infrastructure, but infrastructure has physical reactions to extreme weather conditions, including damaged or obstructed roads and sidewalks or warped rail lines. As Massachusetts experienced in 2015, extended cold periods also affect the ability to clear snow and ice from roadways and other infrastructure.
- Transportation also exacerbates climate change, both nationally and locally. In Massachusetts, almost 40 percent of all GHG emissions in 2015 came from transportation infrastructure and vehicles, with nearly half of the contributions coming from passenger vehicles alone. Without further action, transportation sector GHG emissions are projected to increase.

Transportation Electrification

- Electric vehicles (EVs) are often identified as a key part of the solution to transportation-related emissions, but adoption remains stubbornly slow. In 2017, just over one percent of all vehicles sold in the United States were electric.
- In 2017, 1.4 percent of all light-duty vehicles sold in the Commonwealth were electric, and 12,000 EVs were on the roads here.
- However, some recent projections have shown a significant increase in the number of EV sales happening soon. Projections are frequently revised to reflect greater optimism about their adoption.
- A future of electrified transportation will require a regional electricity grid able to consistently supply sufficient power, as well as a comprehensive network of charging facilities.

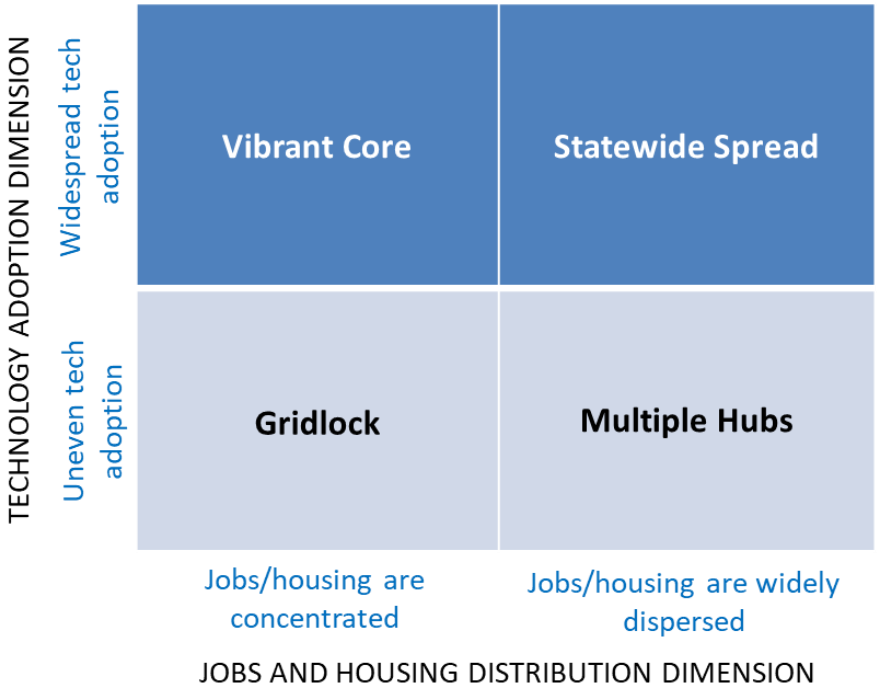
Section Two: Scenario Planning

Governor Baker's Executive Order asked the Commission to provide recommendations to prepare the transportation system for what the future may be in Massachusetts in 2040. Scenario planning was an exercise used by the Commission to process an enormous amount of information about trends in demographics, technology, electrification, transportation services, land use and the economy, and to help describe plausible future scenarios. MassDOT uses this tool in its planning work, as suggested as a "best practice" by the National Cooperative Highway Research Program (NCHRP) Report 750 Foresight Series.

Following hours of scenario planning meetings and after evaluating many potential future trends, the Commission chose two major trends which will shape people's mobility options and needs and used these two trends to create plausible scenarios: technology adoption and jobs and housing distribution.

Technology adoption, and whether it is available and adopted uniformly by people across generations or geographical areas, will strongly influence travel options and needs.

The distribution of jobs and housing will impact travel options and needs - in 2040, in other words, it will matter whether the increase in jobs and housing is concentrated or more widely dispersed.



Scenario 1: Gridlock
The fast growth of Boston and its surrounding municipalities has continued, but without expansion of existing transportation capacity.

Scenario 2: Vibrant Core
Greater Boston continues to grow, supported by new transportation technologies and systems that facilitate the success of a vibrant and livable metro region.

Scenario 3: Multiple Hubs
High-density growth takes place in several cities and their regions of the Commonwealth. Increased density and expanded mobility options create the opportunity to take advantage of lower cost housing and promotes job creation outside of the Boston core.

Scenario 4: Statewide Spread
Technology has transformed not just transportation but every aspect of people's lives, including work, communication, commerce, and service delivery. This widespread use of technology allows for more choice for those with access to technology, while potentially disadvantaging others.

Section Three: Commission Recommendations

Key Challenges
To frame its recommendations, the Commission laid out what it sees as the key challenges facing transportation in Massachusetts over the next two decades based on the earlier trends analysis and scenario planning:

We can't know the future: Many futures are possible for Massachusetts and its transportation system, depending on how technology develops and is adopted; how population and employment trends evolve; how municipalities shape land use and development patterns; and whether the Commonwealth aggressively tackles transportation greenhouse gas emissions and adaptation to a changing climate.

Disruptive technological change is inevitable: Technology is rapidly changing how, why, and where people and goods move. Electrified autonomous vehicles and other new transportation technologies have the potential to improve safety, speed and efficiency; expand mobility options; and reduce greenhouse gas emissions – if they are harnessed properly and managed prudently.

Massachusetts is growing and aging: After decades of little or no growth, the Commonwealth is projected to have significantly more people, homes, and jobs by 2040: approximately 600,000 new residents between now and 2040 - roughly the equivalent of adding another City of Boston to Massachusetts. Our population is also aging: projections show the proportion of residents 65 and older increasing by 2040. Both of these trends pose real challenges for an already over-extended, largely inflexible transportation system.

The existing transportation system is made up of transportation haves and have-nots:
Today's transportation system, not just in Massachusetts but nationwide, is inequitable. Those who do not or cannot own or drive a car – due to youth or age, physical or developmental disability, or financial realities – spend more time and money commuting and sometimes simply cannot get where they need to go, especially in rural and low-density areas.

Transportation needs vary across the Commonwealth and its communities: Massachusetts is a geographically diverse state, and transportation challenges and solutions vary within and among regions.

The transportation system needs to move more people in fewer vehicles: In Massachusetts and throughout the country, the vast majority of trips are made in personal vehicles in which the driver is the only occupant. The transportation system would operate more efficiently and effectively with increased availability and utilization of public transit and an increase in the number of other vehicles that carry more than one passenger, whether they are personal vehicles, private shuttles, or TNCs.

Land use and development decisions drive transportation patterns: Land use, transportation, and economic development are inextricably linked. How much people travel, where they go, and how long those trips are depend on where they live, work, and visit. Those land use patterns, in turn, are determined by where housing and commercial developers and employers choose to locate and how cities and towns choose to regulate land use and development. Because many of the problems of the Commonwealth's transportation system are not driven by transportation-based decisions but instead by land use and development patterns, those issues need to be addressed as part of solving Massachusetts' current and future transportation challenges.

The transportation system needs to be de-carbonized: In Massachusetts the transportation sector is both the largest and the fastest growing emitter of GHGs. If the Commonwealth is to meet its goal of reducing overall GHG emissions 80 percent by 2050, a large proportion of the emission reductions will have to come from transportation. And while accelerating conversion of cars and light duty trucks to electricity or other zero emission technologies is a key strategy, it is not enough by itself.

Transportation infrastructure needs to be made resilient to a changing climate: New infrastructure must be sited and designed with the climate of the future firmly in mind; existing infrastructure will need to be systematically retrofitted over time to withstand sea level rise, more frequent and violent precipitation, and hotter summers.

Needed investments need to be prioritized and paid for: Maintaining and modernizing the Commonwealth's existing transportation systems while also preparing them for the future will be a challenging, long-term, and expensive process. The Commission could not and did not put a price-tag on its recommendations and is well aware that all of the proposed changes cannot be made at once. The Commonwealth will need to set priorities for maintaining, modernizing, and expanding its transportation systems and will need to leverage a combination of public and private resources to make the investments needed to create, operate and maintain a 21st century transportation system.

Recognizing the impact on low-income populations and communities of color

While it is our hope that advancements in technology and strategic and thoughtful planning around the future of transportation will improve the quality of life of all residents in the Commonwealth, it was important to the Commission to think about the impact our recommendations would have on people with low-incomes, disabilities, limited access to public transit and other transportation options, as well as communities of color. In the recommendations that follow, we have tried to point out the possible implications to these populations, noting instances where a particular recommendation could cause a community to bear a disproportionate burden, and other instances where a recommendation would benefit disadvantaged populations.

Recommendations

Grouped into five thematic categories, the Commission is making 18 recommendations for how to best prepare Massachusetts' transportation network for the challenges and opportunities of 2040. Each recommendation consists of a comprehensive recommendation providing longer-term guidance with an eye to 2040, why this recommendation is important, and some initial next steps. The first 16 recommendations do not include consideration of necessary resources, but the Commission provides guidance on governance and resources in the last two.

I. Modernize existing state and municipal transit and transportation assets to more effectively and sustainably move more people throughout a growing Commonwealth.

1. **Prioritize investment in public transit**
   The Commonwealth must continue to focus on modernizing its existing public transit assets, including vehicles, to prepare the current system to perform better long before 2040. The public transit agencies of Massachusetts need to reinvent transit operations to offer better, more responsive, and more customer-focused service, in concert with new mobility.

2. **Transform roadways and travel corridors**
   MassDOT, municipalities, and other roadway owners should redesign them to prioritize person-throughput rather than vehicle-throughput, so that limited corridor capacity is allocated to moving as many people as possible, while accommodating mobility alternatives.

3. **Better manage traffic congestion**
   The Commonwealth must consider a full set of options to address roadway congestion, including improvements to public transit, better systems operations, and the consideration of congestion pricing. The Commonwealth should prioritize and target investments in public transit and other high-capacity transportation modes to make these more efficient, attractive, and reliable to reduce single occupancy vehicle (SOV) use, particularly on our most congested roads in the urban core.

II. Create a 21st century "mobility infrastructure" that will prepare the Commonwealth and its municipalities to capitalize on emerging changes in transportation technology and behavior

4. **Establish a Commonwealth Transportation Technology Transformation Initiative**
   The Commission believes that we are in the early stages of a transportation revolution as impactful as any that has come before it. In order to harness the talent of our workforce, academia, and innovators to take full advantage of this opportunity, the Commission calls for the establishment of the Commonwealth Transportation Technology Transformation Initiative (T3I) to partner public and private resources with innovators to tackle some of the Commonwealth's most difficult transportation issues.

5. **Support and accelerate efforts to consume transportation differently**
   MassDOT should lead the development of policies related to changes in mobility practices, including ride-sharing, vehicle-sharing, Mobility as a Service (MaaS), on-demand mobility (ODM), and micro-mobility. The Commonwealth should continue to be an innovation proving ground for shared mobility initiatives.

6. **Promote a statewide telecommunications infrastructure**
   The Commonwealth should promote full statewide communications infrastructure (5G, Wi-Fi, and their future counterparts) that can support and enable new transportation technologies and services, from connected and autonomous vehicles (C/AVs), to real-time traffic and asset management systems, to telecommuting opportunities. Since the siting of infrastructure to support new technologies includes municipal approval, MassDOT and other state agencies will need to expedite their review and approval processes while better coordinating them with local communities.

7. **Develop a strategy to support connected and autonomous vehicles**
   MassDOT should dedicate resources to the management of an interagency Connected and Autonomous Vehicle (C/AV) Committee, to understand how the Commonwealth can prepare for and maximize the positive impacts of C/AVs. To continue Massachusetts' leadership position, the Governor should consider proposing legislation to establish statutory and regulatory structures that enable the safe and reliable deployment of C/AVs.

8. **Enable and promote a ubiquitous electric charging (and/or alternative fuel) infrastructure**
   The Commonwealth should continue to facilitate the establishment of a statewide electric charging network – and/or the infrastructure needed for other alternative fuels – that is fast, equitable, robust, and resilient in order to support a growing fleet of zero emission vehicles (ZEVs). The Commonwealth should develop standards or incentives for vehicle (driven by humans or driverless) to be electric, to charge during off-peak hours, and to be available to deliver energy back to the grid at peak times.

III. Substantially reduce greenhouse gas (GHG) emissions from transportation sector in order to meet Commonwealth's Global Warming Solutions Act (GWSA) commitments, while also accelerating efforts to make transportation infrastructure resilient to a changing climate

9. **Establish a goal that all new cars, light duty trucks, and buses sold in Massachusetts will be electric by 2040**
   Achieving the Commonwealth's 2050 GWSA mandate will require the near-complete transition of our vehicle fleet (cars, trucks and buses) to electric vehicles or other zero-emission vehicle (ZEV) technology. Because vehicle fleets turn over slowly, for vehicles on the road to be electric by 2050, the Commonwealth should establish the goal for vehicle sales to be electric by no later than 2040 (perhaps sooner in some vehicle classes).

10. **Establish a regional, market-based program to reduce transportation sector greenhouse gas (GHG) emissions**
    The Commonwealth should publicly support the prompt development and implementation of a regional program that uses market mechanisms and public investment as a means to limit GHG emissions from the transportation sector. The Commission also recommends exploring the adoption of a regional Low Carbon Fuel Standard.

11. **Make transportation infrastructure resilient to a changing climate**
    The Commonwealth should develop vulnerability assessments for all publicly-owned or funded transportation infrastructure in Massachusetts across all agencies, the outcomes of which can then inform capital planning. MassDOT should develop and disseminate resiliency-oriented statewide design standards for transportation infrastructure, including

infrastructure owned by the MBTA and the RTAs; by 2020, no transportation-related project should be built that does not conform to those standards.

12. **Ensure sufficient electric capacity**
    As electric vehicle penetration accelerates, Massachusetts should work in close coordination with ISO New England (ISO-NE) and other states to ensure that sufficient electricity continues to be available to provide reliable, clean, and competitively priced power supplies for all electricity users in the Commonwealth.

IV. Coordinate and modernize land use, economic development, housing, and transportation policies and investment in order to support resilient and dynamic regions and communities throughout the Commonwealth

13. **Adopt dense, mixed-use, and transit-oriented land use policies**
    Municipalities should accelerate the adoption of land use regulations that promote density and the use of shared vehicles and active and shared transportation modes. The Commonwealth should consider accelerating local progress in this area through incentives and regulations.

14. **Enable Gateway Cities and the regions they anchor to compete for residents and jobs**
    The Commonwealth's transportation providers – including MassDOT, MBTA, and the RTAs – should support opportunities for housing and economic development in Gateway Cities and other regional hubs that have the potential to act as economic anchors within their respective regions.

15. **Coordinate the planned reinvention of the MBTA commuter rail system with local, regional, and state land use and economic development strategies**
    MBTA should work with stakeholders to compile a menu of new service options for the commuter rail network by the end of 2019 and then develop detailed information on the costs (both capital and operating) and benefits of each of the service models. Regional planning officials and local elected officials in commuter rail-served communities should develop plans to support near-term increases in ridership and the transition to broader, interconnected service models.

16. **Provide better mobility options in rural communities**
    MassDOT, working with MPOs and local municipalities, should develop strategies for providing rural Massachusetts with viable transportation options to supplement privately-owned vehicles. The Commonwealth should designate appropriate state agencies to work with the private sector to ensure that necessary infrastructure is available to support deployment of C/AV and TNC technologies throughout the state, including in rural areas.

V. Make changes to current transportation governance and financial structures in order to better position Massachusetts for the transportation system that it needs in the next years and decades

17. **Prepare MassDOT and other transportation-related entities to effectively oversee a changing transportation system**
    To prepare the Commonwealth's transportation system for the inevitable changes of tomorrow, the Governor should consider specific organizational changes to MassDOT and other agencies that allow better focus, alignment, and results, including the continuation of

a dedicated MBTA Board, a new paradigm for MassDOT, MBTA, and Regional Transit Authorities, and plans for data-sharing to enable improved services and options for the transportation system.

18. **Develop a fiscally sound and responsible transportation resource plan**
    Among the most significant contributions that today's decision makers could make to the public for the year 2040 is to commit to providing sufficient resources for the proper maintenance, operation, and upgrades to the state's transportation network. The Commission concludes its report with this recommendation, not because it is the least important, but because the promise found in our earlier recommendations can only be achieved through a long-term commitment to providing the resources necessary to operate and maintain the Commonwealth's evolving transportation system. This begins with a commitment to eliminate the longstanding backlog of today's identified priority deferred MBTA and MassDOT maintenance projects to achieve safe, efficient services and asset conditions by 2030. Only then will the Commonwealth be able to fully turn its attention to effectuating the Commission's vision for 2040.

Going Forward

The Commission was not able to consider all topics of potential relevance. Freight is a major and growing factor in local and regional mobility, but ultimately outside the scope of the Commission's work. Marine transportation was also beyond the purview of the Commission, as was passenger air travel. Nevertheless, the Commission believes that the summary of trends and the 18 recommendations provided here offer guidance for the Commonwealth to plan for the future in order that it can benefit from change rather than be caught unaware. The Commission suggests that the Commonwealth establish a process for annually reviewing the recommendations in this report, and other benchmarks, projects, and improvements in order to measure whether Massachusetts is advancing toward a desirable future or slipping further behind.

As noted in the Cover Letter, the Commission has used the title *Choices for Stewardship* for this report because this is a generationally important moment, one in which today's leaders can and must act to secure the future for the Massachusetts residents of tomorrow – whether they be born here or newly arrived, no matter their level of education or income or access to power. This call to stewardship is most urgent in the area of climate change, but it is relevant in many other areas as well. It is our duty to build and nurture a reliable, sustainable, well-maintained, and financed multi-modal mobility system for the future of all of Massachusetts.

All materials related to this report and to the work of the Commission can be found on the Commission website.