

July 2024



Final Plan



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1.0 Introduction

1.1 About this Plan

The Massachusetts Department of Transportation (MassDOT) is required by Federal and State regulation to prepare a statewide long range transportation plan. The Beyond Mobility Statewide Long Range Transportation Plan (“*Beyond Mobility*” or “the Plan”) is MassDOT’s response to these regulations. However, the Plan goes beyond meeting Federal and State requirements to serve as a strategic plan for MassDOT that thoroughly documents the most pressing transportation issues for MassDOT to address now and in the future to achieve a safer and more equitable, reliable, and resilient transportation system. The priorities and strategies established in *Beyond Mobility* are a reflection of the Healey-Driscoll Administration’s vision for enhancing transportation and economic development in Massachusetts.

The title of this Plan, *Beyond Mobility*, refers to the idea that good transportation planning is about more than just moving vehicles for the sake of moving vehicles; it is about connecting people to opportunities and the places they care about and need to go. To that end, *Beyond Mobility* focuses on moving beyond the traditional ways transportation has been evaluated and toward centering people and outcomes at the heart of MassDOT’s strategic planning framework.

It is important to note that *Beyond Mobility* does not constitute a listing of transportation projects. Rather, this report serves as a policy document that establishes a strategic framework and priorities for MassDOT to address in order to improve the safety, reliability, equity, and sustainability of Massachusetts’ transportation system. A series of Problem Statements and responsive Action Items organized by six Priority Areas serve as the backbone of the *Beyond Mobility* plan. Collectively, these items will inform future MassDOT organizational efforts in the areas of policy and program development, research, capital planning and programming, partnerships, and operational improvements, among others, to advance a people-centered transportation system in Massachusetts.

1.2 About MassDOT

MassDOT was created as a unified transportation agency in 2009 as a result of “An Act Modernizing the Transportation Systems of the Commonwealth of Massachusetts.” Today, MassDOT is comprised of several modal divisions, including: the Highway Division, which has jurisdiction over

Land Acknowledgement

MassDOT acknowledges that the land on which our agency operates and on which this Plan was written includes the traditional territories of Mohican, Abenaki, Pocumtuc, Nipmuc, Pennacook, and Wampanoag people. Massachusetts is home to two Federally-recognized tribes—the Mashpee Wampanoag Tribe and the Wampanoag Tribe of Aquinnah—and one state-recognized tribe—the Hassanamisco Nipmuc Band. We deeply respect the special relationship between indigenous people, their physical spaces, and cultural practices, and are grateful for the opportunity to share this place, and this work, with all those who are invested in Massachusetts’ future success.

nearly 10,000 roadway miles in the Commonwealth; the Rail and Transit Division, which manages freight, passenger, and seasonal rail lines and coordinates activities with the Commonwealth’s 15 Regional Transit Authorities (RTAs); the Registry of Motor Vehicles, which maintains approximately 5.3 million vehicle registrations and licenses for over six million drivers; the Aeronautics Division, which maintains and oversees 35 public use airports; and the Massachusetts Bay Transportation Authority (MBTA), which delivers over 750,000 transit trips per week on bus, subway, Commuter Rail, and ferries. MassDOT also works in partnership with the Massachusetts Port Authority (Massport), which owns and operates Logan Airport—a world class airport that serves as the primary airport of New England and is minutes from downtown Boston—as well as Flynn Cruiseport Boston, the Conley Container Terminal, Worcester Regional Airport, and Hanscom Field.

1.3 Alignment with Other Statewide Planning and Policy

Transportation is interconnected with a number of policy areas, including climate action, public health, economic development, housing production, and smart growth, among others. As such, the content included within *Beyond Mobility* is consistent with other statewide planning and policy reports. Specifically, the following reports were critical to the development of *Beyond Mobility*, which builds on rather than supplants their transportation-related elements:

- *MassDOT Resiliency Improvement Plan*, MassDOT Highway Division (2024).
- *Recommendations of the Climate Chief*, Massachusetts Office of Climate Innovation and Resilience (2023).
- *ResilientMass / State Hazard Mitigation and Climate Adaptation Plan (SHMCAP)* (2023).
- *Comprehensive Economic Development Plan*, Massachusetts Executive Office of Housing and Livable Communities (EOHLC) (2023).
- The MBTA’s most recent *Capital Needs Assessment and Inventory* (CNAI) (2023).
- *The 2023 MBTA Strategic Plan*.
- *Massachusetts Clean Energy and Climate Plan for 2025 and 2030*, Massachusetts Executive Office of Energy and Environmental Affairs (EOEEA) (2022).
- Prior MassDOT modal plans including the *Freight Plan* (2023), the *Bicycle Plan* and *Pedestrian Plan* (2019), the *Bicycle and Pedestrian Update* (2021), and the *State Rail Plan* (2018).
- Prior MassDOT policy reports including *Congestion in the Commonwealth* (2019) and the *Report of the Commission on the Future of Transportation in the Commonwealth* (2018).
- Safety plans and programs including the Highway Safety Improvement Program (HSIP), *Strategic Highway Safety Plan* (SHSP), and Public Transportation Agency Safety Plans.



In the same vein as previous plans impacting the development of *Beyond Mobility*, it is envisioned that future related planning efforts at MassDOT and the MBTA will be consistent with and directly informed by *Beyond Mobility*. These future planning efforts include but are not limited to the *Program for Mass Transportation (PMT)*, which represents a 25-year plan for how the MBTA can meet the needs of the region; future modal plans; corridor studies; capital plans; and other related strategic planning efforts. Additionally, at the time of the development of *Beyond Mobility*, the Healy-Driscoll Administration announced the creation of a new Transportation Funding Task Force. It is anticipated that *Beyond Mobility* will serve as an important foundation for the work of this Task Force through providing a definition of the vision for the future of transportation directly informed by public input.

In addition to these statewide planning efforts, it is critical to note the important role that municipalities in Massachusetts play in advancing an improved transportation future. In line with the spirit of the Healy-Driscoll Administration's Federal Funds Partnership for Municipalities, MassDOT is committed to ensuring there are open lines of communication between state, Federal, and municipal governments to ensure linkages between strategies like those set forth in *Beyond Mobility* and other statewide planning efforts and the implementation of projects on the ground.

1.4 Plan Structure

This introduction constitutes Chapter 1 of the *Beyond Mobility* plan. Chapter 2, "Strategy and Approach," describes at a high level several tasks that were performed for this Plan, including public outreach, a needs assessment, a review of prior plans, scenario planning, and performance-based planning.

Chapters 4 through 6 are structured by the following six Priority Areas, which were developed through extensive data analysis and robust public engagement. These Priority Areas are inclusive of the themes that emerged from these activities.

1. **Safety** refers to the ability of travelers to move through the transportation system free of physical or other harms.
2. **Reliability** refers to the consistency of transportation network conditions and predictability of travel times across all transportation modes.
3. **Supporting Clean Transportation** refers to the transportation network's ability to accommodate carbon-free travel modes.
4. **Destination Connectivity** refers to the degree to which travelers of any mode can access opportunities and the places they need or want to go.
5. **Resiliency** refers to the ability of the transportation network to anticipate, prepare for, and withstand the ongoing impacts of climate change.
6. **Travel Experience** refers to conditions faced by travelers throughout the transportation network, including level of comfort and state of good repair.

Given the Plan's focus on public engagement, Chapter 3, "What We Heard," provides a detailed summary of all public engagement feedback received by Priority Area.



Chapter 4, “Priority Areas,” documents vision, values, and problem statements for each Priority Area. Although *Beyond Mobility’s* planning horizon is 2050, the Plan’s focus on problem statements stems from the notion that the actions MassDOT needs to take right now to achieve the vision for the future must be directly responsive to actual challenges that people face when using Massachusetts’ transportation system.

Chapter 5, “Action Items,” identifies and describes the actions that MassDOT Divisions and the MBTA will take to address transportation problems and make progress toward achieving the vision statements established in Chapter 4. An online [Action Items Progress Report](#) has also been developed to assist track progress on all of the Beyond Mobility Action Items.

Chapter 6, “Performance-Based Planning,” establishes specific performance metrics to track transportation system outcomes in line with the *Beyond Mobility* Priority Areas and Action Items.

Chapter 7, “Funding the Transportation System,” provides analyses and descriptions of revenues for transportation from a variety of different sources Massachusetts is anticipated to receive between now and the Plan’s horizon year of 2050.

The following appendices are also included and contain additional detail:

- Appendix A—Public Engagement Results
- Appendix B—Previous Plan Review
- Appendix C—Needs Assessment
- Appendix D—System Performance Report
- Appendix E—Draft Report Comments and Responses
- Appendix F—MassDOT Resilience Improvement Plan (RIP)

1.5 Statement on Mode Shift and Vehicle Miles Traveled (VMT) Reduction Targets

During the comment period for *Beyond Mobility*, a number of comments were received on the topic of facilitating mode shift away from single occupancy vehicles and toward transit and active transportation modes. In addition to the responses that have been provided to these comments in Appendix E, this section has been added to the final version of the Beyond Mobility plan to reflect MassDOT’s disposition on this topic.

MassDOT believes in the criticality of mode shift with respect to meeting a host of goals not only for the quality and reliability of the transportation network, but for meeting the state’s environmental and sustainability goals as well. Mode shift helps reduce vehicle miles travelled (VMT), which is otherwise primarily driven by a reduction in overall trip-making. MassDOT’s commitment to encouraging mode shift is demonstrated throughout the Beyond Mobility plan and referred to in several Vision and Values statements that define our six priority areas. Additionally, several Action



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Items defined under various priority areas encourage investment in and expansion of non-vehicular travel services and infrastructure, with the ultimate goal of promoting use of non-vehicular travel modes.

As the document establishing the strategic vision, values, and activities that MassDOT will undertake, those policies and processes that execute Beyond Mobility's directives will also be updated. These include MassDOT's framework for performance evaluation and target-setting, which is an ongoing and iterative process that culminates with the publication of the yearly MassDOT Tracker report. Chapter 6, Performance-Based Planning, introduces a number of measures that could be implemented to quantify progress on various transportation system outcomes.

MassDOT works closely with other Secretariats in meeting performance targets set for the state, including the statutory statewide greenhouse gas (GHG) emissions limits set by the Executive Office of Energy and Environmental Affairs. MassDOT and EEA continue to review the VMT targets modeled for the Clean Energy and Climate Plans (CECPs) and partner on initiatives intended to promote transit ridership and reduce single-occupancy trips. MassDOT is also partnering with EEA on development of the holistic land use plan, referenced in the 2050 CECP, to more strategically link transportation and other land-use policies.

2.0 Strategy and Approach

2.1 Overview

The *Beyond Mobility* planning process was designed to not only meet all Federal and state requirements for long range transportation planning, but also to use extensive public engagement, data analysis, scenario planning, and other activities to thoroughly understand Massachusetts' most pressing transportation challenges and priorities for MassDOT to address.

Figure 2.1 illustrates the organization of the planning process into two distinct phases. The first phase focused on documenting the key transportation problems and defining a shared vision and set of values for long-term transportation decision-making, while the second developed an action plan for directly responding to these challenges to achieve the vision for transportation across the Commonwealth.

Figure 2.1 Beyond Mobility Planning Process



The six key tasks that informed this planning process are summarized in Chapter 2:

- Public Outreach:** Extensive outreach targeting disadvantaged communities and using a variety of public engagement techniques yielded over 5,000 pieces of unique feedback focused on defining key problems, priorities, and visions for the future of transportation.
- Needs Assessment:** To complement the public engagement data described above, a Needs Assessment involving quantitative analysis was performed to define key challenges and disparities in transportation outcomes across communities.
- Defining Priority Areas:** The public feedback and needs assessment findings were synthesized into six Priority Areas (described in more detail above and in Chapter 4) that encompass the comprehensive set of transportation needs to be addressed in the future. Each Priority Area includes a vision statement, values statements, and problem statements based on the *Beyond Mobility* public outreach and needs assessment findings.
- Developing Action Items:** Specific actions for MassDOT's Divisions and the MBTA in the areas of policy and programming, research, partnerships, capital planning, and operational



improvements were developed in direct response to the vision statements and problems identified in previous stages. These Action Items are described in detail in Chapter 5.

- **Scenario Planning:** Recognizing that the future is uncertain and that a number of trends impact the future of transportation, scenarios were developed and used as a filter against the identified Action Items to understand which actions may be more pressing under different scenarios.
- **Performance-Based Planning:** To track progress towards desired outcomes defined under each Priority Area, a series of performance measures were developed and other performance measures recommended for future development (more detail in Chapter 6).

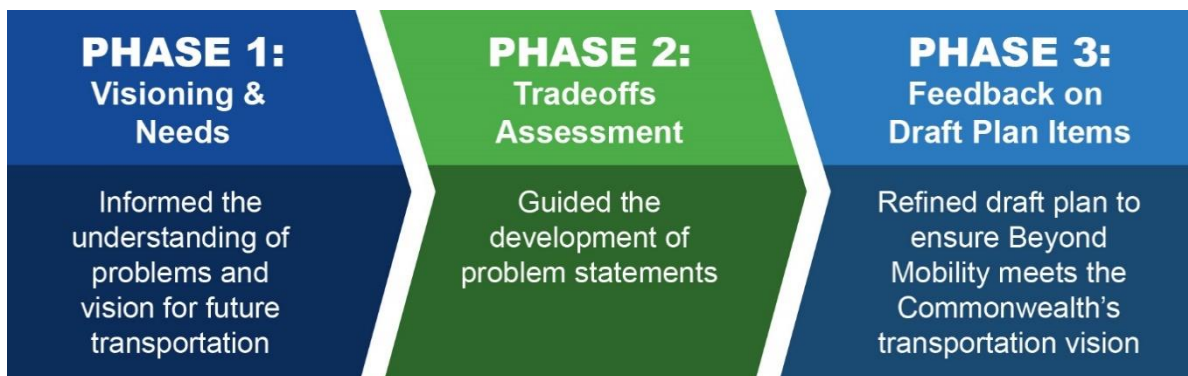
2.2 Public Outreach

Public engagement was a cornerstone of the *Beyond Mobility* planning process. The engagement strategy was designed to inform the direction of *Beyond Mobility*, including both the problem statements and the vision and values statements. The approach was adjusted throughout the process to ensure that representatives of all communities and demographic groups could participate throughout the development of the Plan.

Overall, the public engagement process included a range of outreach and feedback efforts, including 3,650 responses to two public surveys; six multilingual and multicultural focus groups and interviews; one virtual public meeting; nine Meeting-in-a-Box interactions with community stakeholders; and numerous stakeholder interviews throughout the development of *Beyond Mobility*. Collectively, this process resulted in over 5,000 pieces of feedback about people’s visions for the future of transportation as well as current challenges.

The public engagement activities were focused on key topics designed to inform and guide the plan development (Figure 2.2).

Figure 2.2 Beyond Mobility Engagement Phases & Purpose



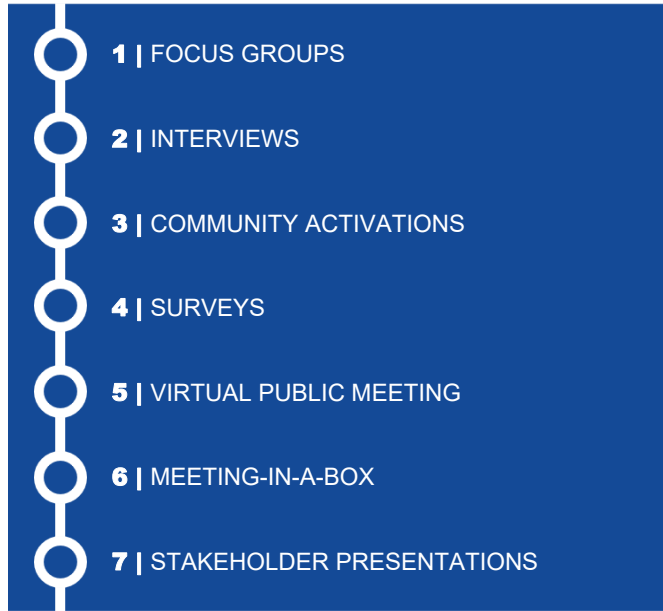
The **first phase** of engagement was designed to understand existing challenges and define a vision of improved transportation outcomes.

The **second phase** focused on assessing tradeoffs across a variety of different funding programs to understand the priorities of different demographic groups and geographic areas. The second phase



also focused on targeted outreach to Environmental Justice¹ communities and others who are often affected by transportation policies, but left out of decision-making processes. Previous public comments collected through prior planning processes were also used to guide the development of *Beyond Mobility*.

The goal of the **third phase** of engagement for *Beyond Mobility* was to gather feedback on draft plan content, and included targeted stakeholder meetings with a wide range of diverse groups. This phase of engagement included presentations to community and environmental advocacy groups focused on a variety of issues, including pedestrian and cyclist infrastructure, accessible infrastructure, public transportation, housing, and environmental justice, among others. Specific perspectives were sought from freight transportation stakeholders; business groups and chambers of commerce; municipal staff; private providers of transportation; tribal organizations; and others.



This outreach was performed not only to satisfy Federal regulations set for statewide long range transportation planning processes, but also to ensure that the Plan and its recommended Action Items accurately reflected all user perspectives and experiences, particularly those historically excluded from planning processes.

Engagement Strategies

Beyond Mobility's robust public engagement approach was designed to make participation easy through quick interactions and conversations. Table 2.1 shows the engagement techniques and results that informed each phase of plan development. Appendix A documents the Public Engagement Plan and inventories of the detailed engagement results for each phase and technique, while Chapter 3 summarizes public engagement findings.

¹ The *Beyond Mobility* Environmental Justice community designation is distinct from the traditional Environmental Justice definition in that it incorporates data on vehicle access, disability status, and age in addition to income, race, and limited English proficiency and it compares each Census block group's characteristics for each variable to the average of its Metropolitan Planning Organization (MPO) region rather than statewide averages.



Table 2.1 Engagement Techniques and Results

Phase	Technique	Results & Key Facts
Phase I	Survey—Vision, Values, & Needs	<ul style="list-style-type: none"> ○ The online survey received 1,107 survey responses and was available in Chinese, French, Haitian Creole, Portuguese, Spanish, Vietnamese, and English. ○ Of the respondents, 11 percent were people of color and 13 percent were people aged 65 and older. ○ The median household income of survey respondents was approximately \$100,000.
	Interviews—Vision, Values, & Needs	<ul style="list-style-type: none"> ○ Six one-on-one interviews were conducted with Mandarin- and Vietnamese-speaking participants.
	Focus Groups—Vision, Values, & Needs	<ul style="list-style-type: none"> ○ Four focus groups were conducted with Spanish-speaking, Portuguese-speaking, Haitian Creole-speaking, and English-speaking Black community Massachusetts residents.
Phase II	Survey—Priorities & Tradeoffs	<ul style="list-style-type: none"> ○ The second online survey received 2,500 survey responses. ○ The survey reached more people of color (29.5 percent), limited English proficient (12 percent), and low-income respondents (12 percent) than the first. ○ The median income of Phase II respondents was approximately \$83,000, slightly lower than Phase I. ○ Fewer older and rural respondents were captured in Phase II, while more limited English proficient people participated. ○ Eighty-eight percent of Phase II respondents used English to complete the survey compared to 99.5 percent of Phase I.
	Community Activations—Priorities & Tradeoffs	<ul style="list-style-type: none"> ○ Community Activations were undertaken in 11 communities: Roxbury, Lynn, Mattapan, Lowell, Lawrence, New Bedford, Brockton, Worcester, Springfield, Framingham, and Pittsfield. ○ These events were located in some of the largest concentrations of Massachusetts’ underserved communities, were situated in a heavily trafficked area during a busy time, and were strategically located to interact with users of multiple modes of transportation.



Phase	Technique	Results & Key Facts
	Meeting-in-a-Box— Priorities & Tradeoffs	<ul style="list-style-type: none"> ○ MassDOT provided Meeting-in-a-Box kits to community groups interested in hosting <i>Beyond Mobility</i> workshops and gathering feedback from their members. <ul style="list-style-type: none"> ○ Meeting-in-a-Box is an emerging public engagement technique that helps promote the project, inform residents, and encourage group conversations about a specific plan, project, or initiative. ○ Ten community groups* participated in the plan development using Meeting-in-a-Box kits: <ul style="list-style-type: none"> ○ Berkshire MPO & Transportation Advisory Committee ○ Amherst Transportation Committee ○ Western Mass Transit Advocacy Network ○ Greater Worcester Community Foundation ○ Outer Cape Focus Group ○ Southeastern Regional Planning & Economic Development District Focus Group ○ Worcester Community Action Council ○ Worcester Center for Independent Living & Working ○ Health Equity Partnership of North Central Massachusetts (CHNA9) ○ Berkshire Regional Coordinating Council on Transportation
	Virtual Public Meeting— <i>Beyond Mobility</i> Project Overview	<ul style="list-style-type: none"> ○ A virtual public meeting with 54 participants was held to provide an overview of the <i>Beyond Mobility</i> planning process and capture input on people’s visions and needs for the future.
Phase III	Targeted Outreach	<p>MassDOT conducted outreach meetings with the following groups:</p> <ul style="list-style-type: none"> ○ Freight Advisory Council ○ Greater Boston Chamber of Commerce, MA Policy Network ○ Intercity Bus Carriers ○ Western MA Transportation Advocacy Network ○ Massport ○ League of Women Voters Massachusetts ○ Great Neighborhoods Network ○ Mass Municipal Association, Committee on Public Works ○ Herring Pond Wampanoag Tribe** ○ WalkMassachusetts Network
All Phases	Earned Media	<ul style="list-style-type: none"> ○ Several <i>Beyond Mobility</i> features on local radio stations, blogs, websites and newspapers.
	Paid Media	<ul style="list-style-type: none"> ○ 24 paid media ads through ethnic media channels using print advertising, online advertising, social media, and radio channels.
	Website	<ul style="list-style-type: none"> ○ Regular website updates with project factsheets and findings.
	Email	<ul style="list-style-type: none"> ○ Eight <i>Beyond Mobility</i> emails sent to a project interest list totaling over 1,500 unique email addresses.
	Stakeholder Meetings	<ul style="list-style-type: none"> ○ Over 20 one-on-one in-depth interviews with stakeholders representing people with disabilities, economic development entities, representatives of transportation users, workforce development groups, public health community, environment organizations, Metropolitan Planning Organizations, and others.



*The groups that participated in the meeting-in-a-box activities were those that responded to MassDOT requests. Although not all Metropolitan Planning Organizations (MPOs) participated, presentations on Beyond Mobility were made to all thirteen MPO regions in Massachusetts at various points of Plan development to ensure they were engaged in the Plan's development process.

** Massachusetts' two Federally-recognized tribes (the Mashpee Wampanoag Tribe and the Wampanoag Tribe of Aquinnah) and Massachusetts' one state-recognized tribe (the Hassanamisco Nipmuc Band) were contacted during the development of Beyond Mobility, but did not respond to requests to participate.

2.3 Needs Assessment

While public outreach and engagement efforts collected information about the lived experience of residents when using the transportation network and the related values and priorities that are important to maintain, the project team conducted a statewide Needs Assessment to identify infrastructure and land use barriers to transportation access and major problem areas across the Commonwealth. The assessment involved the following three steps:

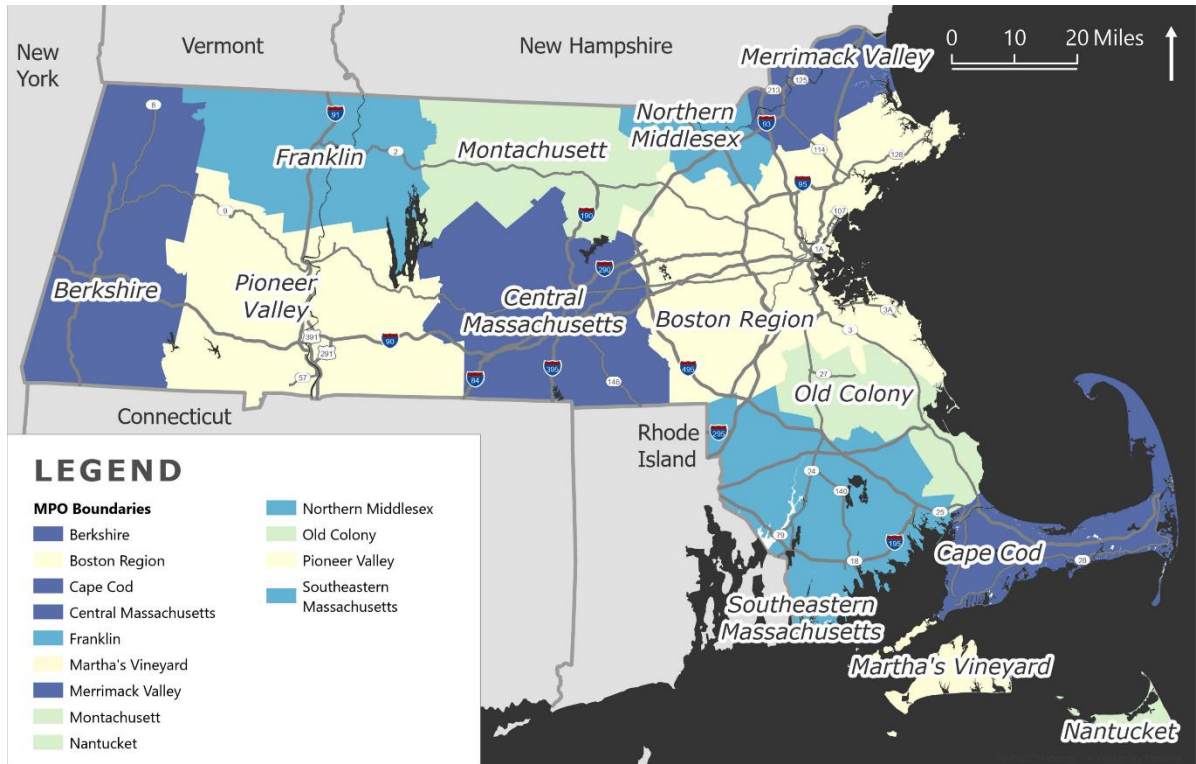
- Define the transportation system.
- Compile barriers and recommendations from prior planning studies.
- Analyze additional data to develop Problem Statements and identify locations that may be driving problem areas.

Defining the System

The Needs Assessment first identified elements of the transportation system for evaluation that impact service; congestion; safety; asset condition; and accessibility to jobs, retail, open space, health care, and other destinations. Geographic boundaries were included in the base condition map, including Metropolitan Planning Organization (MPO) regions, municipalities, and urban boundaries. Figure 2.3 shows the MPO boundaries for Massachusetts.



Figure 2.3 MPO Boundaries



Leveraging Previous Planning & Public Engagement

The Needs Assessment leveraged existing MassDOT data and information, including an evaluation of existing MassDOT modal and service plans. Over 300 transportation barriers were identified through previous planning studies; a more detailed discussion of the previous plan inventory is provided in Appendix B. Transportation barriers varied by geography (statewide, region, or municipality) and theme (safety, roadways, public transportation, active transportation, airport, or goods movement).

Each of these barriers was mapped to understand the key themes across geographies and themes of the reviewed plans and policies, examples of which are shown in Table 2.2.



Table 2.2 Examples of Transportation Barrier Themes from Previous Planning Efforts

Barriers	Examples
Community Characteristics and Trends ¹	Shared transportation is expanding unevenly across Boston's residential neighborhoods— <i>GoBoston 2030</i> Massachusetts is an expensive place to live, and too often, the burden of those high expenses falls on lower-income residents and communities of color— <i>Reimagining the Future of Massachusetts</i>
Transit Reliability	Roadway congestion is increasingly hampering the performance and efficiency of transit services, especially buses— <i>Congestion in the Commonwealth</i> Routes with on time performance (OTP) below 80% may lead to more systemic issues and negative customer perceptions— <i>2020 Comprehensive Regional Transit Plan (CRTP)</i> — <i>WRTA</i>
Environmental	Fully diesel service leads to longer travel times and local air quality issues— <i>MBTA Focus40</i> Climate change impacts are expected to raise the risk of damage to transportation systems, energy-related facilities, communication systems, a range of structures and buildings, solid and hazardous waste facilities, and water supply and wastewater management systems— <i>Massachusetts State Hazard Mitigation and Climate Adaptation Plan</i>
Roadway Congestion and Reliability	Between 2013 and 2018, peak period travel times have grown on most roadway segments, with the most significant increases in Boston Metro— <i>Congestion in the Commonwealth</i> Reoccurring bottlenecks and physical constraints continue to negatively impact freight movement on the regional highway network— <i>Old Colony 2020 L RTP</i>

¹ This theme encompasses several specific categories that attempt to highlight inequities in the transportation system. Aging population, funding, transportation equity, historical context, and related barriers fall into this category.

The data revealed community characteristics and trends, such as inequities, wage and skills gaps, low transit reliability, and the high cost of living in Massachusetts. The word “income” appeared 15 times within the barriers, while the word “cost” appeared 13 times and the word “gap” appeared 10 times. The inventory demonstrated that public transportation is not accessible physically or financially in an equitable way across the Commonwealth, directly tying into transit as the next most common barrier with a lack of reliability, direct connections, and barriers to access transit.

Environmental concerns and roadway congestion, reliability, and safety were also highlighted as top concerns and priorities for future investments. This exercise informed the data analysis described below and was critical for developing the *Beyond Mobility* Problem Statements, which formed the foundation for the Plan’s Action Items.

The results of the *Beyond Mobility* Phase I Vision, Values, & Needs Survey were also used to pinpoint specific themes or locations to be further investigated. This public survey asked participants to highlight up to three locations throughout the Commonwealth where transportation improvements are needed. Corresponding with the previous analyses, nearly 1,000 specific transportation barrier locations were identified and analyzed for key themes to support the understanding of various needs from the perspective of transportation system users.

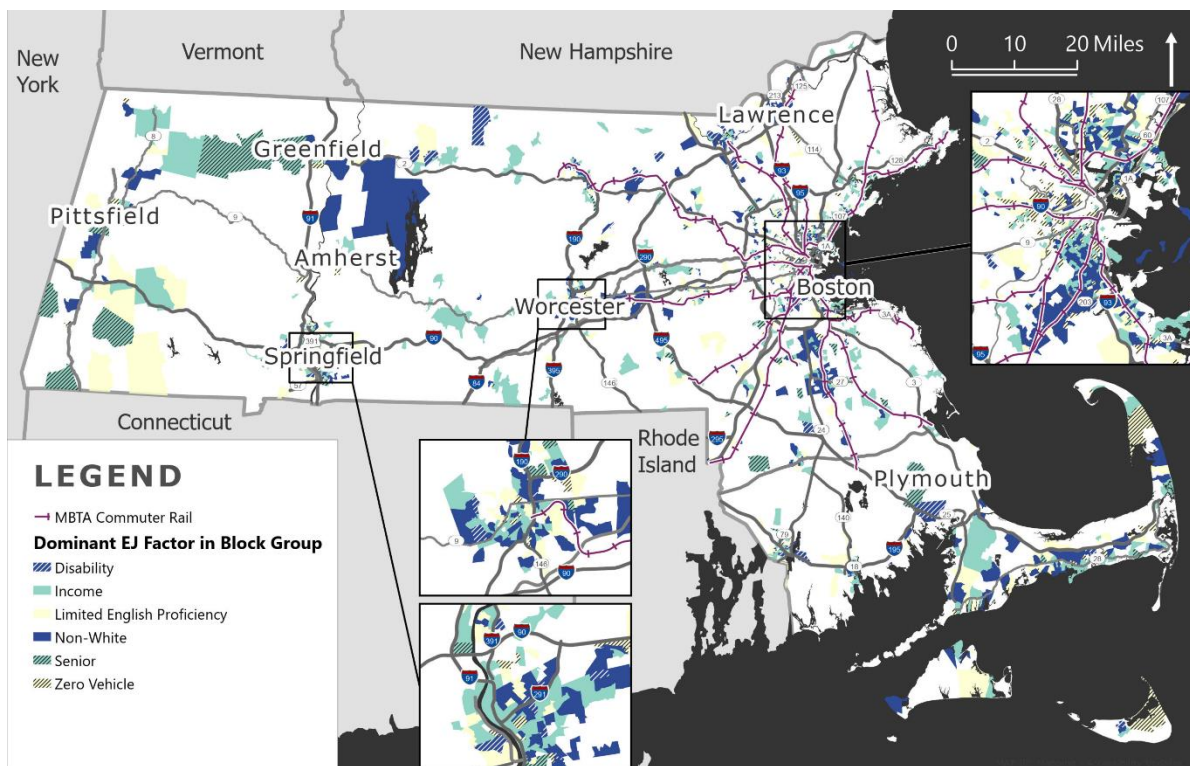
Defining Equity Areas of Focus

MassDOT was intentional about prioritizing the needs of Massachusetts' Environmental Justice communities in *Beyond Mobility*. Through policies, practices, programs, and budgets, MassDOT has an opportunity to advance equitable access to safe, efficient, and affordable transportation systems across the Commonwealth.

Historically, transportation investment decisions have perpetuated inequities in communities such as Black, Latino, Indigenous and Native American persons, Asian Americans and Pacific Islanders and other persons of color; members of religious minorities; lesbian, gay, bisexual, transgender, and queer (LGBTQ+) persons; persons with disabilities; persons who live in rural areas or urban cores; and persons otherwise adversely affected by persistent poverty or inequality. Entrenched disparities have been embedded in the design of transportation planning and investment decision-making processes over time and *Beyond Mobility* is envisioning a variety of approaches to move towards transportation justice.

Figure 2.4 shows the most dominant equity factor by region for Environmental Justice areas identified around the Commonwealth.

Figure 2.4 Environmental Justice Communities, Most Dominant Equity Factor by Region





To define equity areas of focus so that data analyzed as part of the Needs Assessment could be compared across demographic groups to perform “equity checks,” *Beyond Mobility* used demographic data to identify areas with high concentrations of communities that experience disproportionate burdens resulting from the impacts of the transportation system. While referenced as “Environmental Justice communities” throughout *Beyond Mobility*, the specific definition of these equity areas of focus is derived from MassDOT’s Regional Environmental Justice “Plus” (REJ+) data layer, which represents a holistic understanding of communities that are most impacted by transportation planning and decision-making. The *Beyond Mobility* Environmental Justice community designation is distinct from the traditional Environmental Justice definition in that it incorporates data on vehicle access, disability status, and age, in addition to income, race, and limited English proficiency status.

In addition to providing a more holistic and transportation-specific definition of equity, the Environmental Justice communities definition referred to in *Beyond Mobility* compares each Census block group’s characteristics for each demographic variable to the average of its MPO region, rather than statewide averages. This allows the designation of an Environmental Justice community to be contextualized, accounting for the wide variation in demographic characteristics seen throughout the state. For a community to be designated as an Environmental Justice community, it must have a higher concentration of these criteria than other communities within its MPO region. For a more detailed explanation of the REJ+ methodology and explanation of how communities are designated, please visit MassDOT’s [TIS/REJ+ Dashboard](#).

To be defined as an Environmental Justice community, a geographic area must meet one of the following criteria, which are based on the [definitions used by the Executive Office of Energy and Environmental Affairs](#):

- Higher concentration of poverty than in nearby communities,
- Higher concentration of non-white households than in nearby communities, and/or
- Higher concentration of people with limited English proficiency than in nearby communities.

To extend this definition and consider additional demographic characteristics that also influence accessibility and mobility, the following variables were also factored into the Environmental Justice community definition to identify which demographic variable(s) most “drive” transportation vulnerability:

- Higher concentration of households without access to a vehicle than nearby communities,
- Higher concentration of people with disabilities than in nearby communities, and
- Higher concentration of people aged 65 years and over than in nearby communities.



Defining Key Facts and Problem Statements

Key needs assessment data (see inset, right) were analyzed and screened against Environmental Justice community boundaries, urban boundaries, and their proximity to transit stations. This screening allowed the project team to define ‘key facts’ that demonstrate the overall needs of the Commonwealth and take special note of how these needs are experienced differently by historically marginalized communities. Alongside public engagement findings, these ‘key facts’ define the Problem Statements, which were used as the foundation for the Plan’s Action Items.

For example, recent crash data indicates that Environmental Justice communities have 1.7 times more pedestrian crashes per capita and 1.3 times more fatal and serious crashes per capita than non-Environmental Justice communities. Additionally, Environmental Justice communities have 18.4 times more roadway miles at high risk for pedestrian crashes and 13.7 times more roadway miles at high risk for bicycle crashes than non-Environmental Justice communities. Based on this information, the following Problem Statement was developed:

Environmental Justice (EJ) Communities—areas with larger populations of low income, limited English proficiency, and/or residents of color—are disproportionately burdened by transportation-related injuries and deaths on roadways, particularly those involving pedestrians and people on bicycles.

Developing the problem statements involved a comprehensive review of data from the Needs Assessment that identified focus areas (geographies, corridors, etc.) of highest needs within each MPO region. The 2024–2028 Capital Investment Plan (CIP) was overlaid with the analysis above to determine where overlapping needs and gaps in investments exist.

Example Key Needs Assessment Data Analyzed

Safety

- Fatal and Serious Crashes
- Roadway Risk
- Pedestrian Crash Clusters
- Bicycle Crash Clusters

Destination Connectivity

- Potential for Walkable Trips
- Potential for Bicycle Trips
- Bicycle Facility and Share Coverage
- Sidewalk Gaps

Travel Experience

- Pavement Condition
- Bridge Condition
- Curb Ramps

Resiliency

- Sea Level Rise
- Hurricane Inundation Zones

Reliability

- Planning Time Index



2.4 Defining Priority Areas, including Vision and Values

The extensive public feedback and needs assessment data were used to directly inform *Beyond Mobility's* six Priority Areas. These Priority Areas are the key themes by which the public, our stakeholders, and our subject matter experts understand MassDOT's role in developing and maintaining a strong statewide transportation network. The definition of the Priority Areas represented a critical point in *Beyond Mobility's* progress, because these Priority Areas organize the work MassDOT both does now and will do into the future.

Each *Beyond Mobility* Priority Area includes a vision statement, a series of values statements, and one or more Problem Statements (which are themselves defined by key facts). Like the Priority Areas and Problem Statements, the vision and values statements were informed and guided by public input and feedback.

Each Priority Area's vision statement looks ahead to 2050 and describes an ideal future transportation system with respect to that Priority Area, based directly on feedback received from Massachusetts residents, stakeholders, MassDOT staff, and subject matter experts. Vision statements describe our collectively sourced desires for the future of our state's transportation network as they relate to various elements.

The values statements are the principles that MassDOT will uphold when identifying strategies to achieve the vision of each Priority Area. Values statements describe what MassDOT stands for and the standards by which the agency's work is done. The Priority Areas, described in more detail in Chapter 4, include:

- **Safety:** The ability of travelers to move throughout the transportation system free of physical or other harm.
- **Reliability:** The consistency of transportation network conditions and predictability of travel times across all transportation modes.
- **Supporting Clean Transportation:** The transportation network's ability to accommodate low-emission and carbon-free travel modes.
- **Destination Connectivity:** The degree to which travelers of any mode can access opportunities and the places they need or want to go.
- **Resiliency:** The ability of the transportation network to anticipate, prepare for, and withstand the ongoing impacts of climate change.
- **Travel Experience:** The conditions faced by travelers throughout the transportation network, including level of comfort and state of good repair.

2.5 Developing Action Items

The *Beyond Mobility* Action Items (detailed in Chapter 5) articulate the actions that MassDOT and the MBTA will take in response to the vision, values, and Problem Statements identified within each Priority Area. These Action Items account for ongoing initiatives and programs that MassDOT and the MBTA are already involved in and also propose new complementary strategies. Developing these Action Items was a crucial component of *Beyond Mobility* because they define how MassDOT will address identified problems and establish the lead parties responsible for Action Item execution and implementation.

Action Items were identified and confirmed through an iterative process. Actions in previous planning documents provided a solid foundation, and public input confirmed or updated those priorities. Stakeholder interviews—both internal and external to MassDOT—were conducted to further understand problem areas and potential actions. These action items were reviewed by subject matter experts and refined by MassDOT staff through internal workshops and multiple rounds of individual reviews.

The Plan’s Action Items are assigned to the following categories:

- **Policy and programming efforts:** The formulation of new policies and/or funding programs that address identified problems.
- **Research:** The development of scopes of work and/or problem statements in response to the problem statements, serving as a “Research Roadmap” for MassDOT and its partner agencies.
- **Partnerships:** Coordination with local, regional, and Federal partners to advance new initiatives and ideas.
- **Capital planning efforts:** Changes to MassDOT and MBTA capital plan program sizes and/or processes that direct funding within each program.
- **Operational improvements:** Changes to the operations of transportation services that would address identified problems.

In addition to including one of the categories referenced above, each Action Item has been assigned one or more agency and/or MassDOT Division responsible for implementation, the status of the Action Item (new or ongoing), the timeframe required for the Action Item’s completion (either short term, defined as taking place within next five to 10 years, or mid term, within the next decade and beyond), and additional relevant notes. An Action Item webpage in [Tracker](#), MassDOT’s performance management dashboard, complements this component of the Plan and will be used to track the progress toward implementing each Action Item.



2.6 Scenario Planning

Scenario planning brings awareness of uncertainty and risk into decision-making. In order to ensure that the Action Items recommended in this Plan are able to satisfy a range of possible future challenges and opportunities, MassDOT identified variables that will influence the future transportation system through a series of collaborative workshops with subject matter experts. The variables were grouped into six overarching trends, provided in Table 2.3.

Table 2.3 Trends and Variables Developed for *Beyond Mobility*

Trend	Variable	Trend	Variable
Climate Change	Sea Level Rise	Prosperity	Cost of Transportation
	Extreme Temperatures and Energy Needs		Income Inequality
	Severe Weather		Knowledge Economy
Future-of-Work	Flexible Work Schedules		Racial Wealth Gap
	Labor Shortage	Technology	Automation
	Telepresence		E-commerce
People	Aging Population		Electricity and Alternative Energy
	Household Size		Freight
	Migration to Massachusetts	New Mobility	
Places	Housing	Cost of Transportation	
	Workplaces		

MassDOT conducted research into the recent history and potential future of each of these variables and produced summary fact sheets for each trend. In each case, MassDOT charted the recent course for the trend and how that change could accelerate, maintain, or plateau/reverse between today and 2050.

MassDOT developed three scenarios for the state’s transportation network in 2050. In this exploratory process, elements of these future outcomes that could be perceived as both “desirable” and “not desirable” are considered as a whole. Scenarios were used to test Action Items (described in Chapter 5) to ensure *Beyond Mobility’s* recommendations and strategies were robust across a wide range of potential futures.

Future Scenarios

The future scenarios developed for *Beyond Mobility* consider the possible acceleration, continuation, or reversal of present-day trends. These scenarios are:

Hybrid and Diverse, in which all recent trends **accelerate**, is named after hybrid work and telepresence. In this scenario, these would be defining facets of many Bay Staters' lives, and a younger, more diverse 2050 Massachusetts population. For example, under this scenario, as work-from-home spreads the population across the Commonwealth, the growth in housing prices and resulting displacement are likely to be significantly greater in those areas farther from Boston. In this scenario, the biotechnology industry has grown substantially, and it is not uncommon to see laboratory facilities centered in mixed-use "villages" in inland areas of the Commonwealth. The lack of demand for in-office work could create a feedback loop, as employers would bear the costs of office space for a single day per week per employee, and as a consequence, co-working spaces would be the only viable conventional offices that remain.

Office buildings in many areas would be replaced by a limited number of residential units. As work-from-home has spread demand across the Commonwealth, housing prices would soar everywhere, and displacement would arise as a concern to areas farther from Boston.

Summers would become hotter (26 more days per year over 90 degrees) and the whole year would become wetter (13 percent more precipitation in total, and over 20 percent in the winter as rain).

Ahead as Before, in which all recent trends are **maintained**. Under this scenario, hybrid work models would proliferate in industries where this is possible. As Baby Boomers leave the workforce, they are replaced by smaller trailing generations, leading to persistent labor shortages and inflation as higher wages filter down to consumer prices. Successively smaller generations also would not be able to support the Commonwealth's current large number of colleges, and thus some of the smaller schools would close, hurting access to higher education in some disadvantaged communities.

Massachusetts's knowledge economy would maintain its strength in biotechnology, but would plateau in other high-tech sectors as employers can no longer justify the high cost of living in Boston relative to competing metropolitan areas. Much of the area's conventional office square footage would be converted to or replaced by research labs and distribution centers for e-commerce. Housing prices continue to be high but do not experience exponential growth, as communities build a moderate number of new residences.

Active transportation would become plausible for longer periods since less of the winter would be severely cold (30 fewer days under 32 degrees), though winter precipitation would increase in the form of rain or freezing rain (15 percent more winter precipitation than in 2022).

Close and Connected, in which all recent trends **plateau/reverse**. Under this scenario, a combination of corporate pressure and the desire to maintain a work-life balance would bring workers back to the traditional office. Housing costs would plateau across the Commonwealth as a divided economy (knowledge inside Interstate 495, industrial outside) spreads out the demand for housing. Nonetheless, historically marginalized residents would effectively be priced outside of Route 128, becoming dependent on an under-supported Commuter Rail network to reach service jobs in the inner core.

Automation would support but not supplant blue-collar employment, and the manufacturing industry would grow in Central, Western, and Southeastern Massachusetts through on-shoring and 3D printing. The knowledge economy would plateau and consolidate in Boston, Cambridge, and Somerville. As non-biotech, high-tech companies would also seek space close to these institutions, job density in Kendall Square, the Seaport, and Longwood would continue to grow, taxing the transit system in those locations past their limits.

Global warming would peak around 2050 with seven more days over 90 degrees, 19 fewer days below 32 degrees, and only slightly more precipitation as compared to 2022.

2.7 Performance-Based Planning

MassDOT must track the performance of *Beyond Mobility*'s implementation, as well as broader outcomes of the transportation system. Chapter 6, the Performance-Based Planning chapter, is organized by Priority Area and identified indicators informed by the *Beyond Mobility* planning process that will be used to evaluate system performance in the future. Progress will be informed by data collected from sources including but not limited to:

- The decennial US Census and American Community Survey (ACS).
- Inspections of the condition of transportation assets by MassDOT and MBTA staff.
- Travel time, congestion, and reliability data from location-based services (LBS) reports.
- Massachusetts Household Travel Survey (MHTS) data.
- Rider surveys on the MBTA.
- Inventories of MassDOT assets which are updated as investment occurs.

The performance measures established in this Plan have been categorized in two ways: first, some measures are required for reporting to the US Department of Transportation (USDOT). These have been summarized in a *System Performance Report* (found in Appendix D) that complies with Federal Highway Administration (FHWA) requirements and includes targets for MassDOT to pursue.

Second, measures that respond directly to the barriers identified by Massachusetts residents and stakeholders have been assessed and recommended for inclusion in the MassDOT [Tracker](#) based on data availability and appropriateness for analysis over time. A small subset of the measures to be considered for inclusion in *Tracker* has been assessed by *Beyond Mobility* itself, a process described in more detail in Chapter 6.

System Performance Report

The *System Performance Report* responds to USDOT's 2016 series of rulemakings that established performance measures for the Federal-aid highway and transit programs. The Federal performance measure rules fall into three broad categories: safety (highway and transit); infrastructure condition (highway and transit); and system performance (highway only).

Notably, the highway requirements pertain to the National Highway System (NHS), the majority of which in the Commonwealth of Massachusetts is under MassDOT ownership. These targets are set directly by MassDOT and MPOs. By contrast, the transit requirements are primarily set by transit



operators with technical assistance and coordination from MassDOT and the MPOs. These operators include the MBTA and 15 RTAs.

Under Federal rules, MassDOT must include a description of Federal transportation performance measures and targets and a *System Performance Report* in its long range transportation plan. The report included in Appendix D evaluates the condition and performance of the transportation system for the Federal performance targets, including progress achieved by MassDOT in meeting those targets. Future system performance reports must also compare current performance with system performance recorded in previous reports.

3.0 What We Heard

3.1 Introduction

As noted in previous chapters, the six Priority Areas that serve as the structure of *Beyond Mobility* were directly derived from the public engagement process. This process included surveys, community activations, multilingual and multicultural focus groups and interviews, a virtual public meeting, Meeting-in-a-Box interactions with targeted stakeholders, and stakeholder interviews.

The first phase of engagement was designed to gain an understanding of the transportation vision and the transportation needs of residents and visitors traveling within Massachusetts. Through these community conversations, the six “Priority Areas” and related visions and values statements emerged:

- **Safety**
- **Reliability**
- **Supporting Clean Transportation**
- **Destination Connectivity**
- **Resiliency**
- **Travel Experience**

The public engagement input helped determine not only the six Priority Areas themselves but also how each is defined and experienced by different communities and transportation users. These Priority Areas, the future vision of transportation for each, and the values associated with upholding these visions became the building blocks of the Plan.

This chapter provides a summary of what was heard during the *Beyond Mobility* engagement process. The chapter begins with a high-level review of key public engagement findings, and then reviews what we heard with respect to each Priority Area.

Key Public Engagement Findings

Through the public engagement process, several high-level themes and insights were identified and used to guide various elements of the final Plan. The first phase of public engagement focused on understanding residents’ visions and needs for the future. Massachusetts residents’ top values for a future transportation system underscored connectivity, reliability, safety, and a modernized user experience. Overall, respondents recognize that transportation is a pathway to opportunity (e.g., access to jobs, services, and other cultures and communities). However, a closer look at the values and priorities across demographic and modal user groups reveals differing opinions.

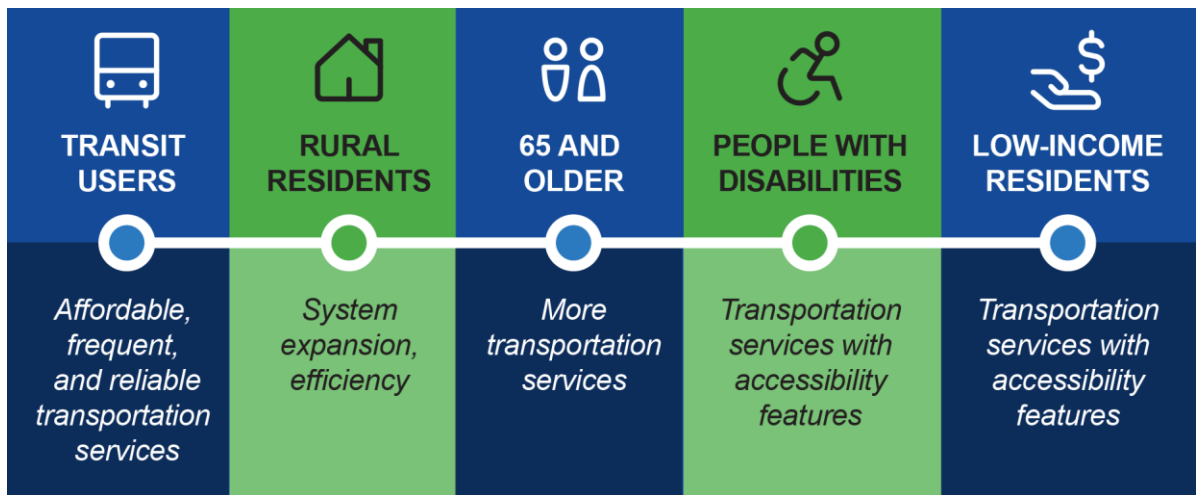
Survey responses indicated that reliability is a key quality of the future transportation system, especially among transit riders. When asked whether to expand, modernize, or maintain the



transportation system, modernization was most valued by respondents of color, while maintenance was most valued among respondents from rural areas and those aged 65 and older.

Throughout all public engagement activities, vehicle-free connectivity was documented as a critical need for all respondents. Individuals who cannot drive face many barriers, including access to affordable and reliable non-vehicle transportation modes. For those unable to drive, the availability of non-vehicular transportation options is the greatest barrier to access, followed by cost. Connectivity and coverage are more important to underrepresented groups than to all residents. Needs vary by community, as shown in Figure 3.1. Additionally, respondents from rural communities are isolated and without sufficient transportation options due to a lack of transit service and incomplete bicycle and pedestrian networks. Moreover, respondents reported that some transportation services lack appropriate features to support various needs and abilities, posing specific challenges to people aged 65 and older or with disabilities.

Figure 3.1 Top Connectivity and Coverage Needs by Population Group

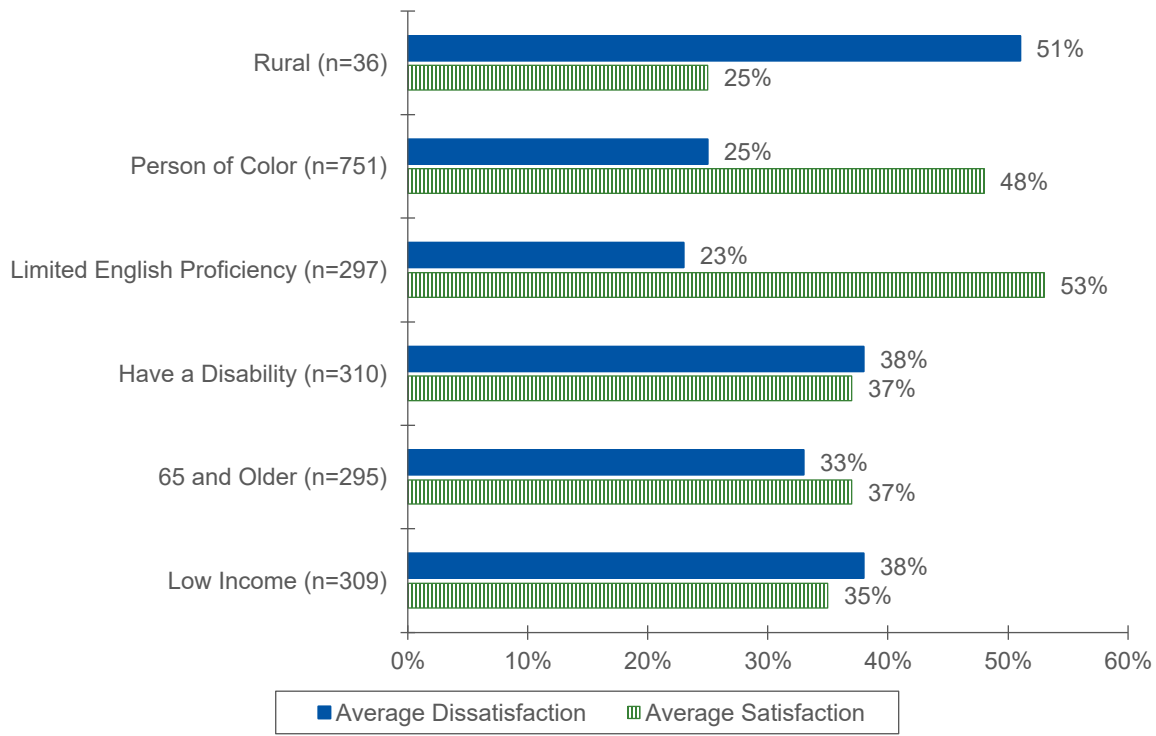


Source: *Beyond Mobility Phase II Priorities & Tradeoffs Survey, Fall 2022.*

The importance of transportation connections to key destinations was mentioned repeatedly, with different demographic groups expressing various levels of satisfaction concerning connectivity to services. For example, respondents from rural communities were less satisfied with access to food retailers and health care services than other respondents. Low-income respondents and those with disabilities reported being less satisfied with access to jobs.



Figure 3.2 Satisfaction with Transportation Connections by Demographic Group



Source: *Beyond Mobility Phase II Priorities & Tradeoffs Survey, Fall 2022.*

Respondents felt the transportation system necessary to access critical destinations across the state—especially jobs, childcare, and medical facilities—is limited or nonexistent, which limits where people can live and age affordably.

Priorities

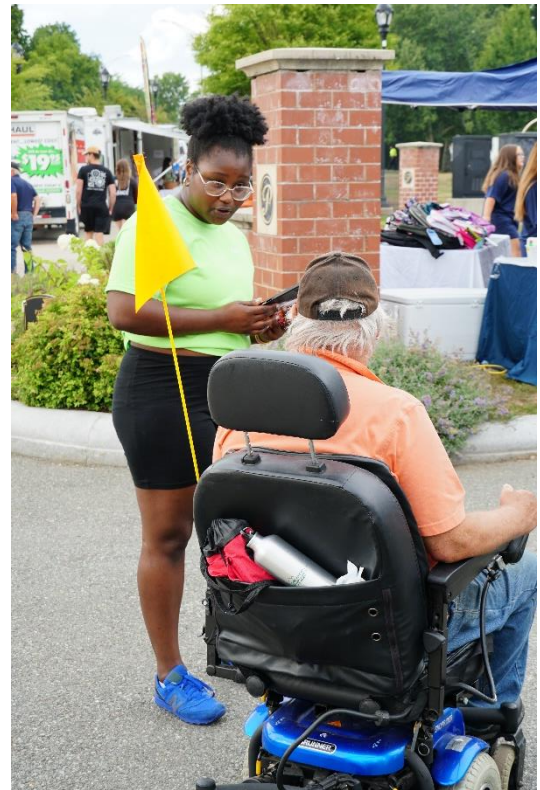
Respondents to the *Beyond Mobility* Phase II Priorities & Tradeoffs Survey had many suggestions for how to move toward a more connected Commonwealth. Over half of all survey respondents felt transit improvements are the most important funding priority for the state. There was an emphasis on east-west connectivity, including passenger rail service for the entire state and meaningful transportation options for rural residents to reach cities and other activity centers. Suggestions included expanding evening transit services and ensuring bus reliability statewide. Rural transit concerns highlighted the challenge of downtown transit hubs inflating transit commute times between destinations outside the city. Microtransit was a frequently cited need in rural areas where fixed route transit will likely not be relevant soon.

Nearly 27 percent of participants reported that pedestrian and bicycle connections are a top funding priority and almost 20 percent responded that more frequent bus service is the most important feature to improve the transit system, findings that were consistent for both urban and rural respondents.

Respondents raised specific concerns about multimodal connections, noting that most public airports are only accessible by automobile; transit stops and stations lack sufficient bicycle and pedestrian accommodations; and wayfinding signage is needed to improve connectivity between transit and key destinations. Non-English respondents were less interested in pedestrian and bicycle infrastructure when asked to prioritize roadway improvements.

Rural populations that lack transit infrastructure view the transition to electric vehicles in their communities as critical to meeting climate and sustainability goals. Respondents from rural communities were also more likely to be interested in electric vehicle charging infrastructure. Low-income respondents placed more importance on transit features on roadways than other groups.

Figure 3.3 Pittsfield Community Activation, Fall 2022



3.2 Safety

Safety is a broad term and can mean different things to different people, depending on the challenges or constraints of a particular geography, mode of transportation, or user group. Acknowledging this, *Beyond Mobility* public engagement was designed to better understand what a “safe transportation system” means for Massachusetts residents, what improvements people would like to see, and what challenges are faced by different user groups (e.g., by mode of travel, age, income, race, language, gender identity, or other demographic characteristics). This section describes major themes and findings from *Beyond Mobility* surveys, focus groups, interviews, public meeting comments, emails to the project team, and other public outreach.

Who is Most Concerned About Safety?

Safety was one of the top three qualities of an ideal future transportation system, along with connectivity and reliability, as gleaned through the *Beyond Mobility* Phase I Vision, Values, & Needs Survey. Of all respondents, 39 percent said they would like to see improvements in safety (see Figure 3.4).² While a need for increased safety levels was expressed by most participants, certain equity groups placed higher emphasis on making the Commonwealth’s transportation system safer and more secure. For instance, respondents from rural communities placed greater value on system

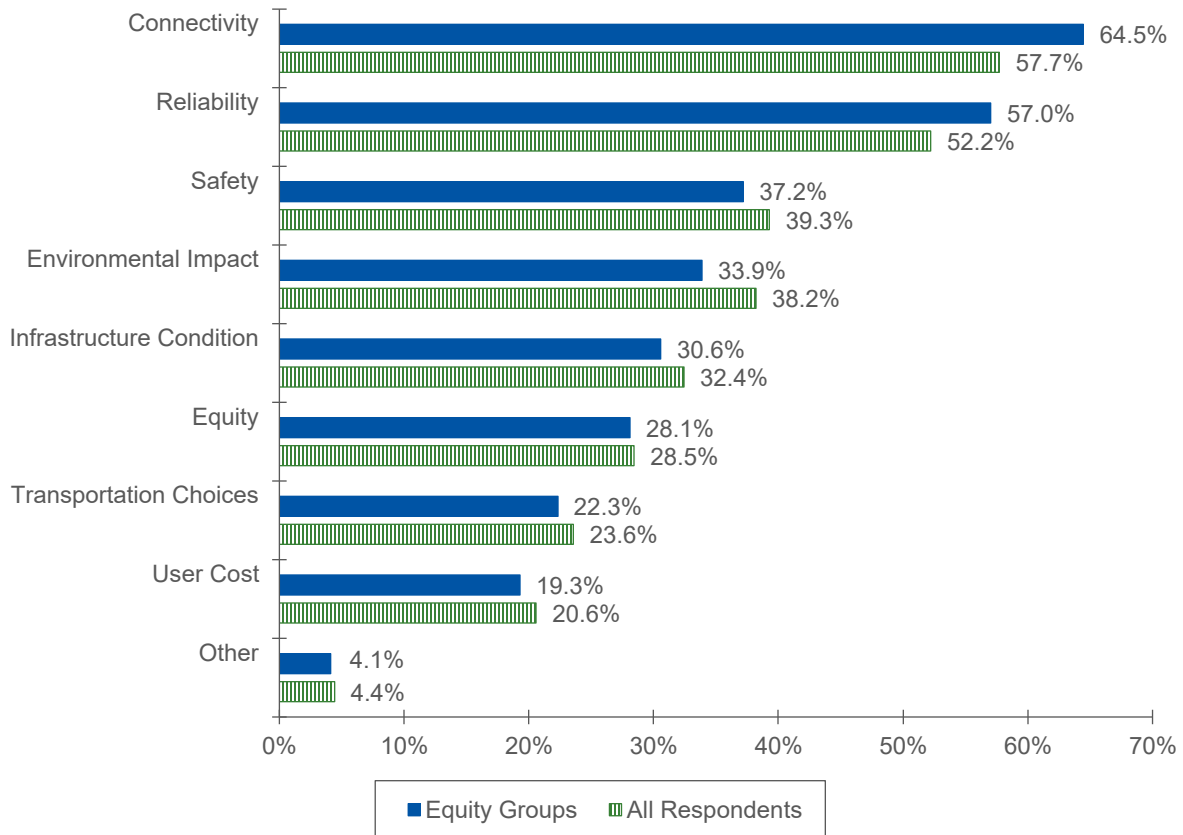
² Beyond Mobility Phase I Vision, Values, & Needs Survey, Summer 2022.



expansion, efficiency, and transit accessibility than on safety, which highlights the lack of access to transit options in rural areas more generally.

Among equity groups, people of color reported safety concerns more than other groups, with 31 percent of the total survey respondents of color listing safety as an important priority for the ideal future transportation system for the state. Other equity groups reported safety concerns as well, but less than people of color.³

Figure 3.4 Top Values Chosen by Participants for Future Ideal Transportation System



N=1,107

Source: *Beyond Mobility Phase I Vision, Values, & Needs Survey, Summer 2022.*

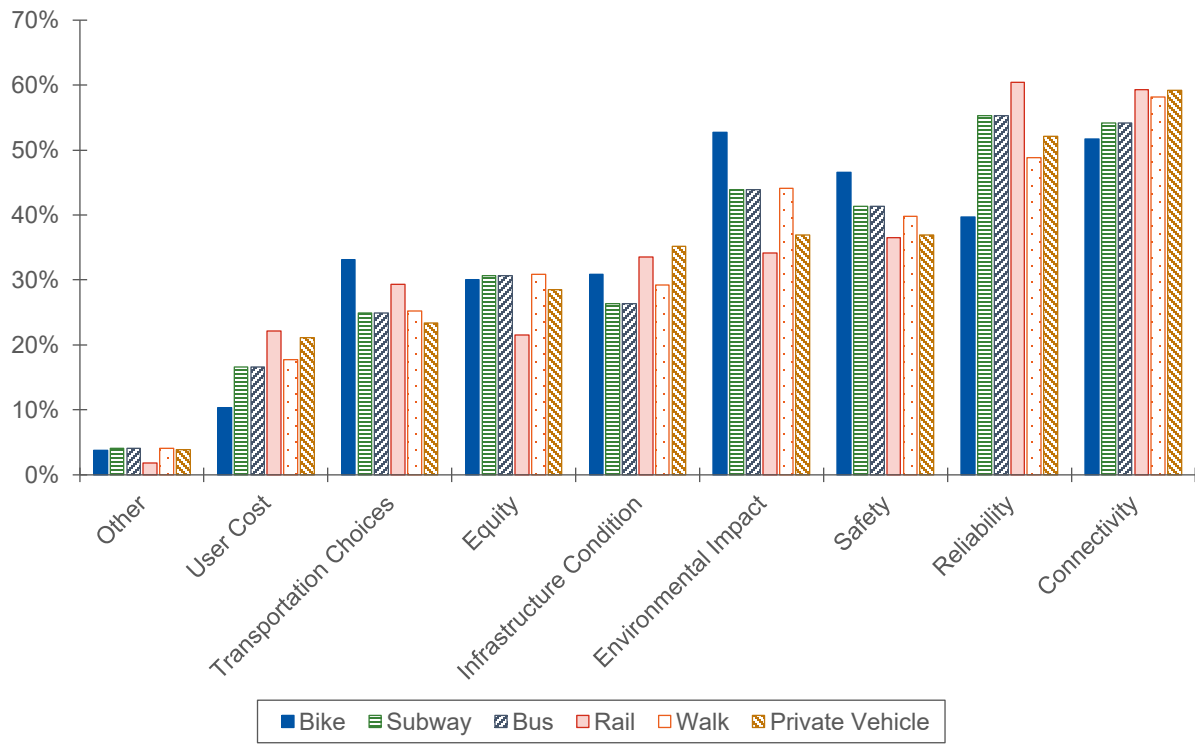
Exploring safety concerns by transportation mode highlighted that bicyclists, transit users (both subway and bus users), and pedestrians are most concerned with safety. Of respondents who reported using bicycling as one of their modes of transportation, 47 percent selected safety as an aspect of the transportation system they would like to see improved or changed. More than 40 percent of transit user and pedestrian respondents also selected safety as an aspect to be improved (see Figure 3.5 below).⁴

³ Safety chosen by 28 percent of respondents each from the low-income respondents and elderly (aged 65 and over) categories, and by 22 percent of the rural respondents.

⁴ Beyond Mobility Phase I Vision, Values, & Needs Survey, Summer 2022.



Figure 3.5 Aspects Respondents Would Like to See Improved or Changed



N=1,107

Source: *Beyond Mobility Phase I Vision, Values, & Needs Survey, Summer 2022.*

Existing Challenges: What Hinders Transportation Safety?

The feedback about the safety of the Massachusetts transportation network elicited responses reflecting a range of fears and uncomfortable situations—both perceived and experienced—around accessing and using different modes. A closer look at the various safety challenges faced by different groups highlights four kinds of fears attached to transportation settings and infrastructure:

- **Fear of crashes on roads** was a common concern among bicyclists and pedestrians. Participants described unmaintained or discontinuous walking/bike paths, dangerous path conditions including potholes, aggressive and rash driving habits among automobile users, and lack of sufficient sidewalks and bike paths.
- **Speeding** was a top concern across all outreach activities, including being cited at every stakeholder meeting in Phase III of engagement. From freight stakeholders to business owners to residents, slowing vehicle speeds are top of mind for many.
- Residents associate **state of good repair** with safety. Specifically, the proactive maintenance of active transportation infrastructure such as sidewalks and bike lanes were shared by participants in outreach activities.



- Stakeholders from rural parts of the Commonwealth, both in the West and the South, cited the **lack of basic infrastructure such as sidewalks and street lighting** as a major concern. Coupled with little to no cell service in many of these areas, travelers are faced with very little protection no matter the mode of travel.
- **Fear of victimization** from potentially harmful individuals was another important factor that resulted in poor security levels among locals, especially concerning accessing and using transit.
- Others described more general security concerns relating to crime and **fear of being attacked** rooted in several distinct reasons. For instance, Mandarin-speaking participants described feeling unsafe due to increased attacks against Asian people.
- An increased **fear of being infected post-COVID** due to the lack of space for social distancing when using transit was also a factor among some groups, especially older adults (aged 65 and above).

Notably, the design of transportation infrastructure itself was not explicitly mentioned as a safety concern. Rather, lack of dedicated infrastructure and poor upkeep of existing infrastructure were expressed frequently as the main reasons underlying the poor safety and security levels of different transportation modes. This sentiment is best reflected in the frequent use of phrases such as the following:

- Lack of bike lanes and dedicated bike infrastructure
- Lack of sidewalks or abrupt ends in walking and bicycling infrastructure
- Potholes
- Fading road signs
- Poorly timed crosswalk signals
- Dirty, unclean, or dark subway station areas and trains

Navigating the above-discussed challenges often led people to adopt several practices to avoid danger and ensure safe mobility. Some of the strategies that emerged from the surveys included avoiding specific areas, routes, or transit stops; using certain modes of transportation that offer a greater sense of security (e.g., cars or taxis); or not using certain modes that require being in unsafe conditions (such as bicycling in certain areas). Ensuring the safety and security levels of different users accessing and using different transportation options was a priority for those who participated in *Beyond Mobility* outreach opportunities.



Vision for a More Safe and Secure Transportation System

When asked about the top three qualities of a successful transportation system, *Beyond Mobility* participants were quick to cite safety. Respondents primarily called for two kinds of interventions to increase security and safety levels, as listed below:

- Respondents asked for the **deployment of more security personnel and security cameras** at bus stops, train stations, and subway stations for an enhanced sense of security when traveling.
- **Physical infrastructure improvements and upgrades** are highly desired by residents. Participants emphasized the need for more sidewalks to protect pedestrians from potential collisions with speeding vehicles and buses. Bicyclists expressed their desire to have more dedicated bike lanes and bike-locking infrastructure. Transit users suggested better partitions between awaiting passengers and railways/roads for enhanced safety levels. A desire for enclosed spaces during cold weather was also a priority to ensure passengers could comfortably and safely wait at bus stops and stations.

Spanish Speakers, Focus Group

“We need more security at the stations. More! I would hope they would fix all the problems with the train tracks. There have been a lot of technical problems with them recently.”

Black Community, Focus Group

“I know that Ms. XX mentioned something about the bus lanes that are in the middle of the street and how they’re not really safe. And they’re not. You’re literally letting off people who are elderly, maybe people who are wheelchair bound, or who need handicap access. You’re now letting them off in the middle of the street, instead of on the sidewalk. And this is something that they need to, it’s now another challenge that they have to face.”

3.3 Reliability

Reliability is an integral function of any transportation system. In transportation planning, travel time reliability measures the extent of unexpected delays that travelers experience, representing the consistency and dependability of trips. In this context, reliability represents the degree to which people can feel confident in their travel experience and the amount of time that it will take. Reliability relates to every part of transportation—operations, infrastructure, maintenance, and travel experience—and is crucial across all types of transportation assets. However, reliability is also impacted by a wide variety of recurring and non-recurring factors, many of which are unseen to transportation system users.

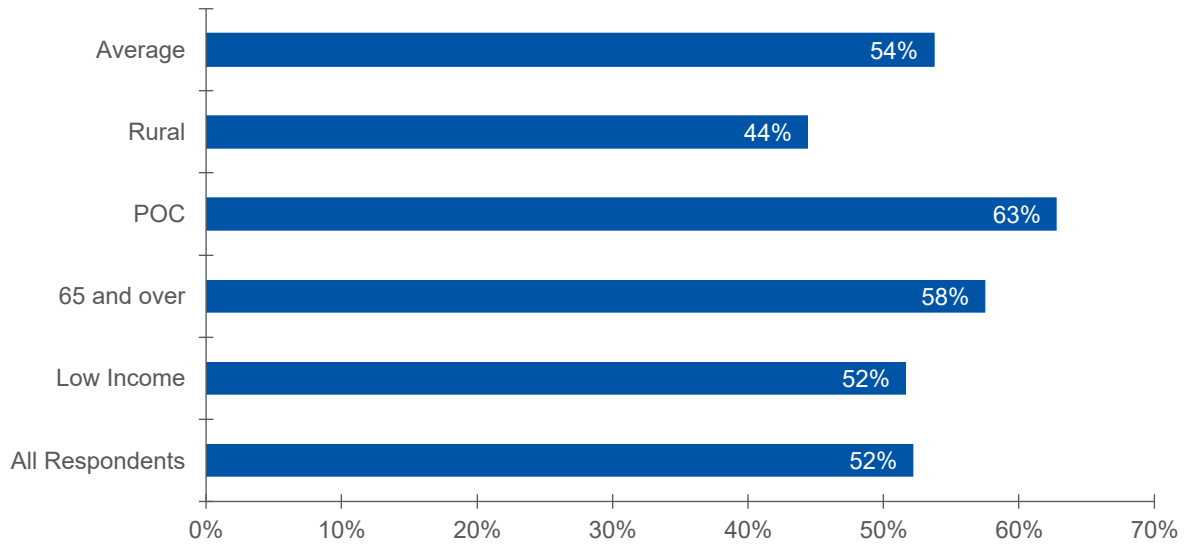
Among respondents to the *Beyond Mobility* Phase I Vision, Values, & Needs Survey, reliability is seen as the core function of the transportation system. When ranking current aspects of the transportation system to be improved or changed, one respondent remarked “Shouldn't reliability NOT be a ‘choice’ for transportation?” Travel time, wait time, safety, and affordability are key to respondents’ experience of reliability.



Who is Most Concerned about Reliability?

Across the *Beyond Mobility* planning process, participants highlighted reliability as a top concern and priority. When asked to identify up to three top priorities, 54 percent of all respondents selected reliability (Figure 3.6). Some equity groups, such as people of color and those over the age of 65, prioritized reliability at even higher rates (63 percent and 58 percent, respectively).

Figure 3.6 Respondents Wanting Reliability to be Improved or Changed by Equity Group



N=1,107

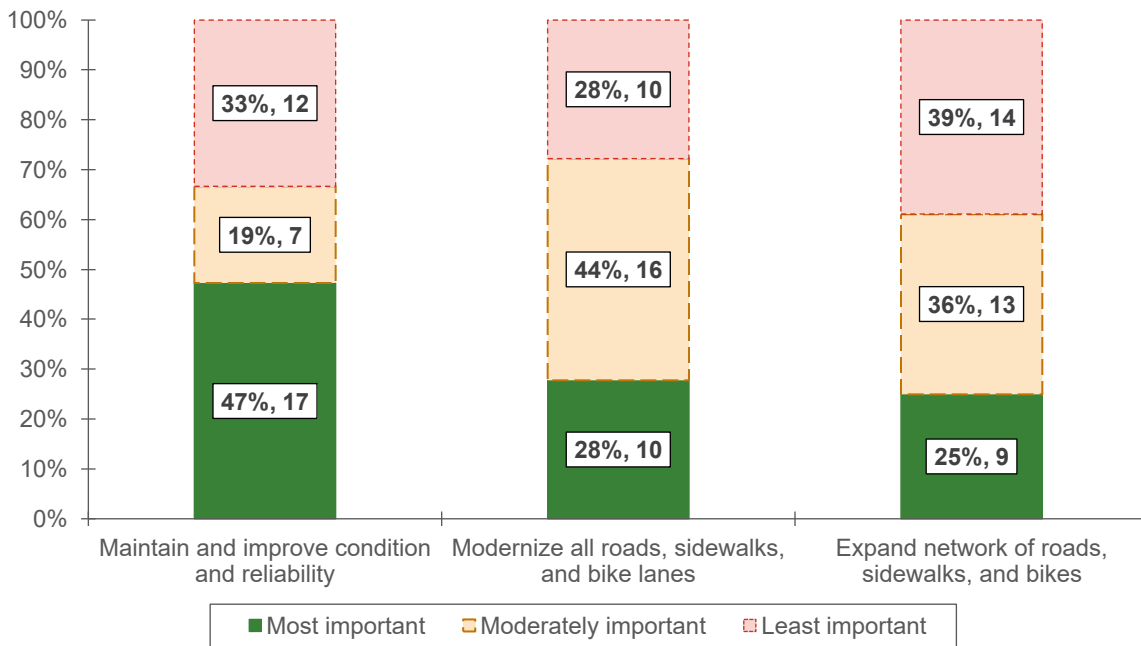
Source: *Beyond Mobility Phase I Vision, Values, & Needs Survey, Summer 2022.*

This keen interest in reliability is evident when looking at the results by mode. Across all modes, the prioritization of reliability is most pronounced among transit riders (rail, bus, and subway). Approximately 60 percent of passenger and Commuter Rail riders selected reliability as a key priority. Similarly, 55 percent of bus and subway riders and 52 percent of single-occupancy vehicle (SOV) drivers prioritized reliability.

Reliability was frequently the “most important” priority among equity groups participating in visioning focus groups, composed of people who are most reliant on public transportation (Figure 3.7). Urban interviewees and participants in *Beyond Mobility* multilingual focus groups reported that financial and legal barriers to vehicle ownership forced them to use public transportation, which they found less reliable than personal vehicles. Multilingual interviewees (many immigrants, people of color, people with limited English proficiency, and/or low-income earners) reported challenges in acquiring a driver’s license or affording a private vehicle, also meaning they had to use (less reliable) public transportation.



Figure 3.7 Priorities for Massachusetts Transportation System

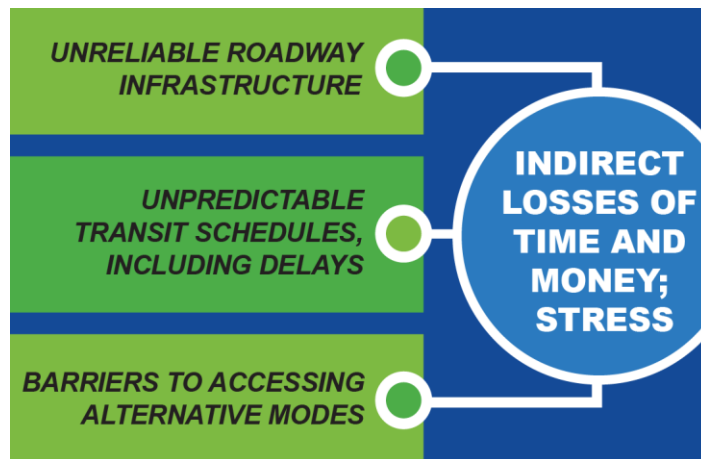


N=40

Existing Challenges: What Hinders Reliability?

Residents across Massachusetts expressed challenges around reliability (Figure 3.8). Around Boston, many residents expressed concerns over “ghost buses” (i.e., a trip that exists on a GPS-based information system such as Google Maps but is not scheduled by the agency); maintenance-related delays or disruptions (e.g., potholes and train breakdowns); and the connection between highway infrastructure and congestion. Outside of Boston, residents mentioned the need for late night and weekend transit service, and unpredictable transit availability.

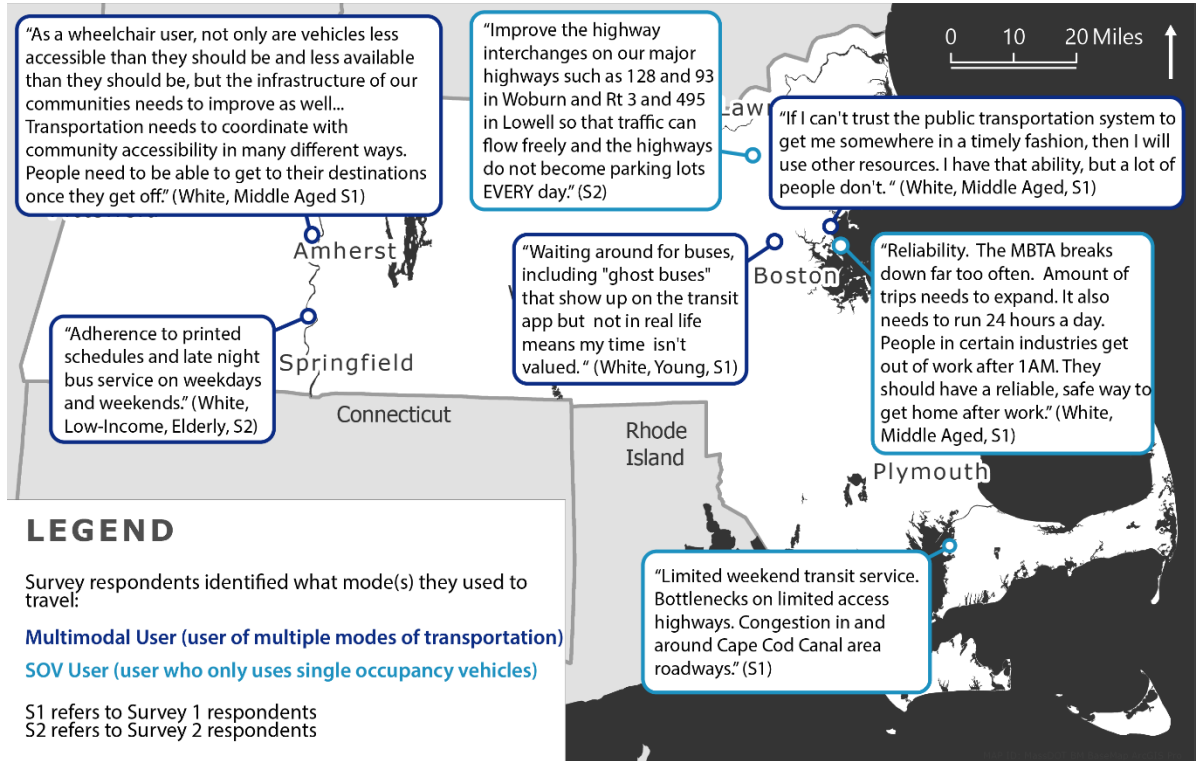
Figure 3.8 Key Elements of Public Feedback on Reliability



Unreliable transit service generates distrust and disincentivizes the use of transit. Twenty-eight percent of the *Beyond Mobility* Phase I Vision, Values, & Needs Survey respondents cited delays, unpredictable schedules, and/or lack of reliability in mass transit as a challenge in trying to travel around the Commonwealth. Respondents noted that this unreliability is particularly detrimental for those without personal vehicles in rural areas or those living in communities without multimodal

roadway facilities (e.g., sidewalks). Figure 3.9 highlights residents' experiences with unreliability across modes and services, accentuating cascading challenges across Massachusetts communities.

Figure 3.9 Various Reliability Challenges Reported by Respondents⁵



Vision for a More Reliable Transportation System

Despite challenges, residents expressed promising visions of the future related to expanded service, enhanced communication, expanded service hours, and accessible multimodal transportation options.

- Transportation with **more predictable, frequent, and redundant service** will improve users' confidence that the system can deliver them to their destinations, no matter the day, time, or location. Transit services arrive on time and are predictable.

Expanded Service

"A great transportation system for me would be reliable to the point I would never have to worry about being able to get to a necessary medical appointment, school, and/or work. A great transportation system should be there to replace or serve as an accessible option in lieu of a personal vehicle that I might not be able to operate or afford to have on my own." (Dracut, White, Low Income, Multimodal User)

⁵ The map identifies user mode given the diverse experiences of drivers versus transit riders.



- **Clear and timely communication** when there are delays, particularly using transit. Some residents expressed a hope that compensation be tied to trip disruptions so that they could afford alternative modes.
- **Operating hours** extend to later in the evening with more operating hours on the weekends. This allows for more reliable transportation for those traveling at off-peak hours.
- **Abundant transportation alternatives** exist beyond single-occupancy vehicles. Traffic congestion is a major cause of stress for residents. They desire better ways to travel that allow them to save money, time, and energy. Part of this vision includes enhanced **multimodal infrastructure**. Building facilities for micromobility and non-motorized modes of transportation helps create enhanced reliability in non-urban parts of the state, generating system-wide benefits.
- Participants from many of the stakeholder groups in Phase III of engagement emphasized that **improved reliability of both rail and bus services** would help increase the reliability on roadways. Stakeholders emphasized that reliability not only encompasses knowledge of when buses or trains will be on time, but also being able to reliably take the bus or train in the early morning or late evening, ensuring those who work at these hours are still able to reliably get to work despite the time of day.

Enhanced Communication

“Consistent communication and transparency from transportation providers regarding delays, plans, and projects.” (*Somerville, White, Urban, Young, Multimodal User*)

Abundant Alternatives

“Once I enter the system I want to have access to information regarding the elements of my trip including possible alternatives.” (*Anonymous*)

3.4 Supporting Clean Transportation

In 2019, transportation was responsible for 42 percent of greenhouse gas (GHG) emissions in the Commonwealth. Massachusetts residents recognize the negative impact that emissions from the transportation system have on the local environment and community well-being. They are also attuned to the extent to which harmful emissions impact historically underserved areas.

Residents see the prioritization of clean transportation as not only a way of accomplishing climate goals, but as a way to expand transportation choices, fill gaps in the transportation network, and achieve social and geographic equity. “Clean transportation” refers to transportation modes with low to zero harmful emissions. This could include cases where those lower emissions are achieved through the use of alternative fuels, energy-efficient vehicles (e.g., electric, hybrid, battery electric, etc.), or mode shift to transit or zero-emission modes such as bicycles or scooters.

Massachusetts residents see cleaner transportation modes as a path towards safer streets, more connected and denser communities, and a cultural shift towards prioritizing people over “business as usual” transportation. They emphasized the importance of clean transportation that is inclusive, affordable, and commonplace.



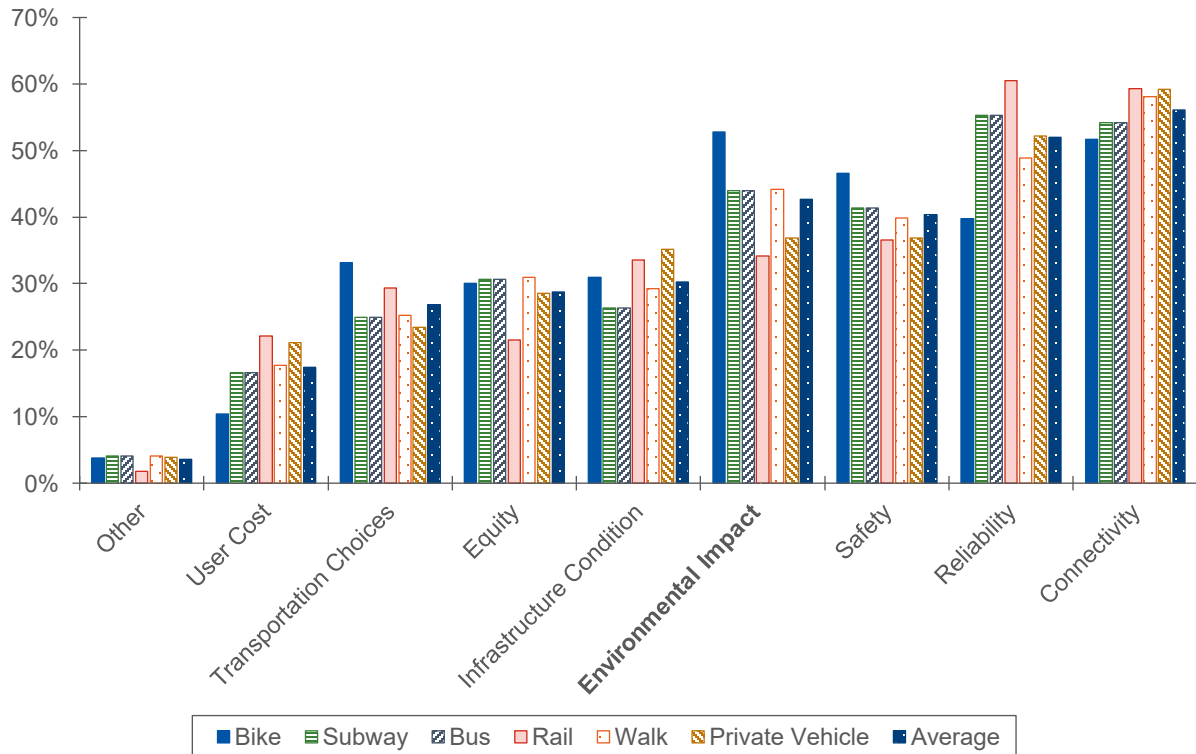
Who is Most Concerned About Clean Transportation?

As a part of the *Beyond Mobility* Phase I Vision, Values, & Needs Survey, 43 percent of all respondents across all transportation modes highlighted environmental impact as a key aspect they would like to see improved or changed in their lifetimes (Figure 3.10). Bicyclists ranked environmental impacts most highly with 53 percent.

Many of the qualities summarized in Figure 3.10 overlap with one another, and several relate to clean transportation. Though environmental impact was the fourth-ranked choice overall, public outreach indicated that system users view supporting clean transportation as a blend of values around connectivity, equity, safety, and reliability. Residents desire cleaner, more accessible, and reliable modes of travel, which often refers to their dependence on vehicles to reach near and far destinations.

As shown in Figure 3.11, an overwhelming 69 percent of *Beyond Mobility* Phase II Priorities & Tradeoffs Survey respondents aligned a “flawless” transportation system with car-free connectivity. The majority of respondents statewide want to explore clean (e.g., multimodal options) and alternative (e.g., electric vehicles) ways to move (Figure 3.12). Around 72 respondents specifically mentioned “electrification” in their responses to *Beyond Mobility* Phase I Vision, Values, & Needs and Phase II Priorities & Tradeoffs survey questions.

Figure 3.10 Aspects of the Transportation System Respondents Would Like to See Improved or Changed by Mode

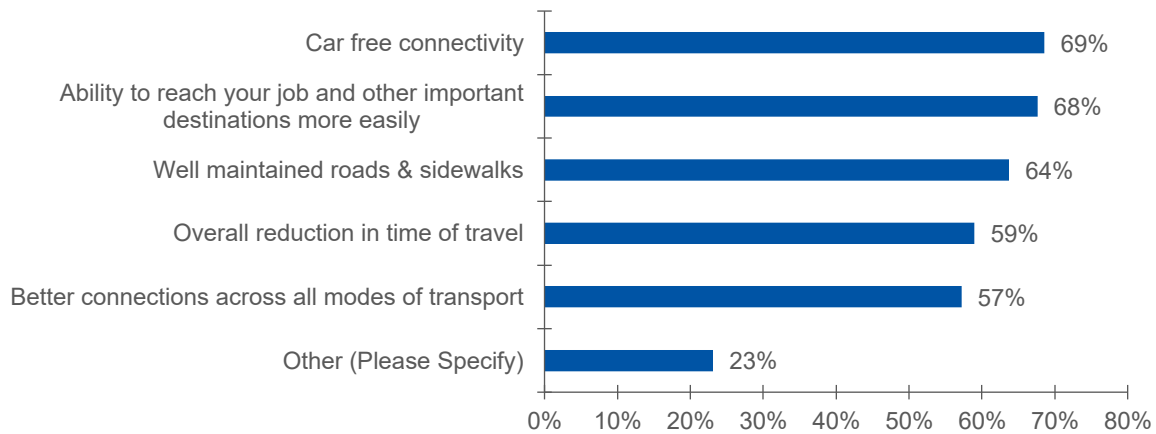


N=1,107

Source: *Beyond Mobility Phase I Vision, Values, & Needs Survey, Summer 2022.*



Figure 3.11 All Respondents Elements of a Great Transportation System

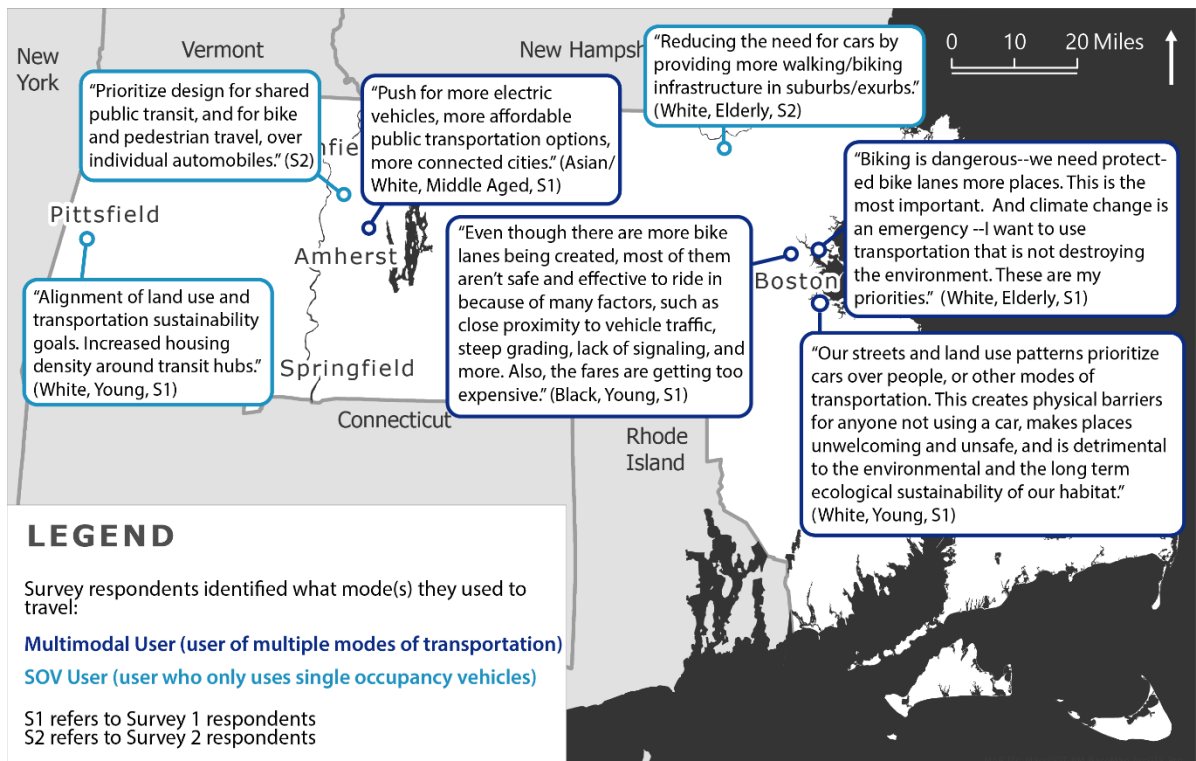


N=2,543

Source: Beyond Mobility Phase II Priorities & Tradeoffs Survey, Fall 2022.

Figure 3.12 offers examples of how clean transportation is viewed by residents in different areas of the state. Respondents emphasize the importance of prioritizing people over automobiles, with Boston residents in particular noting opportunities for expanded bicycle use. Residents outside of the Greater Boston area highlight areas for better alignment of transportation and land use to create more connected, dense urban areas.

Figure 3.12 Visions and Challenges for Clean Transportation



Existing Challenges: What Hinders Clean Transportation?

Transportation systems and priorities differ across Massachusetts, with people in different regions supporting a broad spectrum of qualities related to clean transportation. However, there were some general themes (Figure 3.13) that weave many comments together: **supporting active transportation, car-free connectivity, inclusivity, and environmental benefits.**

Figure 3.13 Supporting Clean Transportation Themes

ACTIVE TRANSPORTATION	CAR-FREE CONNECTIVITY	INCLUSIVITY	ENVIRONMENTAL BENEFITS
<p>“Switching modes supported - such as lots of integrated, covered bike parking at train and bus stations” (Native American, Middle-Aged, Urban, Multimodal)</p> <p>“I really like to walk when I am trying to get somewhere, but there are no sidewalks, that is another huge challenge.” (Haitian Creole, Focus Group)</p> <p>“Good sidewalks and bike lanes for the last mile. That means tree lined streets everywhere, ability to cross streets safely. The climate crisis should be driving our decisions...And good service to get people out of their cars.” (Asian, 65+, Suburban SOV)</p>	<p>“Increased shift away from car-dependent infrastructure and more focus on public transportation and biking.” (White, Young, Urban, Multimodal)</p> <p>“Less dependence on gas powered personal vehicles.” (White, 65+, Rural, SOV)</p> <p>“Can safely walk to many daily destinations. Can get efficiently car-free to locations throughout the state and region. Be part of the solution for addressing climate change.” (White, 65+, Suburban, SOV)</p>	<p>“Robust EV charging infrastructure to be distributed in an equitable way.” (White, Middle-Aged, Low Income, Rural)</p> <p>“Eco friendly without being too expensive.” (White, Young, Urban, Multimodal)</p> <p>“Without transportation solutions to reduce GHG, our roadways will continue to be clogged with dangerous and polluting vehicles that are dirtying our air and harming our pedestrians and cyclists, who are at greater risk than ever, especially in low-income communities and communities of color.” (<i>Capital Investment Plan</i>)</p>	<p>“Alignment of land use and transportation sustainability goals.” (White, Young, Rural, Multimodal)</p> <p>“Deep reductions in pollution and a system that has pollution prevention priority - including noise pollution.” (White, 65+, Urban, Multimodal)</p> <p>“Helps me get around without a highly negative environmental impact due to fossil fuel usage.” (White, Young, Urban, Multimodal)</p>

Sources: *Beyond Mobility Phase I Focus Groups & Interviews, 2022, Beyond Mobility Phase I Vision, Values, & Needs Survey, Summer 2022, Beyond Mobility Phase II Priorities & Tradeoffs Survey, Fall 2022, Massachusetts Capital Improvement Plan, SFY 2022.*

Statewide, there is a strong belief that low-emission travel is culturally and monetarily under-invested in, despite the benefits it brings. Residents see the association between clean mode choice and higher levels of system connectivity, sustainability, and mobility, leading to increased health and environmental outcomes, inclusivity, affordability, and equity. Importantly, residents view clean transportation as an investment tool for marginalized communities, especially communities that are adjacent to freight hubs, low-income populations, and/or predominantly people of color, incentivizing interest even more.



These comments highlighted several existing challenges:

- Residents perceive an **auto-centrism that prevents places from feeling welcoming, safe, and pleasant**. Residents recognize that current land use patterns prioritize cars over people and construct visible (and invisible) barriers. System users feel that car-free lifestyles and active transportation are critical components of a clean transportation system.
- **Taking control of reducing residents' carbon footprints is a challenge given existing travel options**. Young people in particular see driving as both inconvenient and harmful to the environment. Without mode choice and options, residents feel their priorities and desires are not being met.
- A majority of survey respondents cited car-free connectivity as a feature of a flawless transportation system. **Cars are inaccessible to many** due to rising energy costs, as well as increasing costs of vehicles and maintenance, leading to limited access to opportunity. Individuals who would rather use transit or active modes cannot do so in a safe or easily accessible way due to a lack of existing infrastructure (e.g., protected bike lanes, continuous sidewalks, integrated bike share/bike racks/repair stands at transit stations, and traffic calming measures).
- The **availability, or lack thereof, of electric vehicle charging stations** is a concern shared by many stakeholders across various demographics—from freight transportation providers to residents trying to locate a place to charge their vehicle. Furthermore, it is not just the existence of charging stations in proximity to the people that need them, but also the reliability of those stations being operational and available for use that is important to residents.

Vision for a Cleaner Transportation System

By focusing on multimodal, low-emission options, Massachusetts can build a future where people do not need to rely on automobiles. Residents expressed a clear vision of engaging in the effort to tackle the climate crisis:

- Residents view **clean transportation as a gateway to better public health outcomes, enhanced reliability, strong environmental stewardship, and greater personal mobility**. Clean transportation options, including non-motorized transportation, should be approached as opportunities to generate other positive quality-of-life benefits.
- Residents feel confident in a transportation system when it is **flexible and dynamic**. Options such as micromobility are important pieces of personal mobility and lifestyle choices; investing in these modes will bolster confidence in the transportation system's ability to be dynamic. They want to see a transportation system that is readily accessible and can accommodate individual preferences while also benefitting the planet and communities.
- Residents recognize that investing in transit-oriented development (TOD), maintaining denser and affordable housing near transit, and using micromobility and active transportation to fill in network gaps will build a **connected, robust, and environmentally friendly transportation system**. It will also enable deeper community-building and access to opportunity. Intentional and equitable planning is necessary to maintain affordability and ensure all residents can experience clean transportation modes.



- Residents also desire the **equitable distribution of public electric vehicle (EV) charging stations and alternative fuel modes**. A robust, statewide network of EV charging stations may reduce reliance on fossil fuels by providing people with long-distance charging confidence while demonstrating public support and enabling cost savings for consumers. This includes expanding options to communities that rely on public transit the most, allowing for all residents to experience and adapt to new technology while offering alternatives in case of an asset loss or service disruption.

3.5 Destination Connectivity

MassDOT believes that the primary purpose of the transportation system is to connect people to the places they need and want to go. The ability to reach everyday destinations is critical to improving the quality of life for all Massachusetts residents, including transit riders, drivers, and multimodal users.

Connectivity to destinations is also one of the primary factors in how residents evaluate the transportation system. If residents cannot connect to and from their everyday places, they perceive their experience as fragmented and difficult, and begin to doubt the system and its ability to serve their daily networks sufficiently. Every system user has different destinations and thus different experiences of system connectivity.

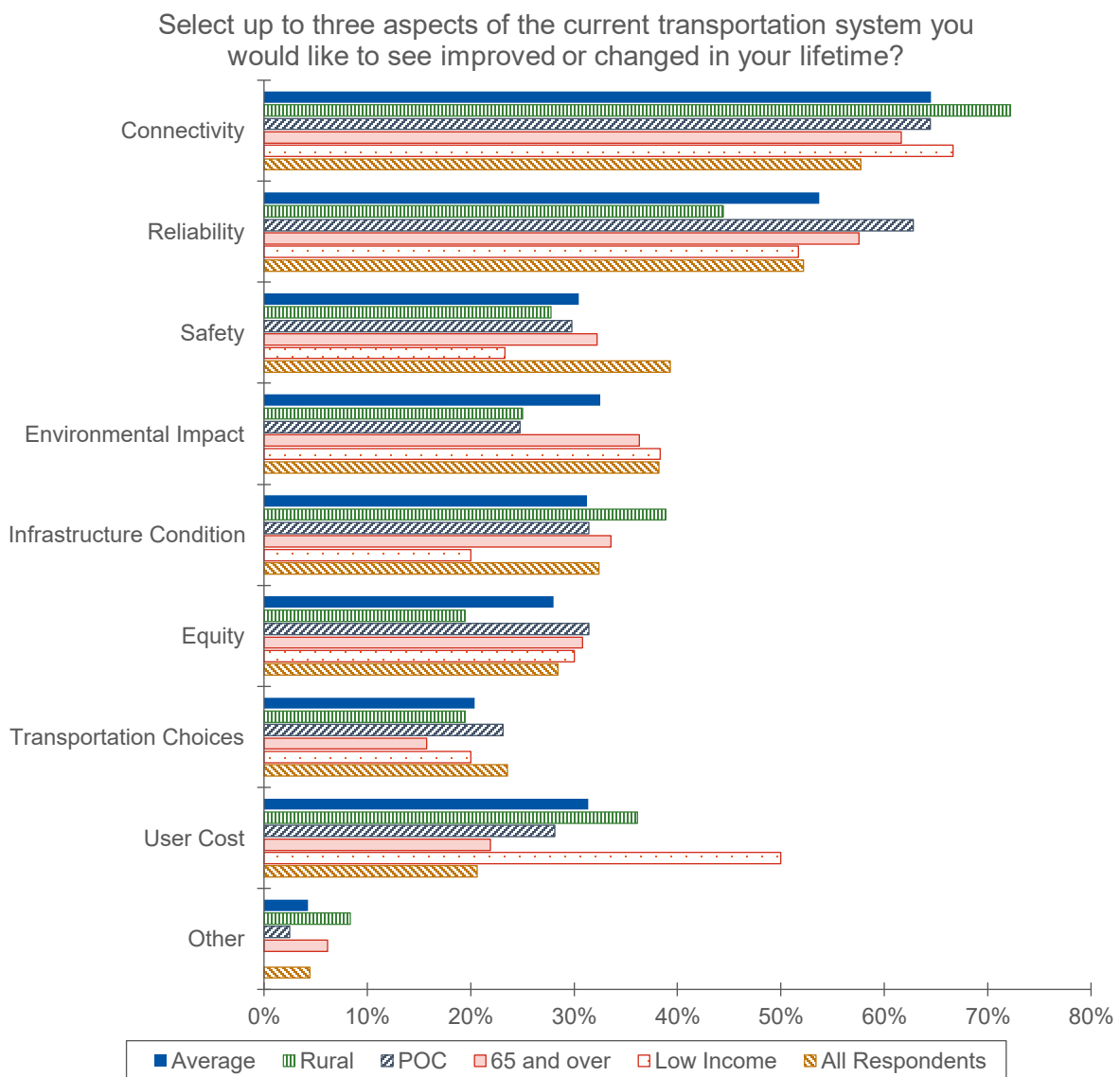
At the regional level, roadways and public transportation impact access to economic, social, and healthcare opportunities. Public transportation connections are particularly vital to ensure access for people unable to drive, such as members of low-income households, immigrants, children, individuals with disabilities, and older adults. Rural residents and historically marginalized communities often find it more challenging to reach key destinations, which results in negative travel experiences.



Who Is Most Concerned about Destination Connectivity?

Of the 1,107 respondents in the *Beyond Mobility* Phase I Vision, Values, & Needs Survey, all respondents chose connectivity as a top priority to change or improve in their lifetime. Rural and low-income respondents expressed particular support for connectivity, at 72 percent and 64 percent, respectively (Figure 3.14). Though the experience of connectivity differs across demographic groups and geographies, over 50 percent of all users by mode (bicyclists, pedestrians, private vehicle drivers, and users of the subway, bus, and Commuter Rail) selected destination connectivity as a key element of a well-functioning transportation system—more so than any other category.

Figure 3.14 Top Priorities for Massachusetts' Transportation System



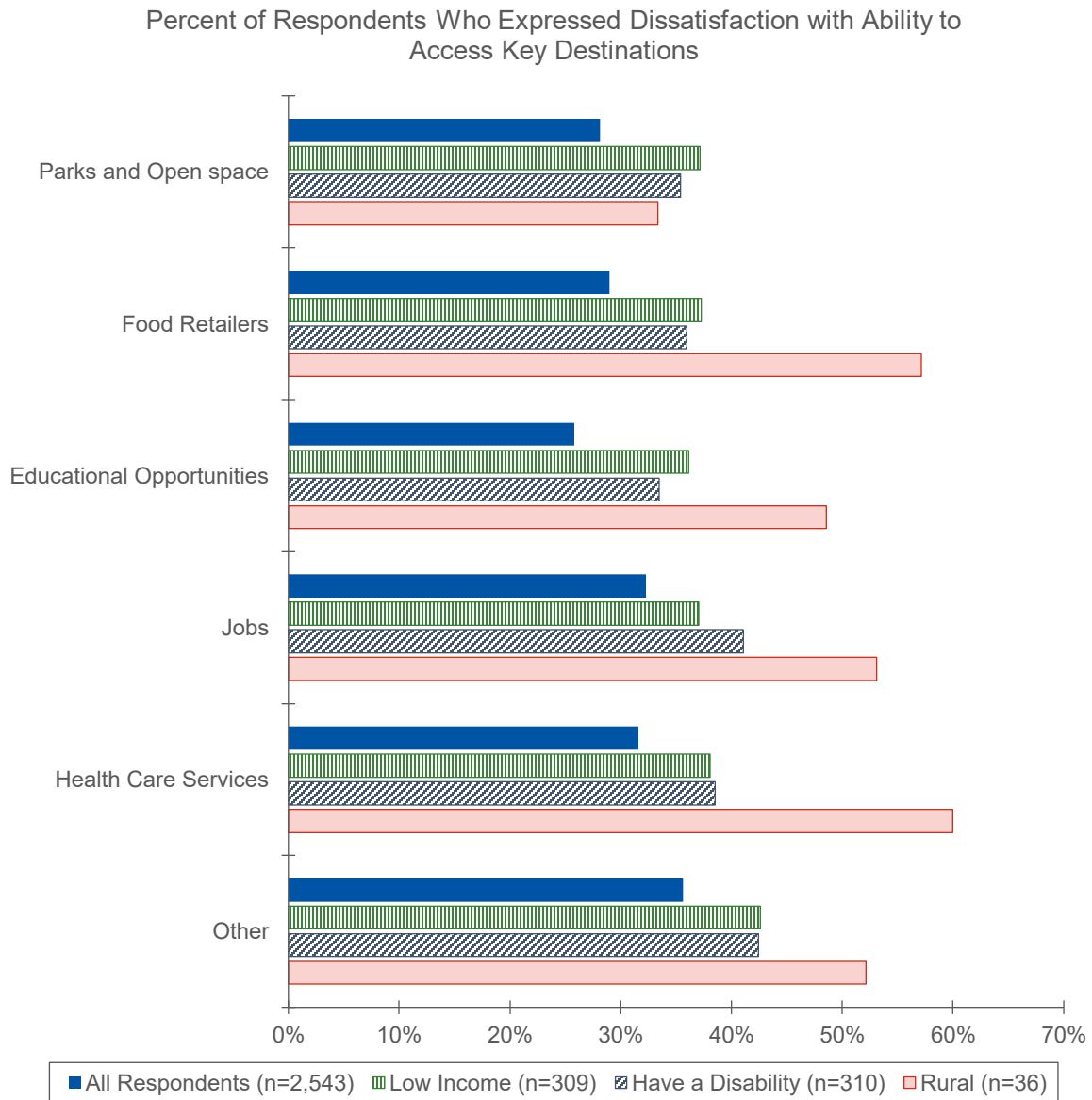
N=1,107

Source: *Beyond Mobility Phase I Vision, Values, & Needs Survey, Summer 2022.*



In reporting satisfaction with accessing certain key destinations, respondents from rural communities, earners in the lowest income brackets, and individuals who have a disability reported the highest levels of dissatisfaction compared to the survey group as a whole; for example, over 50 percent of respondents from rural communities reported dissatisfaction in accessing food retailers, jobs, health care services, and “other” destinations (Figure 3.15). These results indicate that there is a high demand for improved transportation connections to these areas, particularly within Massachusetts’ rural communities.

Figure 3.15 Dissatisfaction with Connectivity to Destinations: Rural, Low-Income, and Individuals with a Disability Compared to All Respondents



N=2,453

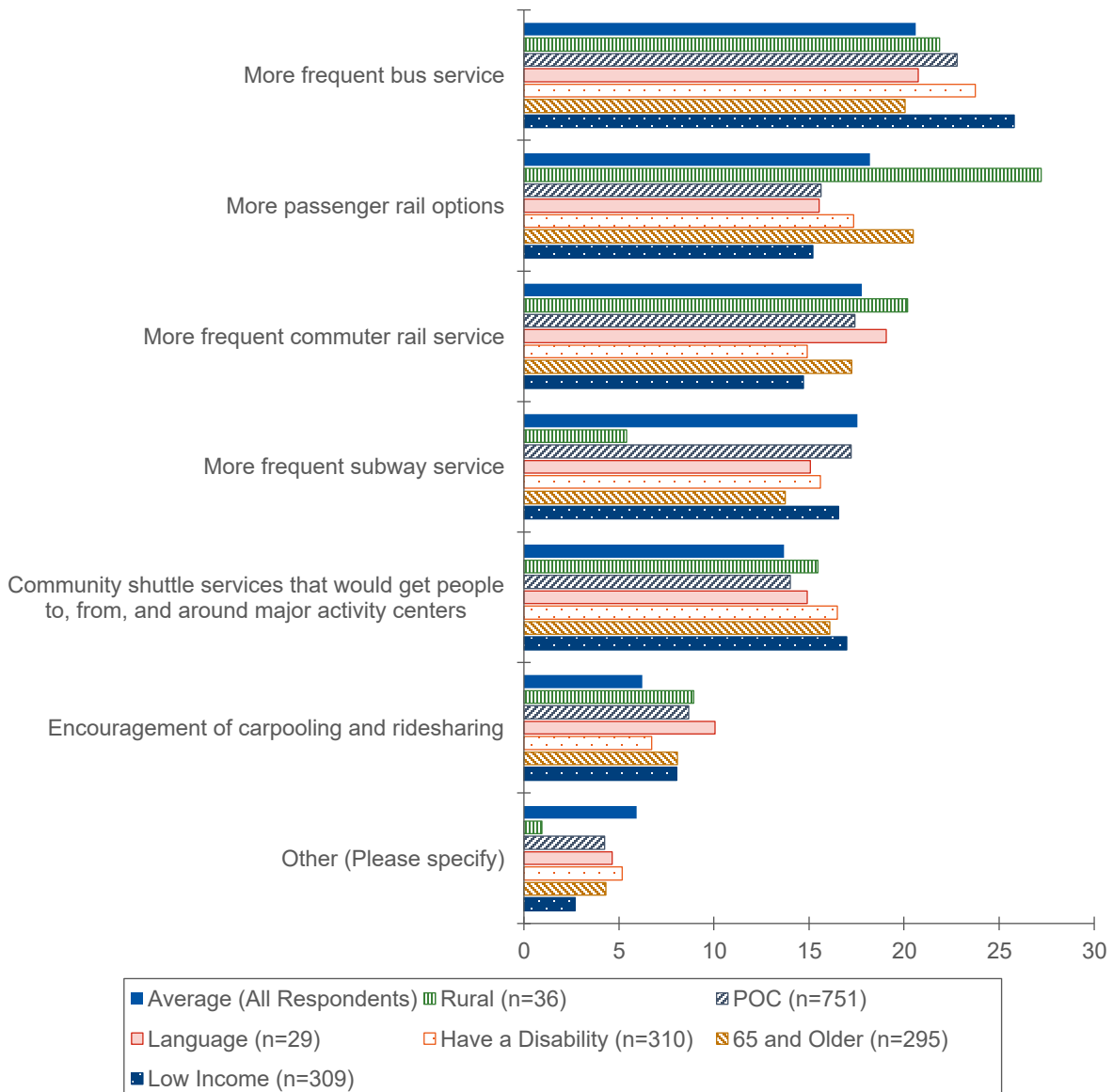
Source: Beyond Mobility Phase II Priorities & Tradeoffs Survey, Fall 2022.



As shown in Figure 3.16, survey respondents were asked to assign value to various kinds of transit improvements. On average, all respondents ranked more frequent bus and Commuter Rail services, and more passenger rail options the highest. Residents in rural communities heavily favored increased rail connections. Low-income residents, people of color, and individuals with disabilities favored more frequent bus service.

Figure 3.16 Priorities for Transit Improvements by Equity Group

Imagine that you have 100 tokens to spend on related transportation improvements. How would you distribute them among the following priorities?

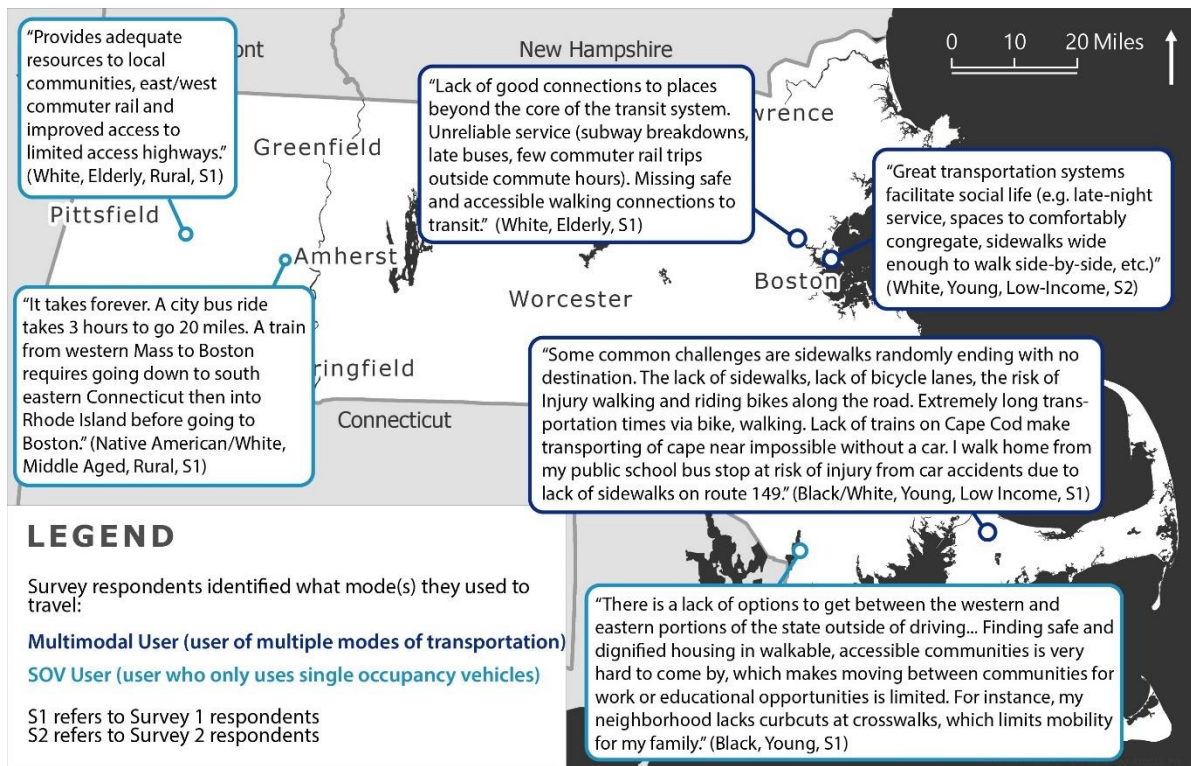


N=2,453

Source: Beyond Mobility Phase II Priorities & Tradeoffs Survey, Fall 2022.

Figure 3.17 offers additional geographic context to identify overlapping priorities, displaying what destination connectivity means statewide. Overwhelmingly, respondents in both urban and rural areas envision the transportation system as a tool to facilitate greater social, economic, and educational outcomes. In parallel, survey respondents in western and coastal Massachusetts spoke to the inadequacy of transportation options, long commutes, and deficient infrastructure that further limits safe travel.

Figure 3.17 Statewide Surveying Results—Destination Connectivity Visions and Challenges





Existing Challenges: What Hinders Destination Connectivity?

Given the significant differences in transportation needs and transportation choices across Massachusetts, destination connectivity has distinct meanings depending on who is asked. However, several destination connectivity themes summarize common challenges: **access to opportunity, multimodal mobility, transit connectivity, and geographic equity.**

Residents acknowledge the value that transportation brings on both a regional scale and personal level. Residents want connectivity to destinations, including first- and last-mile connections to and from transit and improved transportation options. Residents also express challenges commuting or traveling from the western to eastern sides of the state and recognize the importance of connectivity via non-SOV modes. These key themes, as well as additional survey content, provided context for existing challenges:

- o **Lack of contiguous sidewalks and protected bike lanes** prevent residents from using active transportation. Residents are fearful of trying new modes or exploring multimodal options because of aggressive driving, poor connectivity between modes, and inadequate infrastructure. When residents express a desire for “seamless connections,” they oftentimes indicate a desire to travel without a car.
- o Residents associate **state of good repair** with destination connectivity. A lack of protected and well-maintained bike lanes and sidewalks, for example, leads to dysfunction and gaps in the transportation system.
- o There is a **lack of network connectivity in rural areas**, particularly related to public transportation including Commuter Rail, trains, and buses. Currently, there is insufficient connectivity and coverage in much of western and coastal Massachusetts. Users describe a fragmented system that prioritizes urban areas like Boston while leaving rural and suburban areas out of the picture.

Destination Connectivity— Access to Opportunity

“We run a small business here in Berkshire County. If we had fast rail transportation to New York City, we would be able to grow our business, hire more employees, and contribute to the economic growth of Berkshire County.” (2018 State Rail Plan)

Destination Connectivity— Multimodal Mobility

“I grew up in a predominantly Black neighborhood in Boston where people biked, walked, or took the T. People in predominantly black neighborhoods are neglected when it comes to fulfilling all their needs. With no car, they have to rely on the T to get what they want/need and if the T doesn't access places where people can get those resources, it is hard to supply their own livelihood.” (Black Interviewee, *Beyond Mobility* Focus Group)

Destination Connectivity— Transit Connectivity

“We need frequent, interconnected systems that connect rural areas as well as urban ones. We need micro transit connections to bring people to the larger transit system.” (Meeting-in-a-Box participant)



- The **lack of first- and last-mile connections to transit** are a central problem across the Commonwealth. Residents recognize the value of transportation, yet are subjected to limited opportunities when there are no connections, or infrequent and unreliable connections, to places with more opportunity. Over half of all Meeting-in-a-Box participants referenced the importance of microtransit and/or first- and last-mile connections to fixed route transit.
- Equitable access to transportation is a key element of a connected system. Residents acknowledge that, often, wealthy neighborhoods or downtowns are prioritized, leaving residents in other communities feeling disinvested in and disconnected. This **lack of geographic equity leads to higher fares, increased travel time, and large gaps** in the transportation network. Ultimately, this leads to lost opportunities and low levels of destination connectivity.
- Stakeholders in the Cape Cod area emphasized the **seasonality of the Cape Flyer service** as a large hinderance to being able to travel to other parts of the state. Residents on the Cape proposed running ferry service from areas such as New Bedford to help connect residents to where they need to go when construction is occurring on Cape Cod Bridges and other key infrastructure in the area, like the increase in ferry service when the Sumner Tunnel was under construction in the Boston area.

**Destination Connectivity—
Geographic Equity**

“Equitable access to the Hilltown communities of Massachusetts. The need for a train/reliable way to be connected to the rest of Mass... has yet to be appropriately addressed.” (White, Young, Low- Income, Rural, SOV Driver)

**Destination Connectivity—
Car-Free Travel Options**

“For low-income residents without a car in Bourne, you end up relying on Uber for needed trips - which becomes financially burdensome. But there are no other options, you’re stranded here [without a car].” (Herring Pond Wampanoag Tribal Member)

Vision for a More Connected Transportation System

Residents see increased destination connectivity as a way to improve quality of life in Massachusetts. Common and consistent visions regarding the need to improve and expand system integration include:

- **Enabling car-light or car-free lifestyles and enhancing modal connectivity** will not only help the environment but also boost public health, save roadway maintenance costs, and expand options for those who may be unable to drive or afford a vehicle.
- **Expanding infrastructure and access to public transportation** is necessary, including Commuter Rail, trains, and buses in areas with insufficient connectivity and coverage outside of downtown Boston. Within Boston, there is a need for continuous and wide sidewalks to encourage more walking and prioritize safety for pedestrians and commuters.



- **Increasing transit operating hours** to later in the evening and on weekends both within and outside of Boston. More efforts are needed to ensure public transit service is equitably planned and distributed.
- **Extending transportation services and modal options** to reach essential services, key destinations, and popular social spots. This will allow people to conveniently meet their daily needs and increase their social networks, while also expanding options of where residents can live and age affordably.
- **Prioritizing investment in rural, low-income, and or transit-light areas** will create a more comprehensive system that diminishes travel time, fare hikes, and system gaps while ensuring all residents feel connected.
- **Building redundancy and safety into the transportation system** will enable greater levels of comfort and confidence in the transportation system by ensuring there are multiple pathways and modal options between origins and destinations.

3.6 Resiliency

The impacts of climate change present a significant and evolving risk to the safety, reliability, and accessibility of transportation systems, including infrastructure conditions and daily operations. Disruptions in any part of the system may cause recurring and frequent delays or roadway and transit service shutdowns. These disruptions will lead to longer commutes while having rippling socioeconomic impacts (e.g., lost money, time, and opportunity) across multiple cities, neighborhoods, and people, hitting marginalized communities the hardest. Building, operating, and maintaining a resilient transportation system is essential for positive economic, social, and mobility outcomes in Massachusetts.

The definition of resilience is multifaceted and context dependent. A resilient transportation system can adapt to changing conditions over time, such as rising sea levels, higher tides, hotter temperatures, and extreme precipitation and winter storms. Transportation infrastructure may be designed to mitigate or lessen the impacts of disrupting events.

Resilience is also the capability for a transportation system to withstand and recover quickly from a disruption, such as a major equipment breakdown—crucial from an operational perspective. How rapidly a transportation system restores equitable access to services will affect users' ability to securely, comfortably, and effectively travel to their destinations.

These multifaceted components of resilience were reflected in *Beyond Mobility* public engagement feedback. Respondents described not only the various aspects of a resilient transportation network described above but also components that positively contribute to an individual's resilience (i.e., their ability to maintain their mobility despite the stresses and shocks to the environment around them). A non-resilient transportation system can negatively impact users and their well-being. For example, a non-resilient system may manifest as scorching bus stops without covered bus shelters on hot days or an inundated roadway that causes delays, inconveniences, and safety issues.



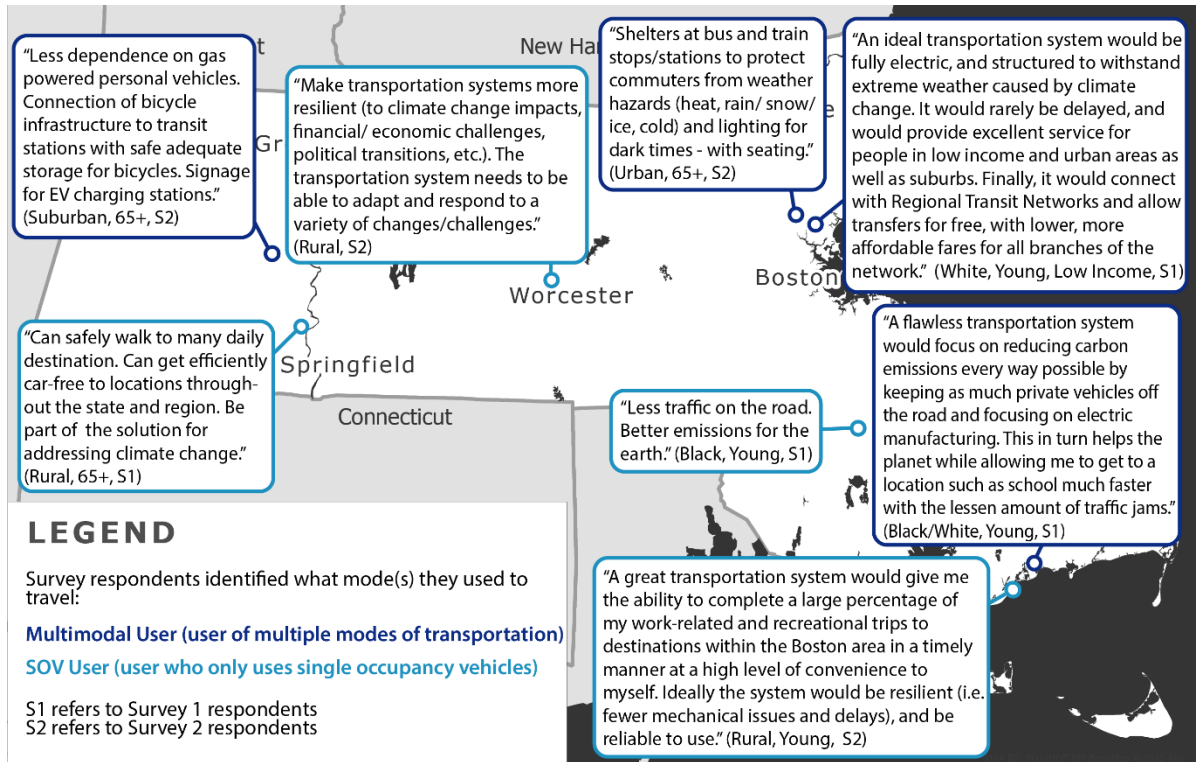
Who is Most Concerned about Resiliency?

As a part of the *Beyond Mobility* Phase I Vision, Values, & Needs Survey, respondents prioritized aspects of the transportation system to change or improve in their lifetime. A resilient transportation system supports many of the top priorities identified by survey respondents (Figure 3.18). For example, a resilient transportation system has network and mode redundancy to ensure connectivity and equitable transportation choices, even when one link is disrupted. It also means robust and adaptable infrastructure in good condition that provides a reliable and safe network for road users. Likewise, the resiliency of the system determines how quickly a roadway can be reopened to full capacity after a crash or heavy storm. Resiliency is the Priority Area that embodies elements of all others (safety, connectivity, travel experience, reliability, and clean transportation), unearthing the real priority amongst residents, which is to travel in spite of disruptions.

Environmental impact was ranked as one of the most pressing priorities, with 38 percent of all *Beyond Mobility* Phase I Vision, Values, & Needs Survey respondents and 34 percent of equity group respondents ranking it within the top four concerns. The essential importance of environmental impacts cuts across generations: 46 percent of respondents who selected environmental impact as a top priority were either under the age of 34 or over the age of 65. This is visualized in Figure 3.18, in which the most telling statements came from Massachusetts' youngest and oldest residents.

In *Beyond Mobility's* Phase II Priorities & Tradeoffs Survey, residents were asked to name qualities of a "flawless" transportation system; one-third of write-in responses expressed an environmentally focused answer. Figure 3.18 also shares examples of how Massachusetts residents view the transportation system as a conduit for achieving environmental goals. The quotes illustrate the pursuit of more resilient transportation despite extreme weather events, common weather hazards, and other unpredictable disruptions.

Figure 3.18 Visions of Resiliency of Respondents



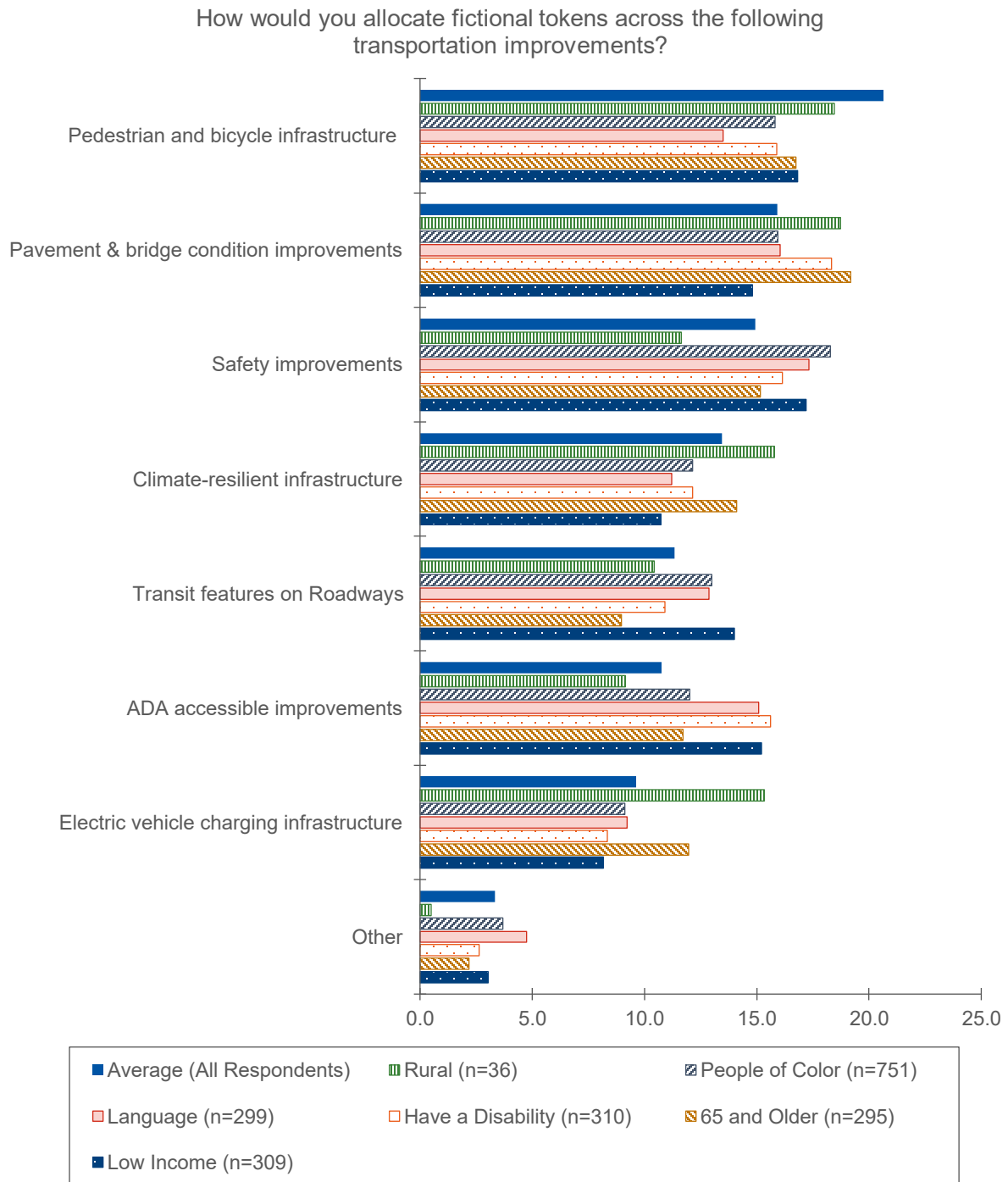
Existing Challenges: What Hinders Resiliency?

For the *Beyond Mobility* Phase II Priorities & Tradeoffs Survey, respondents allocated 100 tokens to various transportation system improvements, many centering on resiliency (Figure 3.19). Respondents’ investment choices illuminate the challenges residents face currently and where they see obstacles to a more resilient system.

All respondents invested significantly in pedestrian and bicycle infrastructure and pavement and bridge condition improvements, which indirectly support a resilient transportation network through increased connectivity, redundancy, and state of good repair. Climate-resilient infrastructure was the fourth-ranked improvement for all respondents, although rural and older (aged 65 and above) respondents invested more in resilient infrastructure than the average respondent. Respondents from rural communities allocated greater than 1.5 times more tokens for electric vehicle charging infrastructure than any other group. Low-income earners, non-native English speakers, and people of color were more likely to prioritize transit features on roadways and safety improvements.



Figure 3.19 Priority Roadway Improvements by Equity Group



N=2,543

Source: *Beyond Mobility Phase II Priorities & Tradeoffs Survey, Fall 2022.*



Within the “other” category, many respondents wrote answers about resilience challenges, such as “heat mitigation of roads and streets,” noting the urban heat island effect and pavement softening; “solar along public highways,” “electric buses,” and “hydrogen fuel,” perceiving a need for non-fossil fuel sources; and “wildlife crossings,” observing how transportation infrastructure can be detrimental to biodiversity and wildlife connectivity.

Many common transportation challenges Massachusetts residents face are exacerbated by the effects of climate change, extreme weather, and poor system resiliency. Quotes from respondents highlight some of these challenges below:

- **Unreliability, lack of connectivity, and inadequate transit services spurred by maintenance delays and inefficient land use patterns** may be aggravated by climate-related infrastructure and service disruptions. Residents feel the current transportation system is outdated, with maintenance often going uncommunicated or taking too long.
- **Concentrations of air and noise pollution caused by transportation and congestion** lead to an inequitable distribution of poor health outcomes and diminished neighborhood well-being, harming a community’s ability to be resilient and thrive. Residents convey their worries about inequitable outcomes for environmentally burdened communities.
- **Climate anxieties about personal and system-level climate change contributions** are increasing. Residents acknowledge their role in contributing to and remediating climate change, while also recognizing the role that the transportation system and other industries play.

Resiliency

“Allows me to get from point A to B in a fast, reliable, safe, and efficient manner. A system that doesn’t disrupt/segregate neighborhoods. A system that is carbon neutral and doesn’t contribute to climate change. Integration with smarter technology. Fast efficient repairs and service to infrastructure.” *(Urban, White, Young)*

Resiliency

“The neighborhood and city center on the other side of the huge highway that creates all kinds of noise and air pollution and cuts my neighborhood off and makes it dangerous and inconvenient to get to by foot or bike even though it is just blocks away.” *(Multimodal User, Black/White, Middle Aged)*

Resiliency

“Get us to where we need to, affordably, without polluting the air we breathe or increasing carbon emissions in the atmosphere thus accelerating climate change; meeting the needs of those that don’t have other alternatives for transport but the public system.” *(Rural, Vehicle Owner, Middle Aged)*



○ **Unaffordability and inequity in services**

mean that, for some, personal vehicles are an expensive or unobtainable transportation option. Some households are dependent on transit, walking, or bicycling, yet there is inequitable access to safe and comfortable active transportation networks or timely and dependable transit services. Residents with limited transportation options often experience disproportionate transportation costs, in terms of time, money, and health outcomes.

○ **People fear that climate change impacts will disable connections to people, places, and opportunities.**

A resilient transportation system provides safe, reliable, and equitable travel options across a robust and well-connected network. Conversely, if the transportation system is not resilient, communities may be isolated physically, socially, and economically by climate disruptions. Residents are fearful of service shutdowns caused by flooding, sea level rise, and extreme heat.

○ **Poor-quality roadways and reliance on personal motor vehicles** limit clean and climate-friendly transportation options. A perceived lack of robust, safe, and reliable options for transit, rail, and active transportation force people to drive personal vehicles, contributing to carbon emissions. System reliability is further threatened by infrastructure in poor condition or lacking capacity to handle 21st century hazards.

○ **Adequate drainage** on the Commonwealth’s highways was a problem highlighted by freight transportation providers and residents. Heavy rain that led to flooding in the summer and fall of 2023 exposed the magnitude of these problems when many roads throughout western and north central Massachusetts were forced to close and residents evacuated.

Resiliency

“Prioritizes multi-modal transportation, aims at reducing driving as primary mode of transportation, recognizes and acts on the urgency of stalling climate change.”
(Multimodal User, Suburban, White, Young)

Resiliency

“My priority would be to think LONG TERM. Much of our public transit in the Boston area could be affected by sea level rise and storm surge flooding. We have to make sure that new infrastructure doesn’t flood.” *(Meeting-in a-Box participant)*

Resiliency

“An ideal transportation system has cars in the equation but it is NOT centered around the private vehicle, and promotes sustainable options such as car sharing. The Commonwealth benefits from a fairly extensive heavy rail network that is rather unexploited, with slow diesel trains, running sparsely through the day. The demand is there for expanding rapid transit and buses, to enhance grade-separate bike lanes to solve the last-mile problem, and to pacify avenues that currently resemble freeways.”
(Multimodal User, Urban, White, Young)



Vision for a More Resilient Transportation System

Beyond Mobility survey respondents shared a vision for a more robust transportation system, one that leverages transportation as a way of developing a more resilient Massachusetts. These visions include:

- **A modern, cleaner, and more efficient transportation system** that focuses on reliably moving users despite disruptions from weather, construction, or delays. This system also reduces noise and air pollution by investing in zero-emission transit vehicles and providing increased frequency and speed of rail and bus services to match demand.
- Residents wish for the **prioritization of multimodal options including creating a more inviting environment for non-motorized travelers**. This includes universal and well-maintained bicycle and pedestrian infrastructure that is densely connected, protects from vehicles, and provides cover from sun and precipitation. Tree-lined streets, public toilets, and benches may boost comfort, provide refuge, and mitigate urban heat island effects.
- **Investment in climate preparedness and enhanced financial and social stewardship** are essential. Transportation agencies prioritizing investments today in adaptive and well-maintained infrastructure may save money, resources, and time in the future or during a disaster.
- There is **increased motivation to fight environmental injustice and improve the quality of life for all residents**. Investments in active transportation, public transportation, emissions and noise pollution reductions, and electrification may have great benefits for all Massachusetts residents, particularly residents who live in historically marginalized communities.

3.7 Travel Experience

Each time someone uses the transportation system, that trip is characterized by a set of impressions around comfort, usability, and ease. MassDOT conceives of this “travel experience” as similar to the idea of “user experience”; that is, it represents how someone who uses the transportation system interacts with the system or service. This term encompasses those features that make up a user’s impression and judgments.

These experiences differ depending on the environment in which the trip is taking place. As part of the *Beyond Mobility* public surveys and outreach process, residents across Massachusetts provided thousands of responses that offer insights into their transportation journeys. For many people, a high-quality travel experience centers on the core functions of a transportation system; people expressed a desire for travel that is low-stress and comfortable, which often entailed some combination of consistency, system ease, personal safety, and asset quality.

Who is Most Concerned about Travel Experience?

Across statewide survey efforts, respondents often identified issues related to their overall travel experience as top priorities for the transportation system. Around 33 percent of *Beyond Mobility* Phase I Vision, Values, & Needs Survey respondents noted that they valued “user experience,” representing the highest average of all respondents over any other category.



A focus on the user’s travel experience was particularly clear among respondents who identify as part of an equity population (Table 3.1). Individuals who identify as part of an equity population often rely on public transportation or own just one household vehicle, which may in part explain this emphasis. Table 3.1 highlights the qualities of the travel experience most important to various demographic groups. These characteristics were identified through qualitative coding of survey and focus group responses that asked respondents to describe components of their ideal future transportation system.

Table 3.1 Definition of Travel Experience by Community Group

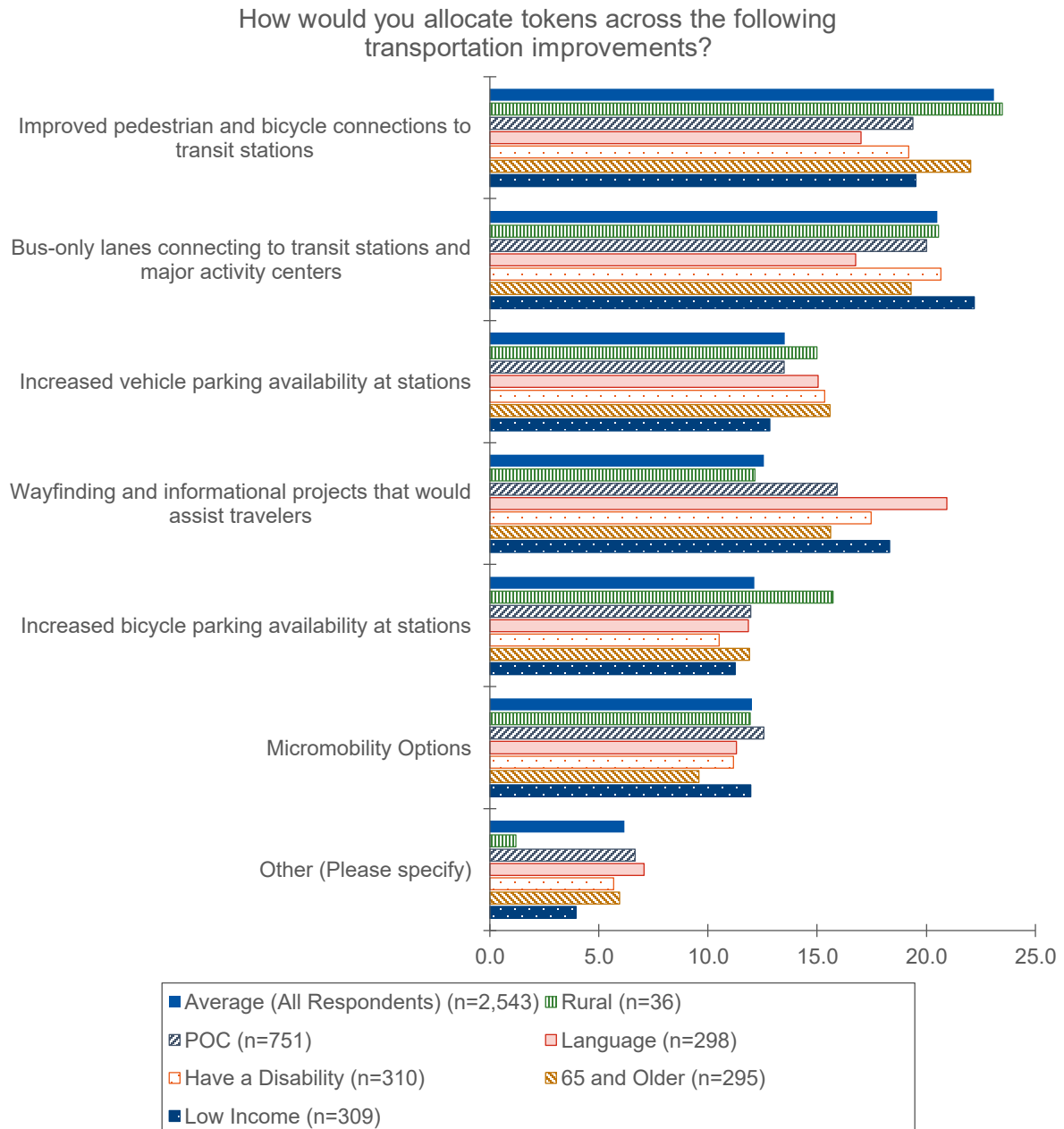
Low Income	Older (Aged 65 and Over)	People of Color	Rural Residents
Speedy, accessible, affordable, social	Clean, comfortable, modern, speedy	Low-stress, convenient, comfortable, safe	Comfortable, accessible, affordable, clean

Sources: *Beyond Mobility Phase I Vision, Values, & Needs Survey, Summer 2022, Beyond Mobility Phase II Priorities & Tradeoffs Survey, Fall 2022, Beyond Mobility Phase I Focus Groups, and Interviews, 2022.*

As indicated in Figure 3.20, lower-income respondents, respondents with disabilities, and limited English proficient (LEP) respondents prioritized wayfinding and traveler assistance projects in a survey question that asked respondents to rank various transportation agency activities. Notably, legibility of the system was the top response from LEP respondents and the second highest response for lower-income respondents, indicating that navigating and understanding the current system remains opaque for certain groups.



Figure 3.20 Transit Supportive Improvement Priorities by Equity Group



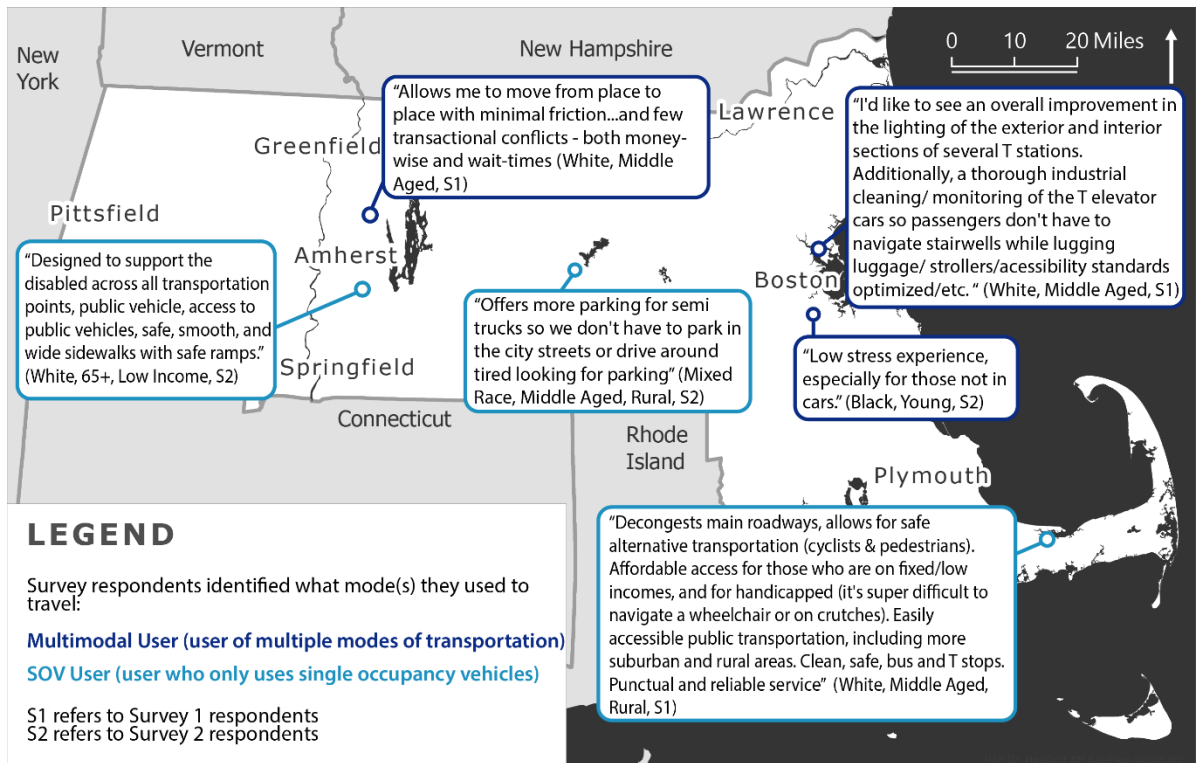
Source: Beyond Mobility Phase II Priorities & Tradeoffs Survey, Fall 2022.



Figure 3.21 offers examples of public feedback on travel experience across the Commonwealth. Respondents in urban areas tend to emphasize stressful commutes, outdated facilities, and unsafe multimodal options. Residents in rural and suburban areas were more concerned with poor roadway conditions, lack of affordable and direct transit services, and feelings of inaccessibility. The map also highlights the user mode, which is a particularly relevant characteristic in this Priority Area given the difference in travel experience in a vehicle versus transit.

Additionally, during Phase III of public engagement, members of the Herring Pond Wampanoag Tribe underscored the importance of indigenous cultural and historical assets and the effect that construction has on these assets. For instance, construction often encourages cut-through traffic, which puts wear and tear on culturally significant pathways, as does the siting of new infrastructure on these pathways. Tribal members encouraged MassDOT and other state agencies to consider indigenous cultural assets in their project development process, similar to environmental assessments or survey reviews.

Figure 3.21 Future Visions of Enhanced Travel Experiences





Existing Challenges: What Hinders Travel Experience?

Given the significant differences in mobility needs, transportation options, and transportation modes across Massachusetts, a high-quality travel experience may mean different things to different people. At the same time, there are some consistent threads across how people view travel experience despite coming from a range of backgrounds. Figure 3.22 highlights several key aspects that make up a high-quality travel experience: **mode choice**, **affordability**, **accessibility**, and **improved infrastructure**.

Figure 3.22 Travel Experience Public Engagement Themes

MODE CHOICE	AFFORDABILITY	ACCESSIBILITY	IMPROVED INFRASTRUCTURE
<p>“Alternative methods for the same route, in case your preferred method is halted by weather repairs, etc.” (White, 65+, Suburban)</p> <p>“Disincentivizing car travel. Reliable T timetables and trains...” (Asian/White, Young, Urban)</p> <p>“Lack of frequency makes transit connections difficult, hard to get outside of the city, difficult to connect between modes even on the same transit system, lack of micro mobility options compared to other states.” (White, Young, Low-Income, Urban)</p>	<p>“I have to drive everywhere. Traffic is awful, gas is expensive, car maintenance is expensive...Driving increases my exposure to cops, which is very unpleasant.” (White, Young, Urban)</p> <p>“When there is snow, a \$10 Uber turns into \$30. This can be very stressful. It would be nice to have something in place, like money for Uber, if you do not have your own vehicle.” (1-on-1 interview, Hatian-Creole)</p>	<p>“Outdated technology, unreliable, unsanitary and unsafe.” (Native American, Middle Aged, Suburban)</p> <p>“Need to connect small community shuttle services with larger community bus services so smaller town folk can get to hospitals, schools, businesses, etc.” (Meeting-in-a-Box)</p> <p>“EVERY bus accessible - not all buses are physically accessible and is very inconvenient... More handicap seating for buses with a hospital stop.” (Focus 40)</p>	<p>“Coming from China, there is a huge gap toward public transit quality. I did not have to drive until I moved here. Our subway back home was more comprehensive and newer with safety doors.” (1-on-1 interview, Mandarin)</p> <p>“The current freight options are antiquated, not cost effective and should be modernized...” (2018 <i>State Freight Plan</i>)</p> <p>“Start the planning from the pedestrian perspective.” (Meeting-in-a-Box)</p>

Source: *Beyond Mobility Phase I Focus Groups & Interviews, 2022, Beyond Mobility Phase I Vision, Values, & Needs Survey, Summer 2022, Beyond Mobility Phase II Priorities & Tradeoffs Survey, Fall 2022, Beyond Mobility Phase II Meeting-in-a-Box, and Massachusetts State Freight Plan, 2018.*

Based on this and other public input, key points for MassDOT to consider include:

- **Ease of trip planning** is an important component of the travel experience. People want to be able to depend on transit service, which involves easily legible and up-to-date timetables, a low chance of service disruptions or “ghost buses,”⁶ and the reliability of trip planning applications.

⁶ A “ghost bus” is a trip that exists on a GPS-based information system (such as Google Maps) but is not actually served.



Technological modernizations, such as advancements in fare payment systems, also make it easier to access transit.

- The ability to **understand and navigate the system** despite a language barrier or unfamiliarity. There is a need for more embedded system accessibility, such as clear communication methods, wayfinding and signage improvements, and onsite staff. Additionally, there is an apparent lack of information between modes of travel and accessing real-time travel information without the use of cellular data or Wi-Fi.
- Outdated, unwelcoming, and neglected **infrastructure maintenance** on public transit, Commuter Rail, roadways, and sidewalks contribute to a negative travel experience. There is a need for upgraded asset infrastructure, including well-maintained roadways, reliable vehicles, and clean facilities. Unreliable snow removal and wintertime maintenance also impede multimodal travel and make travel experiences unpleasant and dangerous.
- People desire a greater sense of **personal safety**. This is particularly critical for those who have experienced harassment on public transit or negative altercations on roadways. For example, safety features may include track guardrails, onsite customer service staff, enhanced exterior and interior lighting, and cleaner facilities. On roadways, personal safety refers to better-designed intersections, crossings, and lane exits.
- More overall transportation options and **options that are affordable** would improve the travel experience for many people.

Vision for a Better Travel Experience

- **Travel information services and wayfinding** mechanisms are accurate and accessible on all modes of transportation. Access to information is a primary customer amenity. *Beyond Mobility* respondents envision enhanced communications technology to inform customers of delays and changes promptly. They envision a system with consistent and accurate traveler information, clear and intuitive signage on public transit, and visual elements such as lane markings in bike lanes and roadways. These features make the system more understandable for all. Participants picture a more inclusive transportation system through adequate multilingual travel information and information readily accessible without using a smartphone or electronic device, sharing details about travel delays, construction, or emergencies.
- An **easy, stress-free travel experience** is a key component for many. This includes being able to reach key destinations quickly and affordably, at any time of day, and without a car; if one mode is out of service, another can be easily substituted. Many wish for redundancy and overlapping of transportation services to be able to reach any point in the state—knowing that wherever and whenever they travel, there will be a way to return home.

**Travel Experience—
Information**

“Better bus customer amenities (shelters, real-time information, customer signage, accessible).”
(Boston/South End, Transit Rider)



- People seek **safety** on all system facilities and all modes. On public transit, during non-peak hours, near isolated bus stops and stations, or while on the system, *Beyond Mobility* participants envision the implementation of more safety features (on-site staff, enhanced lighting, track guardrails, and additional technology) to help riders in case of an emergency. Travelers imagine a seamless transportation system with features that mitigate threats to personal safety, such as separated bicycle lanes that do not suddenly merge with traffic lanes, smooth sidewalks, prioritized traffic signaling, and lower speed limits.
- **High-quality and well-maintained transportation infrastructure** allows all system users to easily access and use transportation across the Commonwealth. *Beyond Mobility* respondents envision a transportation system with features such as continuous sidewalks, curb ramps, accessible platforms, and well-maintained roadways. Maintenance improvements and system-wide cleanings would enhance the travel experience for all users.

Travel Experience— Safety and Maintenance

“It’s an inconveniently long walk to get the T, and even then it’s the orange line which is questionably safe. When driving traffic is terrible, many intersections are terribly designed, long single lane exits that constantly back up, and road infrastructure that incentivizes poor behavior behind the wheel (i.e. never merging until the last possible second).” (Medford, SOV Driver)

“The quality of the roads throughout the state not only negatively impact time of travel, but the damage it does to vehicles and the risk for safety as well. Roads that have not been cared for, open up the potential for more crashes and could potentially cost towns/cities greater in the cost of repairs that just “band aid” the problem.” (Dalton, SOV Driver)

4.0 Priority Areas

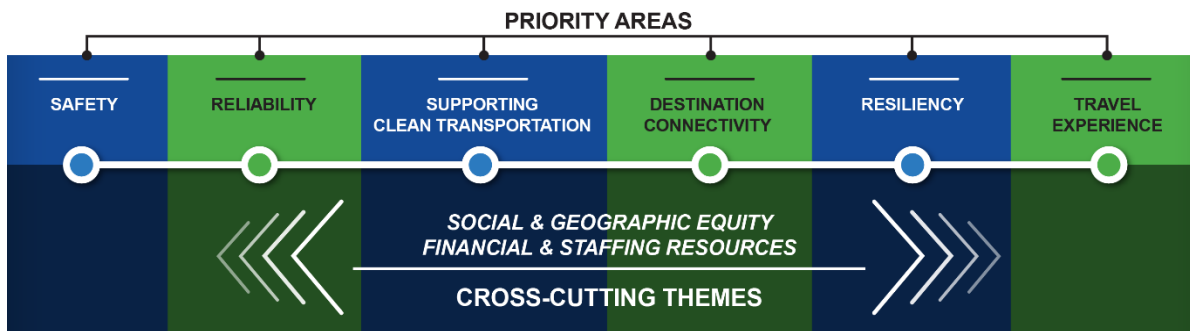
This chapter articulates the vision, values, and problem statements that define the six *Beyond Mobility* Priority Areas. The problem statements, based directly on public engagement feedback and needs assessment data) were used as the foundation for identifying subsequent *Beyond Mobility* Action Items for implementation in the areas of capital planning and programming, policy and program development, research, operations, and other categories across all MassDOT Divisions. These implementation Action Items, presented in Chapter 5, are designed to address the identified problems and make advancements toward each vision while remaining true to the values articulated.

The research and analysis performed as part of the *Beyond Mobility* planning process, including extensive public engagement, led to the identification of six key Priority Areas for MassDOT to focus on over the long term, including:

1. **Safety:** The ability of travelers to move throughout the transportation system free of physical or other harm.
2. **Reliability:** The consistency of transportation network conditions.
3. **Supporting Clean Transportation:** The transportation network’s ability to accommodate low-emission and carbon-free travel modes.
4. **Destination Connectivity:** The degree to which travelers of any mode can access opportunities and the places they need or want to go.
5. **Resiliency:** The ability of the transportation network to anticipate, prepare for, and withstand the ongoing impacts of climate change.
6. **Travel Experience:** The conditions faced by travelers throughout the transportation network, including level of comfort and state of good repair.

Social and Geographic Equity and **Financial and Staffing Resources** are “cross-cutting themes” that connect across all six Priority Areas, as shown in Figure 4.1.

Figure 4.1 Beyond Mobility Priority Areas and Cross-Cutting Themes





Each Priority Area consists of MassDOT’s vision for the future, values to uphold in pursuit of that vision, and Problem Statements describing today’s challenges. The Priority Area visions and values are informed by and respond to the Problem Statements, which were initially developed from a review of data outputs drawn from public and stakeholder feedback, and a needs analysis of existing and future conditions, both site-specific and systemwide. Evidence supporting each Problem Statement is included in this section as “key facts.” Data used to support the development of the key facts include:

- Public engagement findings from multilingual, multicultural focus groups and interviews, Meeting-in-a-Box focus groups with older adults and people with disabilities, a virtual public meeting, and two public surveys with a combined set of over 5,000 responses.
- Analysis performed as part of the *Beyond Mobility* Needs Assessment, which has involved applying “equity checks” to key transportation need indicators.
- Two vision and values workshops with key MassDOT and MBTA stakeholders.
- Interviews with key MassDOT stakeholders.
- A synthesis of public engagement findings from prior MassDOT plans.
- Previous planning and research efforts throughout Massachusetts.
- USDOT and Commonwealth of Massachusetts priority areas.

As noted, *Beyond Mobility* Action Items that respond to each Problem Statement and reflect Priority Area visions and values are introduced in Chapter 5.

Cross-Cutting Theme #1: Social & Geographic Equity

Equity can be challenging to define. Official definitions reported by Federal and State agencies are sometimes inconsistent with the data and measures used to evaluate the concept. The range of considerations included in any thorough study of equity exceeds any singular phrase or value.

For MassDOT transportation professionals, equity broadly refers to the critical need to ensure that people, communities, and lived experiences are prioritized in MassDOT’s work, and to recognize that this has not always been the case, especially for specific groups of people and communities.

**ENVIRONMENTAL
JUSTICE COMMUNITIES
HAVE 18.4 TIMES
MORE ROAD MILES AT
HIGH RISK FOR
PEDESTRIAN CRASHES
AND 13.7 TIMES
MORE ROADWAY MILES AT
HIGH RISK FOR
BICYCLE CRASHES
THAN ALL OTHER
COMMUNITIES**



**REGIONAL TRANSIT
AUTHORITIES PROVIDE
LIMITED SERVICE IN THE
EVENING AND ON
WEEKENDS, MAKING IT
AN UNRELIABLE OPTION
FOR SECOND AND
THIRD-SHIFT WORKERS**

This history has generated significant inconsistencies in how people in different communities are affected by and able to benefit from the Commonwealth’s transportation system. There are myriad cases in which particular people and communities have been routinely and disproportionately burdened by the effects of unsafe roadway conditions, exposed to transportation-related greenhouse gas emissions, or left out of the benefits bestowed by transportation network improvements. Key facts and statistics that identify and highlight these equity issues are detailed throughout *Beyond Mobility*.

MassDOT is committed to advancing equity and mobility justice for all users of the transportation system; accordingly, social and geographic equity is more than a stand-alone Priority Area. Rather, it is a cross-cutting theme and systemic element in all of MassDOT’s work. Accounting for equity must be a standard operating feature of every policy and strategy that MassDOT is involved in. Beginning with the planning and policy development process, MassDOT leaders and the entire workforce must engage community members and organizations in meaningful ways that allow for substantive understanding and conversations about the needs and challenges facing people as they move about the Commonwealth and the communities that the transportation system connects.

A commitment to equity means doing more than simply holding public meetings or town halls. It requires regularly going into communities to talk to people and stakeholders where they live, work, shop, and move about. It also means doing more than meeting minimum contracting thresholds for disadvantaged and women-owned businesses, and instead looking into MassDOT policies to seek out ways to encourage participation. Equity also means going beyond simple mapping exercises to understand potential project impacts to execute full-scale analyses into travel behaviors, access to critical destinations, and public health and environmental impacts.

Beyond Mobility takes equity and the social impact of MassDOT’s work very seriously. A thorough Public Engagement Plan was developed as part of the Plan, which prioritizes historically underserved communities, such as non-English speakers, lower-income residents, tribal organizations, and youth. Through the planning process, MassDOT activated street teams, held multicultural and multilingual focus groups and interviews, launched two public surveys with over 3,600 responses, held stakeholder focus groups and visioning workshops, and deployed innovative strategies like Meeting-in-a-Box interactions to ensure engagement and representation from a wide range of stakeholders. A summary of the public outreach findings is included in Chapter 3.

**ACROSS THE STATE,
A TOTAL OF
1,530
AFFORDABLE
HOUSING UNITS ARE
EXPOSED TO COASTAL
FLOODING RISKS**

Problem Statements and key facts with data analysis results referencing Environmental Justice communities were developed using a data layer called “Regional Environmental Justice Plus” or “REJ+”. These criteria extend the traditional definitions of Environmental Justice communities (areas with larger populations of low-income, limited English proficiency, and/or residents of color) and Title VI communities beyond race, ethnicity, and income to include others particularly vulnerable to changes in the transportation network, including people over the age of 65, people with disabilities,



and people without access to personal vehicles. Many of the problem statements and key facts that were compiled for *Beyond Mobility* can be found in the sections below within this chapter. Additional details about this approach analyzing equity are included in Chapter 2 and Appendix C.

Cross-Cutting Theme #2: Financial & Staffing Resources

In addition to social and geographic equity, the availability of financial and staffing resources underlies all MassDOT's work. Identifying the key challenges facing the transportation system and outlining MassDOT's vision for the future are important steps. However, in the absence of required staffing capacity and funding, these add up to little more than words on a page. To be successful, MassDOT must leverage and potentially seek out additional funding resources to ensure that ongoing maintenance needs are met and that appropriate system expansions and upgrades are realized. Additionally, MassDOT needs an expanded workforce and strong organizational structure to ensure resiliency and responsiveness to the recurring and sometimes unexpected challenges faced.

Financial Resources

As a public agency, MassDOT relies on funding provided through formula and discretionary means from both the State and Federal governments to follow through on agency goals. While not the only factor, the degree to which MassDOT can successfully meet the *Beyond Mobility* vision is directly reflective of the amount of money that is dedicated to various funding programs and the flexibility of how that funding can be used.

**MASSACHUSETTS'
TRANSPORTATION
REVENUES
ACROSS ALL SOURCES ARE
PROJECTED TO INCREASE
FROM \$7.2 BILLION IN 2022 TO
\$10.2 BILLION IN 2050**

Most MassDOT funding is dedicated to specific purposes, including granular elements of the transportation network's capital infrastructure. However, during the development of *Beyond Mobility*, MassDOT staff have reported particularly insufficient Federal and State funding for rail and transit needs, which leads to funding shortfalls in areas required to maintain a consistent level of service on passenger and freight railways in the state. For example, the MBTA is under pressure to deliver new projects even as it struggles to maintain the system in a

state of good repair, which would better facilitate reliability. It has therefore become important to document project types that enhance both operational efficiency and reliability.

Chapter 7 explores anticipated future resources in more detail. Also, with respect to funding, at the time of the development of *Beyond Mobility*, the Healy-Driscoll Administration announced the creation of a new Transportation Funding Task Force. This Task Force will be composed of public and private-sector leaders, representing communities of all sizes across Massachusetts, who will examine the state's transportation system and develop a toolkit that builds on the *Beyond Mobility* plan to document steps Massachusetts' RTAs face similar financial challenges, as well. needed to implement the next generation of transportation investments in Massachusetts.



Staffing Resources

Over 3,000 employees work at MassDOT, including but not limited to office and administrative workers, bus drivers, civil engineers, highway designers, skilled technicians, transportation planners, and laborers. MassDOT's greatest asset is its people, and as an organization, MassDOT should be structured in a way to fully leverage this resource. This includes establishing effective hiring practices as well as processes for knowledge sharing, transfer, and succession planning.

In the development of *Beyond Mobility*, several challenges concerning MassDOT's current organizational capacity were identified. For example, staff attraction and retention are major challenges, especially given the extent of competition from the private sector for talent and the cost of living and housing in Massachusetts. Staffing constraints mean MassDOT is not able to fully execute its mission or position as the lead agency in the state on transportation issues. For example, despite frequent requests, there are limited resources for providing training and technical assistance to partner agencies and municipalities.

Additionally, although MassDOT and its partner agencies are faced with financial challenges and constraints related to funding flexibility, there has been an unprecedented infusion of Federal funding from the Federal *Bipartisan Infrastructure Law* (BIL), which passed in the fall of 2021. To be in a position to maximize the use of these funds, MassDOT will need to grow its workforce to ensure existing organizational capacity is in place in the proper areas to develop new projects and leverage new funding opportunities.

MassDOT's workforce will also need to adapt to emerging research, maintenance, and other needs around new transportation technologies. For example, decarbonization of transit will require new training for maintenance staff, and may require more zero-emission transit vehicles to provide the same amount of service. The Registry of Motor Vehicles (RMV) also recognizes the potential for major changes to the nature of its work in the future, including through e-licensure and its role in data quality and protection. The Highway Division is still studying the implications of automated vehicles on maintaining roadway safety and licensure/permitting. Finally, the use and application of novel technologies such as aerial unmanned aircraft and urban air mobility will require significant investment and resources, as well as buy-in across the agency.

The Aeronautics Division is implementing the use and application of novel technologies such as aerial unmanned aircraft and Advanced Air Mobility (AAM), including electric vertical takeoff and landing (eVTOL) aircraft that can alleviate traffic congestion, reduce greenhouse gas emissions, and substantially reduce travel time between rural communities and urban centers to improve commuting and access to key social services. This will require investment and human resources, as well as a comprehensive analysis on how these technologies complement existing transportation networks.

THE INFRASTRUCTURE INVESTMENT AND JOBS ACT PROVIDED \$550 BILLION IN NEW TRANSPORTATION INFRASTRUCTURE FUNDING, INCLUDING A 40% INCREASE IN TRANSIT FUNDING



Priority Areas

The next six subsections describe the **Safety, Reliability, Supporting Clean Transportation, Destination Connectivity, Resiliency, and Travel Experience** Priority Areas in detail. Each Priority Area includes the following:

- **Vision statement:** A future-looking description of the progress and achievements MassDOT will make in each Priority Area.
- **Values statements:** The principles that MassDOT will uphold in pursuit of the stated vision.
- **Problem Statements:** Major issues, challenges, and obstacles that Massachusetts travelers presently face related to each Priority Area.
- **Key facts:** Statistics, outreach findings, and trends supporting Problem Statements.

This information serves as the basis for the Action Items (defined in Chapter 5), which describe in more detail the work MassDOT and its partner agencies must do to achieve the vision statements and address the problems described below. Chapter 6 contains performance measures that can evaluate progress toward system-level goals informed by the vision statements, values, problems, and key facts. Finally, Chapter 7 summarizes funding resources available over the plan horizon that can be leveraged and potentially re-prioritized to address these issues.



4.2 Safety



VISION

By 2050, Massachusetts will have made significant progress toward advancing a future without transportation-related serious injuries and fatalities and will have eliminated the disparity in crash rates between Environmental Justice communities and all other groups. Residents will experience no infrastructure-related safety risks when walking, bicycling, rolling, driving, and riding transit within any community in Massachusetts.



VALUES

- MassDOT is committed to addressing safety risks through a **human-centered lens and a Safe System Approach**.
- MassDOT is committed to moving toward a future with zero roadway fatalities and serious injuries statewide in line with the “**Vision Zero**” initiative.
- MassDOT is committed to helping realize **safer speeds** across the Commonwealth to prevent serious crashes.
- MassDOT is committed to promoting **transit safety** through coordinating with transit providers on safety initiatives, rail transit operations, capital project delivery, and other activities.



PROBLEM STATEMENTS

- Environmental Justice (EJ) Communities—areas with larger populations of low income, limited English proficiency, and/or residents of color—are disproportionately burdened by transportation-related injuries and deaths on roadways, particularly those involving pedestrians and people on bicycles.
- Massachusetts traffic fatalities and fatality rates rose between 2019 and 2022, but have since begun trending downward.
- Users of active transportation modes like pedestrians and cyclists often experience unsafe, low-comfort, and disconnected facilities, especially in Gateway Cities and rural areas.
- Residents perceive an unsafe environment on public transportation due to a combination of high-profile crashes and other safety events, as well as personal experience.
- There is limited safety-related knowledge or guidance on certain issue areas, like drivers’ education in autonomous vehicles, the application of unmanned aerial systems for improved safety outcomes, or the impacts of limited cellular service on emergency responsiveness or real-time transit vehicle tracking.

41%
**OF ALL PEDESTRIAN
 FATAL AND SERIOUS
 INJURY CRASHES OCCUR
 WITHIN 300 FEET OF A
 BUS STOP¹⁰**

136
**OUT OF THE TOP 200
 STATEWIDE INTERSECTION
 CRASH LOCATIONS ARE IN
 ENVIRONMENTAL JUSTICE
 COMMUNITIES¹⁴**

56%
**OF FATAL PEDESTRIAN
 CRASHES TOOK PLACE IN
 ENVIRONMENTAL JUSTICE
 COMMUNITIES⁸**

142
**OUT OF THE TOP 200
 STATEWIDE PEDESTRIAN
 CRASH LOCATIONS ARE IN
 ENVIRONMENTAL JUSTICE
 COMMUNITIES¹⁴**

Key Facts

PROBLEM STATEMENT 1: Environmental Justice (EJ) Communities—areas with larger populations of low income, limited English proficiency, and/or residents of color—are disproportionately burdened by transportation-related injuries and deaths on roadways, particularly those involving pedestrians and people on bicycles.

Between 2017 and 2019, Environmental Justice communities had 1.72 times more pedestrian crashes per capita, 7.08 times higher pedestrian crash cluster area per capita, and 1.25 times higher fatal/serious crash rate per capita than all other communities (Figure 4.2 and Figure 4.3).⁷

In 2022, 56 percent of fatal pedestrian crashes took place in Environmental Justice communities.⁸

Environmental Justice communities have 18.4 times more roadway miles at high risk for pedestrian crashes and 13.7 times more roadway miles at high risk for bicycle crashes than all other communities. Rural communities have 2.61 times higher percentage of roadway miles at high risk for lane departure crashes (Figure 4.4).⁹

Although less than six percent of all roadway lane miles in Massachusetts are within 300 feet of a bus stop, over 40 percent of all pedestrian fatal and serious injuries occur within 300 feet of a bus stop. In the MBTA catchment area, 50 percent of all pedestrian fatal and serious injuries occur within 300 feet of an MBTA bus stop, yet less than 16 percent of the lane miles in the MBTA catchment area are within 300 feet of a bus stop.¹⁰

From 2016 to 2020, Black (non-Hispanic) people experienced non-fatal pedestrian injury rates (12.7 hospital stays per 100,000 residents) at nearly three times the rate as white (non-Hispanic) people (4.6 hospital stays per 100,000 residents) and Hispanic people at nearly two times the rate (7.6 hospital stays per 100,000 residents).¹¹

⁷ MassDOT Crash Inventory, GeoDOT, 2017–2019.

⁸ MassDOT Crash Inventory, GeoDOT, 2020–2022.

⁹ MassDOT Crash Inventory, Network Screening Risk Based, 2013–2017.

¹⁰ MassDOT Vulnerable Road User Safety Assessment, 2023.
<https://storymaps.arcgis.com/stories/8b36ed2f1f3749b7ac085c0ca5b8efa7>.

¹¹ MassDOT FFY 2023 Massachusetts Highway Safety Plan <https://www.mass.gov/info-details/strategic-highway-safety-plan>



PROBLEM STATEMENT 2: Massachusetts traffic fatalities and fatality rates rose between 2019 and 2022, but have since begun trending downward.

Crashes involving speeding, lane departures, older drivers, and impaired driving are leading to consistently higher traffic fatalities and serious injuries.¹² Crashes at intersections have consistently caused more serious injuries than crashes not at intersections.¹³

Approximately 68 percent of the top 200 statewide intersection crash locations and 71 percent of the top pedestrian crash locations are in Environmental Justice communities.¹⁴

Since 2017, 60 percent of fatalities along Massachusetts roadways took place on principal or minor arterials.¹⁵

Out of the 1,272 at-grade rail crossings in Massachusetts, 135 are “unprotected passive crossings,” meaning there are no lights or gates to indicate the rail crossing.¹⁶

PROBLEM STATEMENT 3: Users of active transportation modes, namely walking and bicycling, often experience unsafe, low-comfort, and disconnected facilities, especially in Gateway Cities and rural areas.

Residents perceive an unsafe environment for people walking, using wheelchairs, and bicycling, including concerns with aggressive drivers and lack of personal space and security. 47 percent of people who use bicycles and 40 percent of pedestrians expressed safety as an element to be improved in the transportation system.¹⁷

Non-motorist intersection crashes are over-represented on state-owned roadways. Between 2016 and 2020, 30 percent of pedestrian and 20 percent of bicyclist crashes at intersections occurred at state-owned intersections, despite only 14 percent of intersections being under state ownership.¹⁸

A recent MassINC poll reported that 34 percent of respondents felt ‘somewhat unsafe’ or ‘very unsafe’ when riding a bicycle in Massachusetts; just 9 percent of respondents indicated they felt ‘very safe’ on a bicycle. Those that felt somewhat or very unsafe reported that reckless or speeding drivers, drivers distracted by their phones, and lack of bike lanes on streets were the most frequent reasons why they felt this way.¹⁹

¹² MassDOT FFY 2023 Massachusetts Highway Safety Plan <https://www.mass.gov/doc/ffy-2023-massachusetts-highway-safetyplan/download#:~:text=The%20FFY%202023%20HSP%20program,within%20each%20respective%20program%20area>.

¹³ *Ibid.*

¹⁴ *Ibid.*

¹⁵ *Ibid.*

¹⁶ MassDOT Massachusetts State Rail Plan, 2018, <https://www.mass.gov/doc/final-state-rail-plan-spring-2018/download>.

¹⁷ Beyond Mobility Phase I Vision, Values, & Needs Survey, Summer 2022.

¹⁸ MassDOT Vulnerable Road User Safety Assessment, 2023. <https://storymaps.arcgis.com/stories/8b36ed2f1f3749b7ac085c0ca5b8efa7>

¹⁹ MassINC Polling Group, 2023. <https://static1.squarespace.com/static/5eb9fa2f8ac4df11937f6a49/t/65551a42e0ee542a089342e8/1700076100123/Topline+2023+11+Barr+Transportation.pdf>.



PROBLEM STATEMENT 4: Residents perceive an unsafe environment on public transportation due to a combination of high-profile crashes and other safety events, as well as personal experience.

39 percent of all respondents and 41 percent of transit rider respondents indicated that they would like to see safety improved or changed within the transportation system.²⁰ Mandarin-speaking and Vietnamese-speaking focus group participants also commented on the rise of anti-Asian hate crimes on transit, which has led to perceived safety concerns and avoidance of using public transportation.²¹

Using data from the MBTA and RTA Public Transportation Agency Safety Plans published between 2019 and 2023, there were roughly 1.4 fatalities on all transit modes statewide per year. On average, there are approximately 586.4 injuries on all transit modes statewide per year, of which 584 occur on the MBTA and 2.4 occur at RTAs. On average, there are 177.7 safety events each year, of which 174 occur at the MBTA and 3.7 occur at the RTAs.²²

In 2021 and 2022, the MBTA experienced several safety events resulting from deferred maintenance of assets in a poor state of repair, including six mainline derailments in 2021 (related to track, switches, and/or vehicle conditions); accidents on escalators and station facilities in poor condition; and safety events stemming from disabled trains, defective switches, and damaged equipment.²³

A recent MassINC poll reported that respondents who indicated feeling unsafe or very unsafe on public transit (inclusive of the MBTA and RTAs) primarily had concerns about crime or violence, overcrowding, and old or broken vehicles, stations, or platforms.²⁴

PROBLEM STATEMENT 5: There is limited safety-related knowledge or guidance on certain issue areas, like drivers' education in autonomous vehicles, the application of unmanned aerial systems for improved safety outcomes, or the impacts of limited cellular service on emergency responsiveness or real-time transit vehicle tracking.

More research is needed into the safety of new technologies (e.g., connected and autonomous vehicles).²⁵

There is a need for more safety awareness and education, including a need for sharing information on topics like driver awareness of people on bicycles, speeding, and safe bicycle riding practices, among others.²⁶

Inconsistent cellular service in rural areas results in slow emergency response times and more severe crash outcomes.²⁷

²⁰ Beyond Mobility Phase I Vision, Values, & Needs Survey, Summer 2022.

²¹ Beyond Mobility Multilingual and Multicultural Focus Groups and Interviews, 2022.

²² MassDOT Tracker, 2022, <https://www.massdottracker.com/wp/>; MBTA Transit Safety Performance Targets 2022 Update.

²³ Federal Transit Administration (FTA) Safety Management Inspection of the MBTA and Department of Public Utilities, 2022, https://www.transit.dot.gov/sites/fta.dot.gov/files/2022-08/FTA-Safety-Management-Inspection-Report-for-MBTA-and-DPU_0.pdf.

²⁴ MassINC Polling Group, 2023. <https://static1.squarespace.com/static/5eb9fa2f8ac4df11937f6a49/t/65551a42e0ee542a089342e8/1700076100123/Topline+2023+11+Barr+Transportation.pdf>.

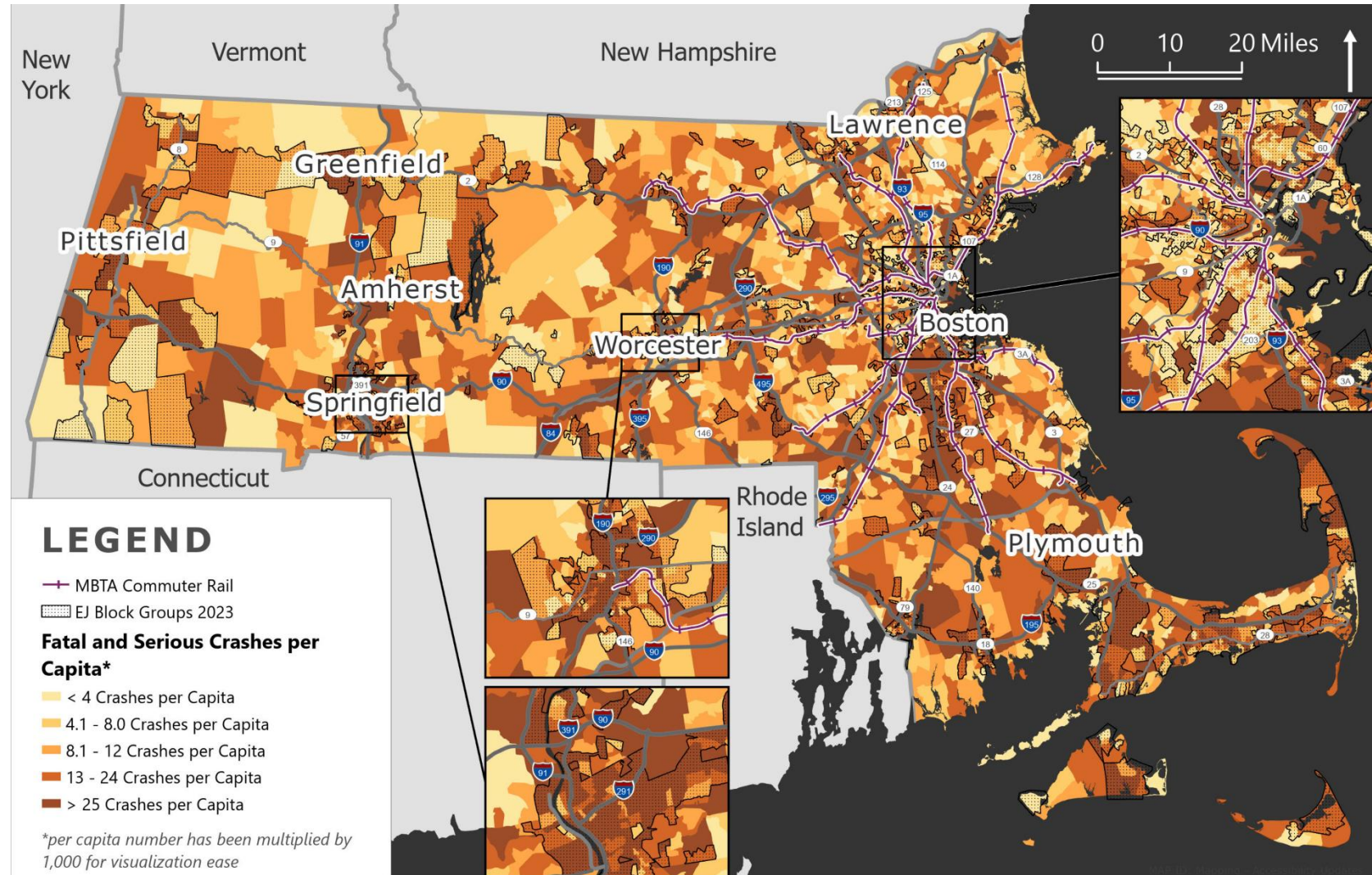
²⁵ Beyond Mobility Gap Analysis—Aeronautics, 2022.

²⁶ Beyond Mobility Gap Analysis—RMV, 2022.

²⁷ Beyond Mobility Vision/Values Workshop, 2022.

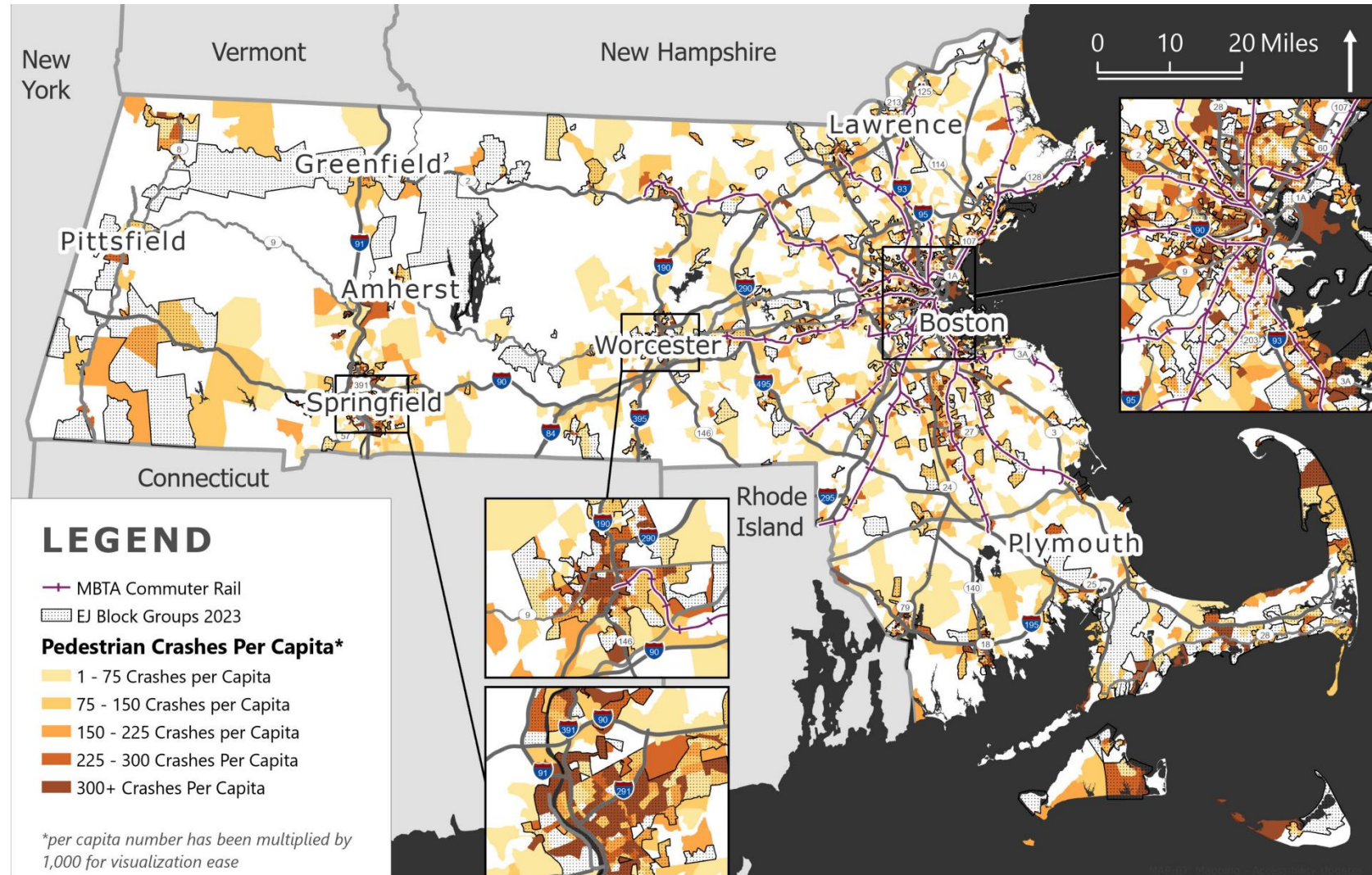


Figure 4.2 Fatal and Serious Injury Crashes (2017–2019) and Environmental Justice Communities



Source: 2016–2020 5-Year ACS, MassDOT Crash Data 2017-2019.

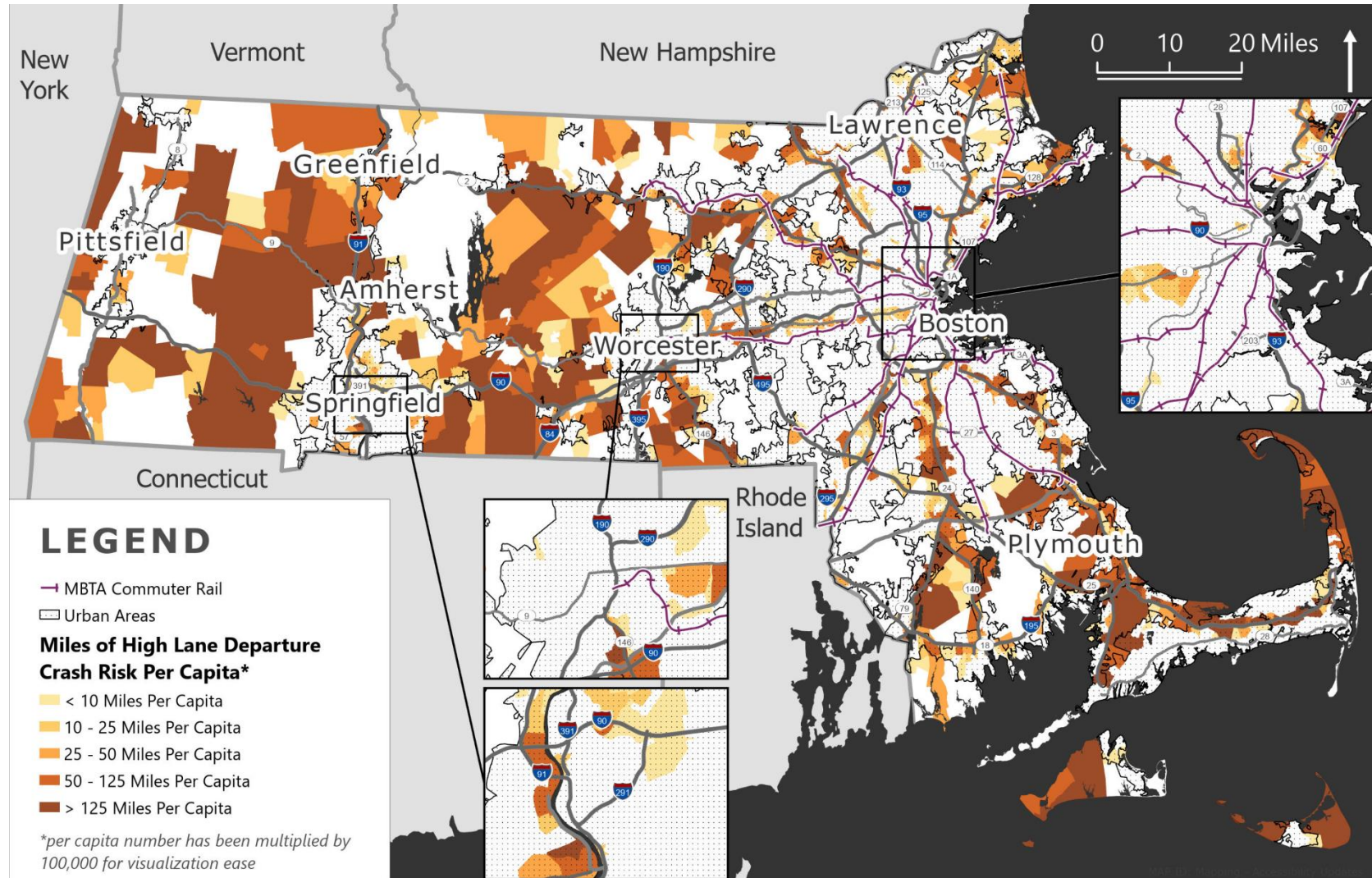
Figure 4.3 Pedestrian Crashes per Capita (2017–2019) and Environmental Justice Communities



Source: 2016–2020 5-Year ACS, MassDOT Crash Data 2017-2019.



Figure 4.4 Roadway Miles at High Risk for Lane Departure per Capita, Urban versus Rural



Source: 2016–2020 5-Year ACS, MassDOT IMPACT Roadway Departure Safety Risk MPO Ranking 2013-2017.



4.3 Reliability



VISION

By 2050, people traveling by any mode or for any trip purpose in Massachusetts will be able to expect consistent travel times at any time of day.



VALUES

- MassDOT is committed to **prioritizing reduced car travel** and reliance on single-occupancy vehicles as the priority strategy for reducing the recurring congestion that contributes to unreliable travel times.
- MassDOT is committed to ensuring that travelers can expect **consistency and dependability in travel times** for all modes and at all times of day.
- MassDOT **does not believe in roadway expansion** as a means to reduce congestion.



PROBLEM STATEMENTS

- Massachusetts travelers by any mode experience congestion and travel delay, resulting in low confidence about the conditions they will encounter and diminished access to everyday needs.
- Roadway congestion diminishes the reliability of public transit bus service, limiting its attractiveness and competitiveness.
- Congestion and freight bottlenecks impact the efficient movement of goods, which drives up labor costs, lowers capital productivity, and often results in higher costs for households and businesses.



DURING PEAK TRAVEL TIMES, TRIPS ON ROADWAYS ACROSS THE COMMONWEALTH CAN TAKE BETWEEN 2.5 AND 8 TIMES LONGER THAN OFF-PEAK, FREE-FLOWING TRAFFIC CONDITIONS³²

WITHIN THE MBTA SERVICE AREA IN 2022: BUS RELIABILITY WAS 70%, COMMUTER RAIL RELIABILITY WAS 91%, AND SUBWAY RELIABILITY WAS 87%³⁶

Key Facts

PROBLEM STATEMENT 1: Massachusetts travelers by any mode experience congestion and travel delay, resulting in low confidence about the conditions they will encounter and diminished access to everyday needs.

People find transit travel times are unpredictable and take significantly longer compared to other travel options.²⁸ Around 28 percent of survey respondents cited delays, unpredictable schedules, and/or lack of reliability in mass transit as a challenge they currently face when trying to get around the Commonwealth.²⁹

The availability of active transportation infrastructure varies by season due to inconsistent snow removal practices.³⁰

For much of Greater Boston, there is high variability in travel times, especially during commuter peak periods. During peak times, trips on many key roadways can take more than three times as long as under free-flowing traffic conditions. Additionally, weekday travel times on key Greater Boston corridors have generally returned to, or in some cases, surpassed pre-pandemic conditions.³¹

People traveling via roadways across the Commonwealth must consistently plan for at least 2.5 times longer than off-peak travel times. They must be prepared for the possibility of their commute taking up to 8 times longer than free-flowing traffic conditions during the most vital daily travel times. This finding is supported by calculations showing that the average planning time index (PTI) is above 2.5 for all of the top 20 most congested corridors in the state between 5 AM and 7 AM, with some corridors averaging over 8 PTI during AM peak periods and 7 during PM peak periods.³²

Several major commuter corridors in the Boston MPO region have average PTIs above 3.5, making it the most consistently and intensely congested region in Massachusetts. Other MPO regions, such as Cape Cod and Central Massachusetts, also contain corridors whose average PTI exceeds 2, illustrating that congestion and travel time variability extend far beyond the Boston region.³³

Only six percent of major commuter corridors in the state have a planning time index below or equal to one, meaning commuters across all regions are forced to plan travel time in excess of free flow conditions at any given point during the day.³⁴

Schedules between different transit agencies and/or different transit modes do not always align, and on time performance among the RTAs is unknown because of limited data availability and reporting.³⁵

PROBLEM STATEMENT 2: Roadway congestion diminishes the reliability of public transit bus service, limiting its attractiveness and competitiveness.

²⁸ The Governors Commission on the Future of Transportation, A Vision for the Future of Massachusetts' RTAs, 2019, <https://www.mass.gov/doc/a-vision-for-the-future-of-massachusetts-regional-transit-authorities/download>.

²⁹ Beyond Mobility Phase I Vision, Values, & Needs Survey, Summer 2022.

³⁰ Beyond Mobility Vision/Values Workshop, 2023.

³¹ MassDOT Monthly Traffic Reports, 2022.

³² Beyond Mobility Needs Assessment Reliability Analysis, 2023.

³³ *Ibid.*

³⁴ *Ibid.*

³⁵ Beyond Mobility Vision/Values Workshop, 2023.



In the MBTA service area, bus reliability is 70.68 percent, Commuter Rail reliability is 91.70 percent (according to schedule adherence), and subway reliability is 87.31 percent (according to passenger wait time) in 2022 across peak and off-peak travel times.³⁶

Unreliable travel times affect the perceived quality of buses and paratransit services and disincentivize their use.³⁷

A lack of enforcement of bus-only lanes leads to increased congestion and less reliability for bus riders.³⁸

PROBLEM STATEMENT 3: Congestion and freight bottlenecks impact the efficient movement of goods, which drives up labor costs, lowers capital productivity, and often results in higher costs for households and businesses.

Congestion and bottlenecks impact the efficient movement of goods. A MassDOT analysis of highway bottlenecks in 2022 identified 17 bottleneck locations, including one, I-93 at Route 3 (the Braintree Split), being identified by the American Transportation Research Institute (ATRI) as 99th of the top 100 truck bottlenecks in the US (I-93 and MA-3).³⁹

Truck parking shortages have safety and reliability implications. The MassDOT *Freight Plan* indicates that truck parking on service plazas along I-90 is particularly overcrowded.⁴⁰

Unprecedented growth in Boston’s Seaport District has led to increased traffic congestion and conflicts between commercial and passenger traffic that continue to threaten truck access to Conley Terminal.⁴¹

³⁶ Massachusetts Bay Transportation Authority (MBTA) Performance Dashboard, 2023 <https://mbtabackontrack.com/performance/#/home>.

³⁷ Beyond Mobility Vision/Values Workshop, 2023.

³⁸ *Ibid.*

³⁹ MassDOT Freight Plan, 2023, <https://www.mass.gov/doc/2023-massachusetts-freight-plan/download>; American Transportation Research Institute Top 100 Truck Bottlenecks, 2023, <https://truckingresearch.org/2023/02/07/top-100-truck-bottlenecks-2023/>.

⁴⁰ MassDOT Freight Plan, 2023, <https://www.mass.gov/doc/2023-massachusetts-freight-plan/download>.

⁴¹ MassDOT Freight Plan, 2023, <https://www.mass.gov/doc/2023-massachusetts-freight-plan/download>.



4.4 Supporting Clean Transportation



VISION

By 2050, MassDOT will have made significant progress in electrifying public transit and investing in other low or no-emission technology, strategically leveraged assets to address critical electric vehicle charging infrastructure gaps, and made investments in infrastructure and initiatives to promote significantly more trips using carbon-free modes such as walking and bicycling.



VALUES

- MassDOT will be intentional about **investing in carbon-free transportation infrastructure** that benefits Environmental Justice communities. MassDOT will incorporate climate science and data into key decision-making processes to ensure the best and most up-to-date science.
- MassDOT is committed to ensuring that **fast charging infrastructure** along major highways promotes ease of access to charging for drivers of electric vehicles.
- MassDOT is committed to **supporting the transition to low- and zero-emission public transit** fleets and the maintenance facilities required to support this transition.
- MassDOT believes that fully achieving decarbonization goals must involve a multi-pronged and systems thinking approach that goes beyond electrification to emphasize the importance of **moving more people with fewer vehicles and cross-disciplinary problem solving**.
- MassDOT will collaborate on decarbonization efforts **across the government** and ensure decarbonization efforts are consistent with other state agencies' efforts.



PROBLEM STATEMENTS

- Transportation is the largest contributor of Massachusetts' carbon emissions and transportation-related emissions are disproportionately concentrated in Environmental Justice communities.
- Availability of suitable infrastructure is a potential barrier to low-emission transportation choices.



THE TRANSPORTATION SECTOR WAS RESPONSIBLE FOR 42% OF GREENHOUSE GAS EMISSIONS STATEWIDE IN 2019⁴²

AN ADDITIONAL 900,000 RESIDENTS WILL NEED TO DRIVE ELECTRIC VEHICLES BY 2030 TO MEET THE COMMONWEALTH'S CLIMATE GOALS⁴⁵

Key Facts

PROBLEM STATEMENT 1: Transportation is the largest contributor of Massachusetts' carbon emissions and transportation-related emissions are disproportionately concentrated in Environmental Justice communities.

Transportation was responsible for 42 percent of greenhouse gas (GHG) emissions statewide in 2019.⁴² In addition to contributing to climate change, GHG emissions from transportation are a leading source of toxic air pollution, including particulate matter (PM) and nitrous oxide, both of which harm human health and are disproportionately concentrated in communities of color in Massachusetts.⁴³

Delivery trucks, most of which are diesel-powered, are a growing source of congestion and emissions on Massachusetts roads. The freight network is becoming more decentralized, leading to more trucks traveling through residential areas. This has negative implications for public health.⁴⁴

PROBLEM STATEMENT 2: Availability of suitable infrastructure is a potential barrier to low-emission transportation choices.

By 2030, Massachusetts will need to have 900,000 new electric vehicles (EVs) to meet climate goals.⁴⁵ While vehicle cost and range are the largest barriers to those interested in buying an electric vehicle, seven percent of survey respondents cite the availability of charging on, or adjacent to, highways as the most important barrier to buying an electric vehicle.⁴⁶

Majorities of urban (78 percent) and suburban (59 percent) residents would like to bike to work, but 60 percent of people are only comfortable bicycling on shared-use paths, in separated bike lanes, or on quiet streets.⁴⁷ However, according to a recent MassDOT analysis, just 6.8 percent of all roadways in the state are considered to have high potential for bicycling.⁴⁸

⁴² Massachusetts Office of Energy and Environmental Affairs Massachusetts Clean Energy and Climate Plan for 2025 and 2030, 2022, <https://www.mass.gov/doc/clean-energy-and-climate-plan-for-2025-and-2030/download>.

⁴³ Harvard University T.H. Chan School of Public Health, Transportation, Equity, Climate and Health (TRECH) Project, 2022, <https://www.hsph.harvard.edu/c-change/subtopics/trechproject/>.

⁴⁴ Massachusetts Office of Energy and Environmental Affairs, Massachusetts Clean Energy and Climate Plan for 2025 and 2030, 2022, <https://www.mass.gov/doc/clean-energy-and-climate-plan-for-2025-and-2030/download>.

⁴⁵ *Ibid.*

⁴⁶ NEVI Deployment Plan for Massachusetts: Public Sample Survey Results. MassDOT, 2022, <https://www.mass.gov/doc/massdot-nevi-plan-accessible-version/download>.

⁴⁷ MassDOT Statewide Bicycle Plan, 2019 <https://massdot.maps.arcgis.com/apps/MapJournal/index.html?appid=c80930586c474a3486d391a850007694>.

⁴⁸ MassDOT Potential for Everyday Biking Update, 2022, <https://geo-massdot.opendata.arcgis.com/maps/4f36acded5c14bd69d519d47f949e451>.



PROBLEM STATEMENT 2: Availability of suitable infrastructure is a potential barrier to low-emission transportation choices.

There are large capital costs of implementing zero-emission buses across RTAs and the MBTA, including the cost of new and upgraded maintenance facilities and charging equipment.⁴⁹ The effects of rapid inflation and supply chain issues, in particular for electrical infrastructure and equipment, are ballooning the capital costs and extending timelines for these projects. For example, the bids for the new MBTA Bus Maintenance Facility in Quincy came in at nearly \$80 million over the engineer's estimate of \$280 million in the Spring of 2022, during the height of inflation and economic uncertainty.⁵⁰

⁴⁹ Beyond Mobility Vision/Values Workshop, 2023.
⁵⁰ MBTA Office of the Chief Engineer.



4.5 Destination Connectivity



VISION

By 2050, due to targeted investments that have expanded access to everyday destinations for transit-critical and historically underserved communities statewide, there will be significantly more modal options, more equitable travel times, increased transportation choices, and far fewer first- and last-mile gaps for these communities.



VALUES

- MassDOT believes that the primary purpose of the transportation system is to **connect people to the places that they need and want to go**.
- MassDOT believes in the importance of measuring how **people, rather than just vehicles**, pass through the transportation system.
- MassDOT is committed to the principle that a **“regional rail”** system with expanded service throughout the day is critical to building a stronger and more inclusive state economy.
- MassDOT is committed to supporting **robust on-demand transit services** using dedicated drivers and vehicles across the Commonwealth, especially in communities served by Regional Transit Authorities (RTAs) that may not have and/or lack the density to support fixed route service.



PROBLEM STATEMENTS

- People living in Environmental Justice communities are burdened by connectivity inequities across our transportation system, limiting their access to opportunities.
- The lack of contiguous, safe, high-comfort bike or pedestrian pathways connecting existing pedestrian and bicycle facilities limits the ability of people walking, bicycling, and using other non-motorized modes, including mobility-assistive devices, to access critical destinations.
- Residents outside of inner core areas across the Commonwealth, particularly those in rural areas, lack convenient transit services and other non-vehicular transportation options and feel disconnected from cultural, economic, and other opportunities. Additionally, current passenger rail service opportunities for the western half of the Commonwealth are extremely limited. Though the Commonwealth supports reduced car travel as a climate change strategy, people traveling in Massachusetts find it difficult to get around using other modes including transit, cycling, and water transportation.
- Existing land use patterns reinforce car travel and exclude lower-income people from having sufficient modal choices.



**ONLY 1.2%
OF ALL TRIPS
UNDER 3 MILES
IN MASSACHUSETTS ARE
MADE BY BICYCLISTS⁶⁴**

**69%
OF ALL BEYOND MOBILITY TRADEOFF
SURVEY RESPONDENTS DESIRE
CAR-FREE CONNECTIVITY FROM
THEIR FRONT DOOR TO THEIR
DESTINATIONS⁶³**

**60%
OF MASSACHUSETTS RESIDENTS
DROVE ALONE TO WORK IN 2021⁶⁵**

Key Facts

PROBLEM STATEMENT 1: People living in Environmental Justice communities are burdened by connectivity inequities across our transportation system, limiting their access to opportunities.

In Greater Boston, Black commuters experience longer travel times via every reported mode when compared to white commuters, and the disparity has grown larger in recent years.⁵¹

About 64 percent of non-white and low-income respondents and 58 percent of all *Beyond Mobility* survey respondents want to see improvements in network connectivity and coverage.⁵² When asked to prioritize a series of transportation investments, low-income respondents ranked “bus-only lanes connecting to transit stations and activity centers” highest.⁵³

Over half of all Meeting-in-a-Box participants referenced the importance of microtransit and/or first and last-mile connections to fixed route transit.⁵⁴

Despite having more areas with high potential for bicycling, Environmental Justice communities have fewer existing and planned bike facilities per capita than all other communities (Figure 4.5 and Figure 4.6).⁵⁵

PROBLEM STATEMENT 2: The lack of contiguous, safe, high-comfort bike or pedestrian pathways connecting existing bicycle facilities limits the ability of people walking, bicycling, and using other non-motorized modes, including mobility-assistive devices, to access critical destinations.

Approximately 97.5 percent of MassDOT-owned roads and 97.4 percent of locally owned roads where bicycling is allowed lack designated bicycle facilities.⁵⁶

The condition of bicycle and pedestrian facilities varies greatly based on season and geographic location, as snow clearance and other maintenance operations are often under local jurisdiction and vary by municipality.⁵⁷

PROBLEM STATEMENT 3: Residents outside of inner core areas across the Commonwealth, particularly those in rural areas, lack convenient transit services and other non-vehicular

⁵¹ Metropolitan Area Planning Council, Metro Common x 2050 Indicators, 2021, https://metrocommon.mapc.org/assets/MC2050_COMPLETE_PDF-e2ed6a9e41af35a4bfb88863ecfb07addcedbcd81bc874c69dee21f870b020b0.pdf.

⁵² Beyond Mobility Phase I Vision, Values, & Needs Survey, Summer 2022.

⁵³ Beyond Mobility Phase II Priorities & Tradeoffs Survey, Fall 2022.

⁵⁴ Beyond Mobility Meeting-In-A-Box Focus Group Sessions, 2023.

⁵⁵ MassDOT GeoDOT, Bike Inventory, 2020.

⁵⁶ MassDOT Statewide Bicycle Plan, 2019

<https://massdot.maps.arcgis.com/apps/MapJournal/index.html?appid=c80930586c474a3486d391a850007694>.

⁵⁷ Beyond Mobility Phase I Vision, Values, & Needs Survey, Summer 2022.



transportation options and feel disconnected from cultural, economic, and other opportunities. Additionally, current passenger rail service opportunities for the western half of the Commonwealth are extremely limited.

Around 66 percent of respondents from rural communities identified transit system expansion and/or better connectivity and frequency as aspects of a flawless transportation system for Massachusetts.⁵⁸ When asked to pick between three categories of needed infrastructure improvements, 57 percent of respondents from rural communities selected “transit elements” as their first choice.⁵⁹

Of the 36 rural respondents to the Tradeoff Survey, 53 percent reported being unsatisfied or very unsatisfied with job access; 57 percent were unsatisfied or very unsatisfied with access to food retailers; and 60 percent were unsatisfied or very unsatisfied with access to healthcare.⁶⁰

When asked to prioritize a series of investments, respondents from rural communities ranked “improved bicycle and pedestrian connections to transit stations” highest.⁶¹

Although pilots of microtransit and fixed route service expansions in rural and suburban areas provide important connections to critical destinations, there is a lack of ongoing and sustained funding and challenges associated with measuring the success of these services compared to those in urban areas, limiting their fiscal sustainability.⁶²

PROBLEM STATEMENT 4: Though the Commonwealth supports reduced car travel as a climate change strategy, people traveling in Massachusetts find it difficult to get around using other modes including transit, cycling, and water transportation.

Around 69 percent (1,743) of all Tradeoff Survey respondents, 70 percent of low-income respondents, and over 70 percent of respondents with a disability or who are over 65 years of age selected “car-free connectivity from point of departure to destination” as a feature of a great transportation system.⁶³

Only 1.2 percent of trips between zero to three miles are made by bicycles statewide, and just 2.5 percent of MassDOT roads and 2.6 percent of local roads have bike facilities.⁶⁴

Approximately 59.5 percent of Massachusetts residents drove alone to work in 2021, with higher rates in central and western Massachusetts. Commute times by automobile are longer in the eastern part of Massachusetts than in the rest of the state, while commute times for people using public transportation are consistent across the state and significantly higher than commuting by car.⁶⁵

⁵⁸ Beyond Mobility Phase I Vision, Values, & Needs Survey, Summer 2022.

⁵⁹ Beyond Mobility Phase II Priorities & Tradeoffs Survey, Fall 2022.

⁶⁰ *Ibid.*

⁶¹ *Ibid.*

⁶² Beyond Mobility Gap Analysis—Rail and Transit, 2022.

⁶³ Beyond Mobility Phase II Priorities & Tradeoffs Survey, Fall 2022.

⁶⁴ MassDOT Bicycle and Pedestrian Update—2021
<https://storymaps.arcgis.com/stories/446e35bc40614e5aaced4a62ff7343b2>.

⁶⁵ American Community Survey, 2021, 5-year tables, B08134 Means of Transportation to Work by Travel Time to Work and B08301 Means of Transportation to Work.



PROBLEM STATEMENT 5: Existing land use patterns reinforce car travel and exclude lower-income people from having sufficient modal choices.

Development patterns and zoning regulations in Massachusetts cities and towns largely favor single-family homes and single-use neighborhoods where destinations are far apart from each other, which reinforces automobile travel as the most convenient and effective way to get around.⁶⁶

As an example, the stretch of Route 128/I-95 between Newton and Lexington is one of the most congested roadway corridors in the state. Its land use is dominated by office space, and to a lesser extent, industrial and retail spaces, which cumulatively attract 97 times as many workers as there are residents. Nearly 56,000 people work in the study area, but just 500 of these workers live locally due to the lack of available housing. About 60 percent of people who work in this study area live at least ten miles away; what this means is that a lot of people are traveling on the same roads at about the same times to this major employment hub, creating recurring congestion that is past the network's tipping point.⁶⁷

Of the 261 light rail, heavy rail, and bus stops in the Greater Boston Area, 61 percent have fewer than 10 homes per acre and 41 percent have fewer than five homes per acre, stifling potential transit-oriented development opportunities.⁶⁸

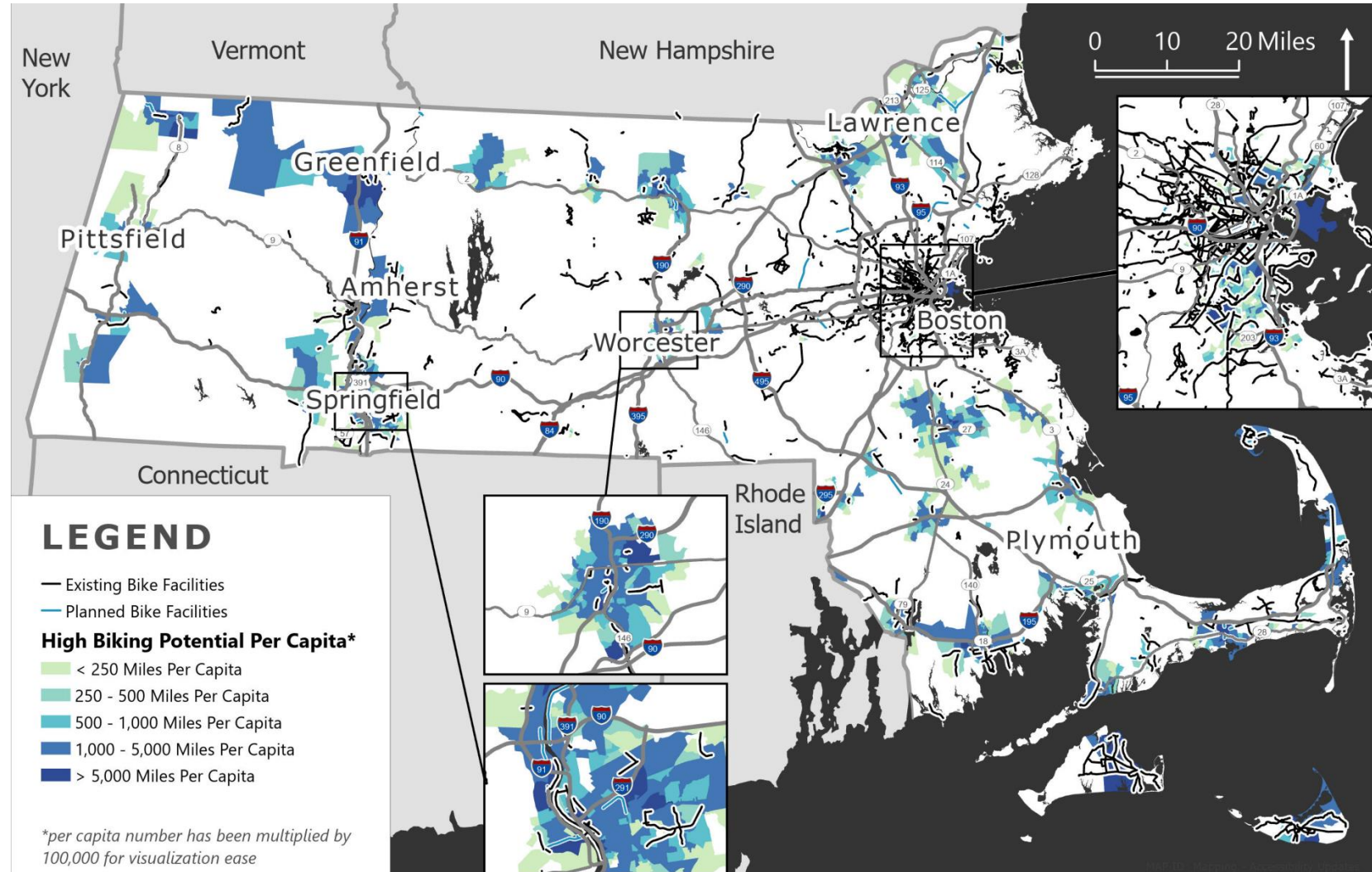
⁶⁶ Massachusetts Office of Energy and Environmental Affairs, Massachusetts Clean Energy and Climate Plan for 2025 and 2030, 2022, <https://www.mass.gov/doc/clean-energy-and-climate-plan-for-2025-and-2030/download>.

⁶⁷ MassDOT Route 128 Land Use and Transportation Study Final Report, 2023, <https://www.mass.gov/route-128i-95-study>.

⁶⁸ Massachusetts Housing Partnership, TODEX Transit Oriented Development Explorer Research Brief, 2019, <https://www.mhp.net/news/2019/todex-research-brief>.



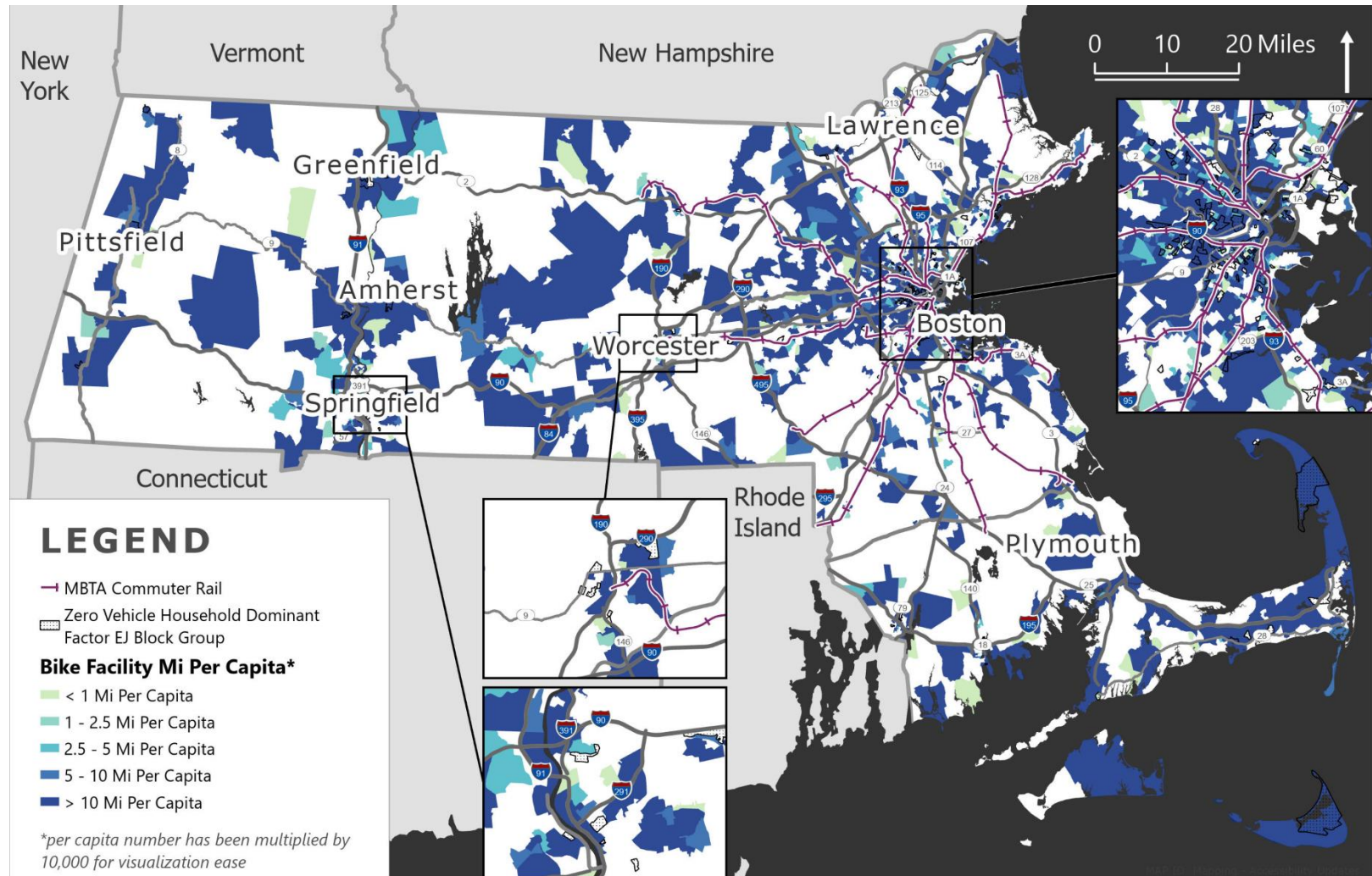
Figure 4.5 High Potential for Everyday Biking per Capita and Existing and Planned Bicycle Facilities



Sources: 2016–2020 5-Year ACS, MassDOT Potential for Everyday Biking 2022, MassDOT Bike Inventory 2020.



Figure 4.6 Existing and Planned Bicycle Facilities per Capita and Zero-Vehicle Household Most Dominant Factor (MDF) Environmental Justice Communities



Source: 2016–2020 5-Year ACS, MassDOT Bike Inventory 2020.



4.6 Resiliency



VISION

By 2050, significant investments to mitigate climate threats and impacts (such as urban heat islands, flooding, sea level rise, and stormwater runoff) have protected transportation assets against natural hazards and climate change impacts.



VALUES

- MassDOT will be proactive about understanding the elements of the network at the highest risk from climate change and implementing strategies to reduce these risks.
- MassDOT will pursue resiliency efforts across the entire agency, including each modal division and all shared services.
- MassDOT investment decisions about new transportation infrastructure will take into account floodplains and sea level rise projections.
- MassDOT will prioritize resiliency improvements by targeting the largest risks from climate change impacts, including sea level rise and flooding.
- Acknowledging that a whole-of-government approach is needed to tackle the climate crisis, MassDOT will collaborate on resiliency efforts **across the government** and ensure resiliency efforts are consistent with other state agencies' efforts.



PROBLEM STATEMENTS

- Significant transportation infrastructure in Massachusetts is exposed to natural hazards.

OVER 75%
OF THE POPULATION
LIVES IN COASTAL AREAS OF
MASSACHUSETTS, WHICH
COULD EXPERIENCE AN
ESTIMATED SEA LEVEL RISE OF
2.3 TO 4.2 FEET BY 2070 (OVER
2000 LEVELS)⁷⁰

NINE OUT OF THE TOP 20
WARMEST YEARS
ON RECORD IN MASSACHUSETTS
HAVE OCCURRED SINCE 2010:
 2010, 2011, 2012, 2013, 2016,
 2017, 2018, 2020, AND 2021⁷⁶



Key Facts

PROBLEM STATEMENT 1: Significant transportation infrastructure in Massachusetts is exposed to natural hazards.

Figure 4.7 illustrates key locations that survey respondents identified as having resiliency concerns across active transportation, airports, freight movement, public transportation, and roadways.⁶⁹ Please note that Figure 4.7 only represents responses related to resiliency concerns on the Beyond Mobility survey. For a fuller description of resiliency needs, please visit the ResilientMass Municipal Vulnerability Preparedness Program webpage: <https://resilient.mass.gov/mvp/>.

By 2070, some projections estimate a rise in sea level of 2.3 to 4.2 feet over 2000 levels.⁷⁰

MassGIS estimates that given two feet of sea level rise, more than 96 miles of roadway in the state and two bus stops would be flooded; that five feet of sea level rise would lead to 850 roadway miles and 364 bus stops flooded; and that ten feet of sea level rise would mean 2,100 roadway miles and 1,249 bus stops, 81 rapid transit stops, and 15 Commuter Rail stops flooded.⁷¹

Research into the impacts of storms on the MBTA's system found that as soon as 2030, a 100-year storm would completely inundate the Blue Line and large portions of the Red and Orange Lines. By 2070, a 100-year storm would flood nearly the entire network, sparing only some sections of the Green and Orange lines, with "system connectivity" reduced to just nine percent.⁷²

Over 3,300 miles of roadway, the vast majority of which are locally owned, are located within Hurricane Category 4 impact areas.⁷³ Additionally, more than 2,200 MBTA bus stops, 100 MBTA rapid transit stations, and 20 MBTA Commuter Rail stations are also located within Hurricane Category 4 impact areas.

Across Massachusetts, 2,567 bridges and 3,322 roadway miles are within 100 feet of flowing waterbodies and therefore have a higher probability of being exposed to riverine flooding, including any increases in flooding resulting from climate change.⁷⁴

Many bridges and culverts are or will be subjected to coastal and riverine flooding, particularly those that are hydraulically undersized or tidally restricted. Analyses have shown that vulnerability may increase to 108 culverts, 53 bridges, and over 400 miles of stream channel by 2070 due to climate change.⁷⁵

Nine out of the top 20 warmest years on record in Massachusetts have occurred since 2010: 2010, 2011, 2012, 2013, 2016, 2017, 2018, 2020, and 2021. By 2050, there may be up to 40 fewer days per year with daily minimum temperatures below freezing.⁷⁶

Impacts of extreme heat on Massachusetts' transportation system include but are not limited to an increased number of slow zones on light and heavy rail transportation due to a reduction in track capacity; softening pavement condition on roadways and airport runways; and power outages impacting electrified public transit and electric vehicle power demand during hotter summer days.⁷⁷

⁶⁹ Beyond Mobility Phase I Vision, Values, & Needs Survey, Summer 2022.

⁷⁰ Massachusetts Department of Public Health, Sea Level Rise: Climate Hazard Adaptation Profile, 2023, <https://www.mass.gov/info-details/sea-level-rise>.

⁷¹ MassGIS, NOAA Sea Level Rise, 2019.

⁷² Martello et. al. "Evaluation of climate change resilience for Boston's rail rapid transit network," 2021, <https://www.sciencedirect.com/science/article/abs/pii/S1361920921002078>.

⁷³ MassGIS, Hurricane Surge Inundation Zones, 2013.

⁷⁴ MassDOT Flood Risk Assessment, 2023, <https://www.mass.gov/massdot-flood-risk-assessment>.

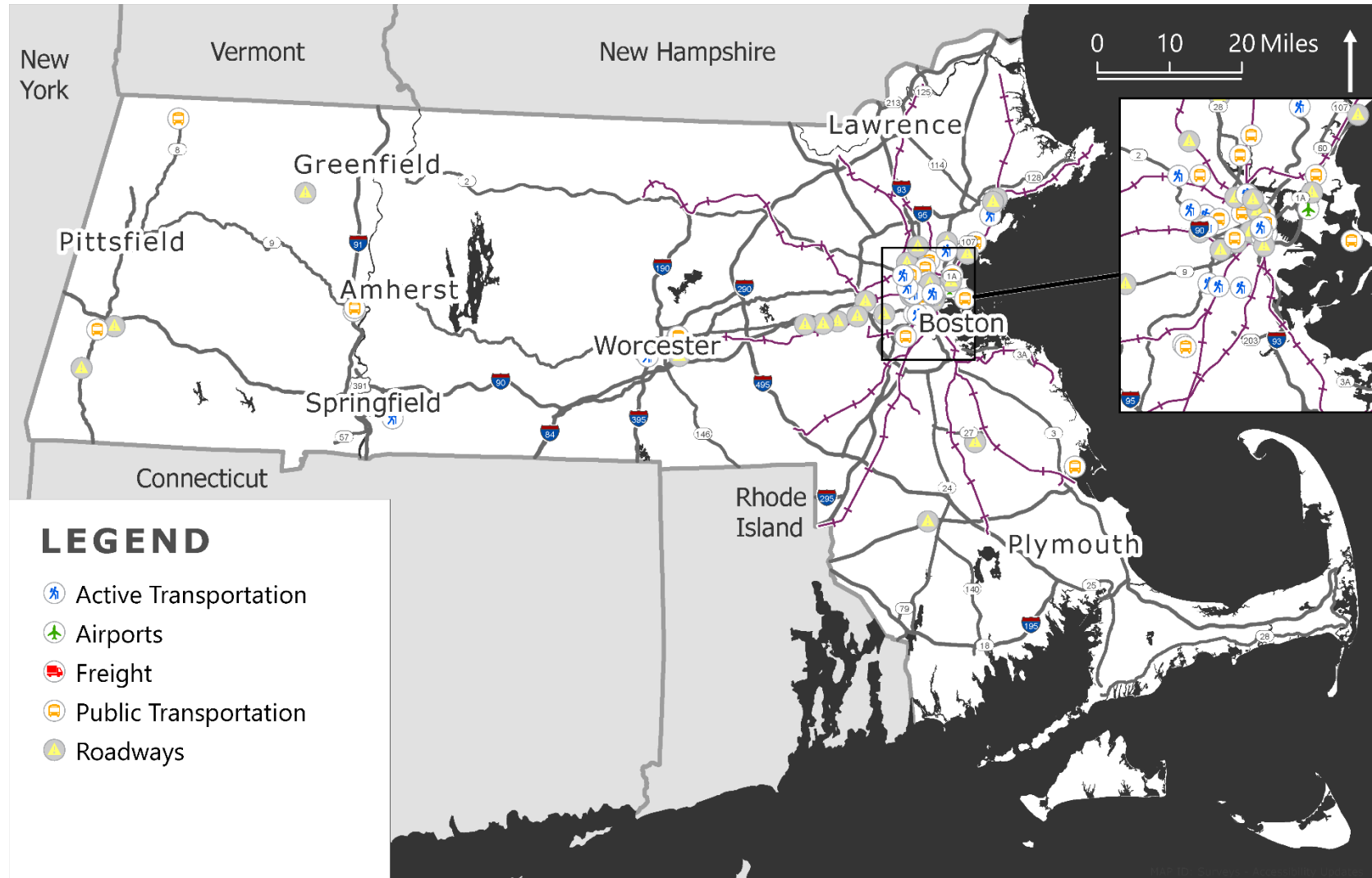
⁷⁵ Massachusetts Integrated State Hazard Mitigation and Climate Adaptation Plan, 2018, <https://www.mass.gov/files/documents/2018/09/17/SHMCAP-September2018-Chapter4.pdf>.

⁷⁶ NOAA National Centers for Environmental Information, "Climate at a Glance: Statewide Time Series." 2022, <https://www.ncei.noaa.gov/access/monitoring/climate-at-a-glance/statewide/time-series>; Massachusetts Integrated State Hazard Mitigation and Climate Adaptation Plan, 2018, <https://www.mass.gov/files/documents/2018/09/17/SHMCAP-September2018-Chapter4.pdf>.

⁷⁷ Massachusetts Integrated State Hazard Mitigation and Climate Adaptation Plan, 2018, <https://www.mass.gov/files/documents/2018/09/17/SHMCAP-September2018-Chapter4.pdf>.



Figure 4.7 Survey Responses—Resiliency Concerns



Source: Beyond Mobility Phase I Vision, Values, & Needs Survey, Summer 2022.



4.7 Travel Experience



VISION

By 2050, equitable access to a high-quality and well-maintained transportation network will be expanded throughout the Commonwealth, with special attention to Environmental Justice and rural communities. The system's state of good repair will be routinely positive and maintenance backlogs will be minimal. Enhanced wayfinding and information will support systemwide navigation for users of all ages, abilities, and languages. Transit facilities will be safe, clean, and comfortable with modern seating, lighting, and features that improve users' experience.



VALUES

- MassDOT believes that achieving a state of good repair for all transportation assets is important not only for a more pleasant and comfortable travel experience but also for **maintaining overall system quality**.
- MassDOT believes that **all travelers in the state deserve** a transportation system that is easy to understand, ADA accessible, inclusive of signage and wayfinding on transit and roadways, and contains dynamic traveler information services and resources.
- MassDOT believes that targeted transit expansions and increased transit frequency in underserved areas are critical to encouraging mode shift.
- Consistent with statewide environmental goals, MassDOT's improvements in travel experience will be used to **encourage modal shift** from single occupancy vehicles to public and active transportation modes.



PROBLEM STATEMENTS

- All transit riders, including users of paratransit and human services transportation (HST), deserve a better user experience and increased affordability on transit, in Environmental Justice communities and across the Commonwealth.
- Missing sidewalks, curb ramps, and crosswalks limit mobility options, especially for older adults, people with disabilities, and children. This is a particular issue in rural communities, where many such residents live.
- Transit riders, people with disabilities, and limited English proficient (LEP) community members find it challenging to understand and navigate transit infrastructure, including stations, service changes involving diversions, and alternative routing options.
- Bicyclists report that wayfinding and amenities at facilities are confusing or substandard.
- The systems and protocols that support excellent customer service are not always prioritized.



29%
OF ALL **MBTA RIDERS** AND
42%
OF **MBTA BUS RIDERS** HAVE AN
INCOME OF LESS THAN
\$43,500⁷⁸

22%
OF TOTAL **ROADWAY MILES**
WITHIN ONE-HALF MILE OF A
TRANSIT STOP
HAVE SIDEWALK
GAPS⁸⁰

AS A PERCENTAGE OF TOTAL ROADWAY MILES,
RURAL COMMUNITIES HAVE
1.65 TIMES MORE SIDEWALK GAPS
THAN URBAN COMMUNITIES⁸⁴

Key Facts

PROBLEM STATEMENT 1: All transit riders, including users of paratransit and human services transportation (HST), deserve a better user experience and increased affordability on transit, in Environmental Justice communities and across the Commonwealth.

Across the whole MBTA system, 29 percent of all riders have an income of less than 60 percent of the area median income of \$72,500, whereas among MBTA bus riders, 42 percent have incomes below this level. Riders on Massachusetts' 15 RTA bus routes tend to have even lower incomes, are more likely to be non-white, and are more dependent on public transit for travel.⁷⁸

Approximately 33 percent of all survey respondents, 35 percent of low-income respondents, and 36 percent of respondents of color identified user experience as an attribute of a great transportation system.⁷⁹

PROBLEM STATEMENT 2: Missing sidewalks, curb ramps, and crosswalks limit mobility options, especially for older adults, and people with disabilities, and children. This is a particular issue in rural communities, where many such residents live.

Around 22 percent of roadway miles near transit stops (i.e., within one-half mile) anywhere in the state have sidewalk gaps, and 20 percent of curb ramps within one-half mile of transit stops are deficient.⁸⁰

Approximately 72 percent of locally-owned roads and 57 percent of MassDOT-owned roads where walking is allowed currently lack sidewalks (Figure 4.8).⁸¹ Additionally, people with disabilities find it difficult to use transit due to poor infrastructure, including sidewalk gaps.⁸²

Environmental Justice communities experience a higher proportion of deficient curb ramps within one-half mile of transit stops—26 percent of all curb ramps within one-half mile of a transit stop, compared to only seven percent in non-EJ communities.⁸³

⁷⁸ MassBudget, Free Buses Advance Equity, 2021, <https://massbudget.org/2021/03/24/free-buses-advance-equity/>.

⁷⁹ Beyond Mobility Phase I Vision, Values, & Needs Survey, Summer 2022.

⁸⁰ MassDOT Road Inventory, GeoDOT, 2020.

⁸¹ MassDOT Statewide Pedestrian Transportation Plan, 2019
<https://massdot.maps.arcgis.com/apps/MapJournal/index.html?appid=96339eb442f94ac7a5a7396a337e60c>.

⁸² Beyond Mobility Phase I Vision, Values, & Needs Survey, Summer 2022.

⁸³ GeoDOT, Pedestrian Curb Cuts, 2018.



PROBLEM STATEMENT 2: Missing sidewalks, curb ramps, and crosswalks limit mobility options, especially for older adults, and people with disabilities, and children. This is a particular issue in rural communities, where many such residents live.

Rural communities have 1.65 times more sidewalk gaps as a percentage of total roadway miles, 3.5 times more poor/fair road conditions per capita, 4.4 times more poor/deficient bridges per capita, and 1.3 times more deficient curb ramps than urban communities.⁸⁴

PROBLEM STATEMENT 3: Transit riders, people with disabilities, and limited English proficient (LEP) community members find it challenging to understand and navigate transit infrastructure, including stations, service changes involving diversions, and alternative routing options.

People find the transit system challenging to use due to unclear wayfinding, challenges learning about community transportation options available, poor ADA accessibility, and lack of transit employees present.⁸⁵

Transit system riders are reliant on third-party applications for travel time information, which vary in reliability and accuracy.⁸⁶

People with limited English proficiency, lower-income people, and people with disabilities report a need for improved wayfinding signage and information to assist travelers far more than other groups.⁸⁷

PROBLEM STATEMENT 4: Bicyclists report that wayfinding and amenities at facilities are confusing or substandard.

Bicycle riders report that the bicycling network in Massachusetts lacks intuitive wayfinding, signals, lane markings, and amenities such as water fountains and parking.⁸⁸

Protected and traffic-separated multimodal facilities remain inconsistent even in urban core areas, with protected lanes often merging into shared vehicle traffic and sidewalks varying in width, condition, and grade, which influences people's willingness to bike. Ninety-four percent of participants in the 2019 *Massachusetts Bicycle Transportation Plan* outreach indicated that they would bike if they were separated from vehicles, while only 33 percent of them were willing to bike in mixed traffic.⁸⁹

PROBLEM STATEMENT 5: The systems and protocols that support excellent customer service are not always prioritized.

There is a need to improve customer service at the RMV through investments in systems such as online renewals, improved data security, and fraud/identity theft prevention.⁹⁰

Due to high-profile and time-sensitive pressures such as managing project costs, delivering system expansions, and staffing at the MBTA, other initiatives such as customer service are often not able to be prioritized.⁹¹

⁸⁴ MassDOT Road Inventory, GeoDOT, 2020; GeoDOT, Pavement Condition, 2020; GeoDOT, Bridges, 2022; GeoDOT, Pedestrian Curb Cuts, 2018.

⁸⁵ Beyond Mobility Phase I Vision, Values, & Needs Survey, Summer 2022.

⁸⁶ *Ibid.*

⁸⁷ Beyond Mobility Phase II Priorities & Tradeoffs Survey, Fall 2022.

⁸⁸ MassDOT Statewide Bicycle Plan, 2019

<https://massdot.maps.arcgis.com/apps/MapJournal/index.html?appid=c80930586c474a3486d391a850007694>.

⁸⁹ MassDOT Statewide Bicycle Plan, 2019

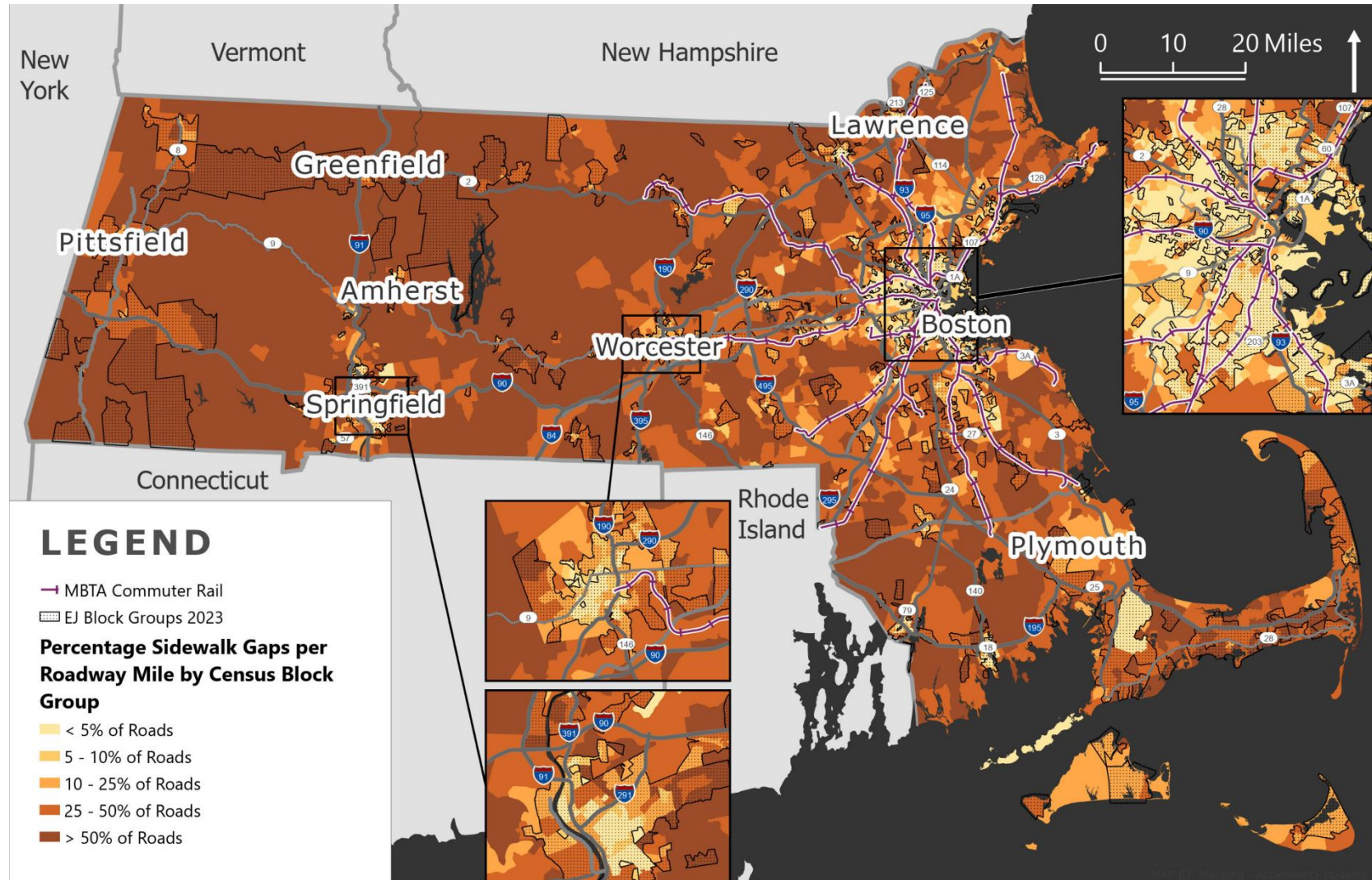
<https://massdot.maps.arcgis.com/apps/MapJournal/index.html?appid=c80930586c474a3486d391a850007694>.

⁹⁰ Beyond Mobility Gap Analysis—RMV, 2023.

⁹¹ Beyond Mobility Gap Analysis—MBTA, 2023.



Figure 4.8 Sidewalk Gaps and Environmental Justice Communities



Source: 2016-2020 5-Year ACS, MassDOT Road Inventory 2021



5.0 Action Items

5.1 Introduction and Background

This chapter articulates the actions that MassDOT and the MBTA will take in response to the vision, values, and Problem Statements identified in Chapter 4. These Action Items both account for ongoing initiatives and programs that MassDOT and the MBTA are already involved in and propose new complementary strategies. In short, these Action Items codify the findings of previous Plan sections into actionable next steps. Developing these Action Items was a crucial component of *Beyond Mobility* because they define how MassDOT will address identified problems and establish the lead parties responsible for Action Item implementation. The Action Items identified below are organized by *Beyond Mobility*'s six key Priority Areas.

Chapter 7, “Funding the Transportation System,” outlines various funding sources that support transportation investments in Massachusetts. Each year, when developing its rolling five-year *Capital Investment Plan*, MassDOT works with its transportation planning partners to determine the level of funds available from each source to fund capital projects. For example, MassDOT works with USDOT and its modal administrations to understand the funding available through various Federal formula funding programs; MassDOT also coordinates with the Commonwealth’s Executive Office for Administration and Finance on the total amount of general obligation bond debt that will support MassDOT’s Capital programs. Similar processes to identify available funding are carried out for the MBTA’s *Capital Investment Plan* and MassDOT’s and the MBTA’s operating budgets. The annual development of these plans will enable MassDOT, the MBTA, and their planning partners to assess opportunities and resources available to advance *Beyond Mobility*’s priorities and action steps.

Also, with respect to funding, at the time of the development of *Beyond Mobility*, the Healy-Driscoll Administration announced the creation of a new Transportation Funding Task Force. This Task Force will be composed of public and private-sector leaders, representing communities of all sizes across Massachusetts, who will examine the Commonwealth’s transportation system and develop a toolkit that builds on the *Beyond Mobility* plan to document steps needed to implement the next generation of transportation investments in Massachusetts **Action Item Development**

Action Items were identified and confirmed through an iterative process. Actions in previous planning documents provided a solid foundation, and public input confirmed or updated those priorities. Stakeholder interviews—both internal and external to MassDOT—were conducted to further understand problem areas and potential actions. These Action Items were reviewed by subject matter experts and refined by MassDOT staff through internal workshops and individual reviews.

Action Items are grouped into the following categories:

- **Policy and programming efforts:** The formulation of new policies and/or funding programs that address identified problems.
- **Research:** The development of scopes of work and/or problem statements in response to the issues identified, serving as a “Research Roadmap” for MassDOT and its partner agencies.



- **Partnerships:** Coordination with regional, local, and Federal partners to advance new initiatives and ideas.
- **Capital planning efforts:** Changes to MassDOT and MBTA capital plan budget program sizes and/or processes that direct funding within each program.
- **Operational improvements:** Changes to the operation of transportation services that would address identified problems.

All MassDOT Divisions with current or potential programs, policies, or initiatives related to the Action Items are listed, with the presumed 'lead' Division highlighted in **bold text**. In order to meet anticipated long-term needs and have initiatives in place by the year 2050, suggested time frames for each Action Item are also included, with 'short term' activities anticipated to take place within the next five to ten years, and 'mid term' activities anticipated to take place within the next decade or beyond.

As a final "filter," the Action Items were tested against three scenarios to ensure they were relevant across a wide range of potential futures. These scenarios, developed by MassDOT to represent three plausible alternative futures for the state's transportation network in 2050, were the following:

- **Hybrid and Diverse**, in which all recent trends **accelerate**. As work-from-home spreads demand across the Commonwealth, the growth in housing prices and resulting displacement are greater in areas farther from Boston. The biotechnology industry has exploded, and laboratory facilities are often sited in mixed-use "villages" in inland areas. Summers become hotter and the whole year becomes wetter.
- **Ahead as Before**, in which all recent trends **maintain**. Hybrid work models proliferate in industries where this is possible. As Baby Boomers leave the workforce, they are replaced by smaller generations, leading to persistent labor shortages and inflation as higher wages filter down to consumer prices. Massachusetts' knowledge economy maintains its strength in biotechnology but plateaus in other high-tech sectors. Less of the winter is severely cold, though winter precipitation increases in the form of rain or freezing rain.
- **Close and Connected**, in which all recent trends **plateau or reverse**. Workers reenter the traditional office space. Housing costs plateau across the Commonwealth as a divided economy (knowledge inside I-495; industrial outside) spreads demand for housing. Historically marginalized residents are effectively priced outside of Route 128. Automation supports but does not supplant blue-collar employment, while the knowledge economy plateaus and consolidates in Boston, Cambridge, and Somerville.

Although there are known actions that would contribute to addressing the problems identified in the first phase of the Plan, the actions documented in this section are those that can be implemented and/or analyzed by MassDOT's modal Divisions, shared services (e.g., Office of Transportation Planning), and the MBTA. Many of these Action Items are consistent with other MassDOT and Commonwealth strategic plans and initiatives, such as the [2023 Strategic Highway Safety Plan](#) (SHSP), the [2023 Transportation Asset Management Plan](#) (TAMP), the [MBTA's Strategic Plan](#), the [MBTA's 2023 Capital Needs Assessment and Inventory \(CNAI\)](#), the [National Electric Vehicle Infrastructure \(NEVI\) Plan](#), the [2023 Resilient Mass Plan](#), the [2023 Massachusetts Climate Chief Report](#), and the [Massachusetts Clean Energy and Climate Plan for 2025 and 2030](#), among others.



Consistent across all efforts is the theme that in order to meet Massachusetts' climate goals, there is a need to increase the percentage of transit trips made in Massachusetts by attracting new riders and retaining existing riders with dependable, frequent, and accessible service. Many of the *Beyond Mobility* Action Items identified in this chapter support this goal and mode shift more broadly, including but not limited to those focused on expanding transit-priority infrastructure such as dedicated bus lanes, regional rail, multimodal connections to transit, Complete Streets and multimodal infrastructure improvements, and accessibility improvements.

Beyond Mobility will also directly inform future related planning efforts at MassDOT and the MBTA. These future planning efforts include but are not limited to the Program for Mass Transportation (PMT), which represents a 25-year plan for how the MBTA can meet the needs of the region; MassDOT Highway Division's *Resiliency Improvement Plan*; future modal plans; corridor studies; capital plans; and other related strategic planning efforts.

An online [Action Items Progress Report](#) has also been developed to assist track progress on all of the *Beyond Mobility* Action Items.

5.2 Safety

Ongoing Safety Efforts

MassDOT and its partner agencies are continually involved in planning efforts to analyze and improve safety conditions on transit, roadways, and other transportation facilities in Massachusetts. These efforts include [MassDOT's 2023 Strategic Highway Safety Plan](#) (SHSP), Road Safety Audits (RSAs), Highway Safety Improvement Program (HSIP), [2023 Vulnerable Road User Safety Assessment](#), transit providers' [Public Transportation Agency Safety Plans](#) (PTASPs), safety investments included in [MassDOT's Capital Investment Plan \(CIP\)](#) and the [MBTA's CIP](#), and the MBTA's *3-Year Safety Improvement Plan*, among others.

The SHSP lays out a vision for zero roadway fatalities and serious injuries and the most impactful actions identified to date that can be taken to move towards zero deaths. These actions include speed management to realize safer speeds; addressing top-risk locations and populations; taking an active role in vehicle design, features, and use; and accelerating research and adoption of technology.

For capital planning and programming, MassDOT's Federally funded Safety Improvements, Safe Routes to School, and Intersection Improvements Programs in the *State Transportation Improvement Program* (STIP) and *Capital Investment Plan* (CIP) fund tens of millions of dollars of safety projects statewide each year. State-funded programs such as Complete Streets and Shared Streets and Spaces also award millions of dollars to communities on an ongoing basis to make safety improvements to infrastructure across the Commonwealth. Since its start in June 2020, the Shared Streets and Spaces Program has awarded a total of \$50 million to 228 municipalities and seven transit authorities to implement 494 projects.

The Highway Division's Traffic Safety Section is also continually tracking safety data across the Commonwealth through MassDOT's [Impact Portal](#) to identify high-crash and high-risk locations. Additionally, MassDOT has developed a [Vulnerable Road User \(VRU\) Safety Assessment](#), which documents vulnerable road users at the highest risk for crashes using a data-driven approach.



Vulnerable road users include people walking, riding bicycles, and using assistive devices for mobility. MassDOT is taking steps to support Massachusetts' new Vulnerable Road Users Law through activities such as providing new signage to municipalities giving notice that a safe passing distance of four feet is required for vehicles passing vulnerable road users.

In addition to all transit providers developing PTASPs to analyze the safety of their respective systems, many are also making targeted investments in safety projects. The MBTA's *2024–2028 Capital Investment Plan*, for example, contains more than 475 safety projects to improve safety across the system.

The Aeronautics Division conducts airport inspections/accident investigations at public-use airports. Small Uncrewed Aircraft Systems/drones complement physical inspections to help identify obstructions that could pose hazards to flight. The Aeronautics Division also collaborates with other MassDOT Divisions training staff, to leverage Uncrewed Aircraft Systems/drone infrastructure data collection—further improving safety for the traveling public. The Aeronautics Division also runs the Commonwealth UAS/drone Integration Program (CUIP) to identify and foster technologies to support drone and Advanced Air Mobility (AAM) activities, including Counter-UAS security systems (e.g., the National Counter-UAS Center of Excellence) to guard against the negligent or hostile use of drones.

Safety Action Items

Safety Problem Statement 1

Environmental Justice (EJ) Communities—areas with larger populations of low income, limited English proficiency, and/or residents of color—are disproportionately burdened by transportation-related injuries and deaths on roadways, particularly those involving pedestrians and people on bicycles.

Table 5.1 Safety Action Items—Problem Statement 1

Action Items	Category	Division(s)	Status	Timeframe	Related
SAI1.1 Bench of safety projects. MassDOT will coordinate with municipalities on prioritizing current projects and building a bench of future projects to address safety concerns throughout the state and in communities most disproportionately burdened by unsafe conditions. This bench of projects will culminate in a formal <i>Capital Investment Plan</i> (CIP) program dedicated to addressing safety issues for vulnerable road users.	Policy and Program Capital Planning	Highway OTP	New	Mid term	SAI2.1; 2.2; 2.3; 3.1; 3.3; 3.4 RAI1.5 SCTAI 1.1



Action Items	Category	Division(s)	Status	Timeframe	Related
SAI1.2 Tracking safety action plans + prioritization plan. MassDOT will continue to fast-track technical assistance for locally initiated safety action plans in Environmental Justice communities for municipalities and MPOs to more quickly access both Federal formula funding for safety projects as well as Safe Streets and Roads for All (SS4A) Program implementation grant funding through BIL. In line with these efforts, a prioritization plan will be established to determine where similar future efforts should be targeted.	Partnerships	Highway	Ongoing	Mid term	TEAI2.2
SAI1.3 Incorporating crash rate disparities in Tracker. MassDOT will incorporate performance measures on reducing disparities in crash rates between different community types into MassDOT’s Performance Management Report, Tracker.	Research	OPMI OTP Highway	Ongoing	Short term	SAI1.4; 2.1; 3.2 DCAI1.2
SAI1.4 Tracking crashes through an equity lens. Consistent with the SHSP, MassDOT will continue to track crash data through an equity lens to quantify disparities in crash rates between Environmental Justice and others (while accounting for communities with higher-than-average concentrations of people with disabilities) and identify which locations in these communities have particularly high crash rates.	Research	Highway OPMI OTP	Ongoing	Short term	SAI2.1; 1.3

Safety Problem Statement 2

Massachusetts traffic fatalities and fatality rates rose between 2019 and 2022, but have since begun trending downward.

Table 5.2 Safety Action Items—Problem Statement 2

Action Items	Category	Division(s)	Status	Timeframe	Related
SAI2.1 Back-casting toward Vision Zero. In line with the “back-casting” approach (identifying the actions closest to the achievement of a long-term target) MassDOT will define a series of actions working backwards from zero long-term fatalities and serious injuries on all roadways in Massachusetts and implement those activities. Among other initiatives, this will involve the continued data-driven implementation of systemic improvements and intersection safety interventions prioritizing areas with the highest crash rates with a focus on social and geographic equity.	Capital Planning Policy and Program	Highway OTP OPMI	Ongoing	Short term	SAI1.1; 1.3; 1.4



Action Items	Category	Division(s)	Status	Timeframe	Related
SAI2.2 Funding towards areas driving high fatality rates. MassDOT will direct funding to locations and crash types driving increased serious injury and fatal crash rates. Specifically, Highway Safety Improvement Program (HSIP) funding will continue to be put toward infrastructure investments that mitigate the types of crashes driving the increasing number of fatalities, including crashes involving speeding and lane departures.	Capital Planning	Highway	Ongoing	Short term	SAI1.1; 2.3; 3.3 SCTAI1.1
SAI2.3 Systematically invest in and deploy low-cost interventions with proven safety benefits. MassDOT will continue to partner with communities in top-risk areas to advance systemic safety improvements, as documented in the 2023 <i>Strategic Highway Safety Plan</i> .	Capital Planning	Highway	Ongoing	Mid term	SAI1.1; 2.1; 2.2; 2.4; 3.3 SCTAI1.1
SAI2.4 Develop Capital Freight Program. MassDOT will develop a dedicated Freight Program within its <i>Capital Investment Plan</i> (CIP) and State Transportation Improvement Program (STIP) to fund projects eligible for National Highway Freight Program (NHFP) formula funds, including but not limited to truck parking facilities, intelligent freight transportation systems, weigh-in-motion stations, and infrastructural safety improvements.	Policy and Program	Highway OTP RTD Aeronautics RMV	New	Short term	SAI2.3; 3.3; SCTAI1.3; 1.4 RSAI1.7; 3.1; 3.2
SAI2.5 Vehicle design. Consistent with the SHSP, MassDOT will take an active role in affecting change in vehicle design (e.g., vehicle size, use of sideguards), which is a significant factor for injuries sustained in the instance of a crash. In the short term, this analysis will include a review of the impacts of electric vehicle specifications including weight on crash severity.	Research	Highway RMV	New	Mid term	
SAI2.6 Automated enforcement pilots. In coordination with select municipal partners, MassDOT will pilot automated enforcement technologies to enforce traffic violations for running red lights and speeding, and develop recommendations for the Massachusetts Legislature's approval. As part of this pilot, it is essential that social equity is accounted for to prevent existing enforcement disparities and that safety (rather than revenue generation) be the sole purpose for implementing automated enforcement technology.	Policy and Program Research	Highway OTP	New	Short term	SAI2.3; RAI2.2

Safety Problem Statement 3

Users of active transportation modes, namely walking and bicycling, often experience unsafe, low-comfort, and disconnected facilities, especially in Gateway Cities and rural areas. Older



adults are particularly vulnerable to serious injury or death when they are involved in crashes as pedestrians.

Table 5.3 Safety Action Items—Problem Statement 3

Action Items	Category	Division(s)	Status	Timeframe	Related
<p>SAI3.1 Sidewalk and bicycle facility gaps. Building on MassDOT’s Next Generation Bicycle/Pedestrian Vision mapping effort, MassDOT will continue to identify the gaps in sidewalk and bicycle facility coverage that contribute to crashes and prioritize funding to address these gaps. For example, in line with recent research that finds a correlation between gaps in sidewalk coverage and pedestrian crashes, MassDOT will continue to develop and prioritize an inventory system of the bike and sidewalk networks throughout the Commonwealth while accounting for facility condition and ADA accessibility issues, with a priority on Gateway Cities and rural areas.</p>	Research Capital Planning	OTP Highway OPMI	New	Short term	SAI1.1; 3.2 SCTAI1.1 DCAI2.2 TEA4.2
<p>SAI3.2 Sidewalk performance measures for Tracker. MassDOT will explore the development of performance measures for “miles of priority sidewalk gaps in EJ areas” and “miles of priority sidewalk gaps within a one-half mile of transit” for incorporation into Tracker, as well as measures regarding the maintenance of crosswalk markings.</p>	Research	OPMI	New	Short term	SAI1.3; 3.1 TEA4.2
<p>SAI3.3 Speed management and traffic calming. Consistent with the 2023 SHSP, MassDOT will continue to identify opportunities to introduce traffic calming measures to high-risk corridors and intersections and add to its resources for speed management interventions. MassDOT will also explore ‘dementia-friendly’ design considerations presented by the Massachusetts Executive Office of Elder Affairs.</p>	Policy and Program Capital Planning	Highway OTP	Ongoing	Short term	SAI1.1; 2.2; 2.3; 2.4 SCTAI1.1



Action Items	Category	Division(s)	Status	Timeframe	Related
SAI3.4 Prioritizing maintenance activities. MassDOT will prioritize maintenance efforts in line with identified best practices. For example, maintenance activities such as snow removal from bike lanes and sidewalks and installing more visible pavement markings will be advanced. Additional training and educational opportunities will be provided to MassDOT employees in these areas, and municipal agreements regarding these kinds of maintenance activities will be pursued.	Operations Capital Planning Research	Highway OTP	New	Mid term	SAI1.1 SCTAI1.1 DCAI2.1 ; 2.2; 3.1 RSAI1.4

Safety Problem Statement 4

Residents perceive an unsafe environment on public transportation due to a combination of high-profile crashes and other safety events, as well as personal experience.

Table 5.4 Safety Action Items—Problem Statement 4

Action Items	Category	Division(s)	Status	Timeframe	Related
SAI4.1 Presentations on safety progress. MassDOT, in collaboration with the MBTA and the Massachusetts Association of Regional Transit Authorities (MARTA), will consistently present updates to safety data to the public and other stakeholders on progress made in addressing safety concerns such as escalators and other stop or station facility improvements, disabled trains and buses, and the expansion of positive train control (PTC).	Research Partnerships	MBTA RTD	New	Short term	SAI4.2; 4.3
SAI4.2 Steps from MBTA safety plan. As documented in the MBTA's 3-Year Safety Improvement Plan in response to the Federal Transit Administration's Safety Management Inspection (SMI), the MBTA will continue to take several steps to achieve its safety objectives, including operational improvements as well as Capital Transformation Program safety-related projects. Progress toward these action items will be tracked on the MBTA's FTA SMI Response Dashboard .	Capital Planning Operational Improvements	MBTA	Ongoing	Short term	SAI1.4
SAI4.3 Organizational changes. MassDOT and the MBTA will continue to make organizational changes that involve the oversight of safety activities to ensure a safe and healthy transportation system for all employees, passengers, and the public across all modes of transportation.	Operational Improvements	MBTA MassDOT Highway	Ongoing	Short term	SAI1.4 RAI1.3



Action Items	Category	Division(s)	Status	Timeframe	Related
SAI4.4 Station and vehicle safety improvements. The MBTA and RTAs will work to ensure that all stations, vehicles, and right of way (including pedestrian access points) are adequately lit, regularly serviced and staffed by transit agency staff, and have operating security features like cameras and emergency call boxes.	Capital Planning Operational Improvements	MBTA RTD	Ongoing	Mid term	TEA1.3; 3.1

Safety Problem Statement 5

There is limited safety-related knowledge or guidance on certain issue areas, like driver’s education in autonomous vehicles, the application of unmanned aerial systems for improved safety outcomes, or the impacts of limited cellular service on emergency responsiveness or real-time transit vehicle tracking.

Table 5.5 Safety Action Items—Problem Statement 5

Action Items	Category	Division(s)	Status	Timeframe	Related
SAI5.1 RMV guidelines. MassDOT’s RMV will perform a formal review of and update the driver’s education curricula to promote road safety by educating bicyclists, pedestrians, and motorists to be aware of their actions as they travel.	Policy and Program	RMV Highway OTP	New	Short term	SAI5.2; 5.4
SAI5.2 Driver education content. MassDOT will update the driving school topic list to include new material like stopping distances when operating at higher speeds and/or on high-speed roads, as well as road user education on visibility around trucks, bicycles, and school buses; the operation of autonomous vehicles and other emerging technologies; adherence to new vulnerable road user laws; increasing fatigue awareness; and continuing efforts to reduce distracted driving and control the use of handheld electronic devices while driving.	Policy and Program	RMV Highway OTP	New	Short term	SAI5.1; 5.4
SAI5.3 Research on emerging technologies. MassDOT will continue to study emerging technologies such as automation and Artificial Intelligence (AI) and their impacts on, and utility for, transportation safety. For example, MassDOT will continue to dedicate significant resources towards research efforts in partnership with the University of Massachusetts Transportation Center (UMTC) to develop reports on driver safety topics including but not limited to site identification, traffic monitoring and emergency response, the effect of advanced driver assistance systems (ADAS) on road safety, autonomous vehicles, and the calibration of safety performance functions and features for urban and suburban intersections.	Research	Highway OTP RTD MBTA	Ongoing	Mid term	RSAI1. 6



Action Items	Category	Division(s)	Status	Timeframe	Related
SAI5.4 Education resources for new drivers. MassDOT will develop new driver education resources, materials, and public awareness campaigns around emerging safety issues like speeding and new transportation technologies.	Policy and Program	RMV Highway OTP	New	Short term	SAI5.1; 5.2
SAI5.5 UAS for Safety Assessments. MassDOT's Aeronautics Division will explore opportunities for tools like unmanned aerial systems (UAS) to improve worker safety, disruptions, and improve data quality for asset management purposes.	Policy and Program	Aeronautics	New	Mid term	RSAI1. 6

5.3 Reliability

Ongoing Reliability Efforts

MassDOT and its partner agencies are actively involved in ensuring its operational activities and funding programs improve the reliability of the transportation network, meaning that users can feel confident in the travel conditions they are expecting at any given time. MassDOT's six Highway District offices and the MBTA's Operations Control Center continually manage day-to-day issues impacting operations. Specific examples of initiatives designed to improve travel time reliability include MassDOT's Local Bottleneck Reduction Program, which funds solutions to address congestion bottlenecks on local roadways to improve traffic flow, as well as MassDOT's Mobility Dashboard, a regularly updated roundup of key indicators that reflect how much people are traveling, how they are getting around, and where they are going.

MassDOT's [2019 Congestion in the Commonwealth report](#) and [2023 Freight Plan](#) each established a baseline for the challenges and impacts associated with congestion in the state for passenger vehicles, freight, and transit trips, chiefly that the network is largely unreliable and users cannot be confident in the amount of time their trips will take or the associated opportunity costs. This unreliability limits Massachusetts' attractiveness to companies large and small, as both employers and commercial entities. MassDOT understands the implications of unreliable conditions and, since the publication of the congestion report, has taken significant steps to address network reliability in terms of both vehicular congestion and transit service provision. These steps include, but are not limited to, new tools to manage state and roadway operations, reinvention of bus transit at both the MBTA and RTAs, transit signal priority including Tobin Bus Lanes and the Lynnway, and increasing MBTA capacity and ridership through safety and maintenance prioritization efforts.

Additionally, the MBTA's *2024–2028 Capital Investment Plan* (CIP) includes more than 300 critical reliability projects to inspect, repair, and upgrade stations, tracks, bridges, tunnels, signals, power, and IT infrastructure and components. Additional detail on what is required to achieve a state of good repair on the MBTA system is included in the MBTA's *Capital Needs Assessment and Inventory* (CNAI). The CNAI is an MBTA-led analysis conducted every three to four years to inventory the MBTA's assets, understand the overall condition of the transit system, and identify assets that are not in a state of good repair in order to determine the level of investment needed to support the existing network. Understanding the MBTA's state of good repair needs and the level of investment required to address them is a critical step toward improving the system. The MBTA is currently working to incorporate the findings of the CNAI into the capital project pipeline.



MassDOT’s Highway Division has a *Transportation Asset Management Plan (TAMP)* that describes plans and progress for long-term state of good repair for pavement and bridge assets based on a risk-based asset management plan. State of good repair impacts reliability in many ways, including emergency repair construction, restrictions, and bridge closures. Currently Massachusetts is one of a handful of states falling short of the Federal minimum condition threshold, requiring an increase in investment to state of good repair activities and inhibiting investment in system modernization and expansion. This requirement will be accounted for when determining funding levels for a variety of relevant future actions.

MassDOT’s Aeronautics Division uses advanced tools to translate drone data into analytical products that enhance the reliability of management and operations, drive shorter project life cycles, and reduce costs. The Aeronautics Division is exploring options for battery- and hydrogen-powered aircraft and evaluating the best way to integrate AAM into surface, rail, and maritime modes to optimize our existing transportation system.

Reliability Action Items

Reliability Problem Statement 1

Massachusetts travelers by any mode experience congestion, resulting in low confidence about the conditions they will encounter and diminished access to everyday needs.

Table 5.6 Reliability Action Items—Problem Statement 1

Action Items	Category	Division(s)	Status	Timeframe	Related
RAI1.1 Initiate projects flowing from prior planning studies and reports on travel time reliability. MassDOT will investigate opportunities to execute the recommendations outlined in its planning studies and reports, including but not limited to the <i>Managed Lanes Screening Studies</i> , <i>Route 128/I-95 Land Use and Transportation Study</i> , <i>Congestion in the Commonwealth</i> , and Shared Travel Network analysis.	Operational Improvements Capital Planning	Highway OTP	New	Short term	RAI1.5;1.6; 2.1; 3.1 DCAI1.1; 1.5
RAI1.2 Rapid transit delays. The MBTA will continue to address systemic issues that affect delay along rapid transit lines according to strategic plans developed by the General Manager and Chief Operating Officer.	Operational Improvements	MBTA	Ongoing	Short term	RAI1.4; 2.1; 2.3 DCAI4.2
RAI1.3 Communications. The MBTA will continue efforts to keep the public apprised of project status and timelines and expected returns to normal service delivery so riders can better plan their trips.	Operational Improvements	MBTA	Ongoing	Short term	SAI4.3



Action Items	Category	Division(s)	Status	Timeframe	Related
<p>RAI1.4 Roadway bottlenecks and delay. The Highway Division will continue its efforts to prioritize locations within the roadway network that are prone to bottlenecks and delay and deploy site-specific mitigation projects.</p>	Capital Planning	Highway	Ongoing	Short term	SAI1.1 RAI1.1 DCAI1.1
<p>RAI1.5 Roadway pricing study. MassDOT will study roadway pricing with a focus on the transit capacity needed for success as well as implications of roadway pricing on vehicle miles traveled (VMT), while accounting for social and geographic equity.</p>	Research	OTP Highway Division	New	Short term	RAI1.1
<p>RAI1.6 Regional rail services. The MBTA will continue to explore options to expand its regional rail services in response to changing travel patterns and behaviors, and be proactive in executing the recommendations codified in the <i>Rail Vision</i> report. Similarly, RTD will continue efforts to develop Compass Rail.</p>	Capital Planning	MBTA RTD OTP	Ongoing	Short term	DCAI3.3; 5.1
<p>RAI1.7 Program for Mass Transportation (PMT) Development. MassDOT and the MBTA will complete the next Program for Mass Transportation, ensuring that transit capital plans align with <i>Beyond Mobility</i>, other statewide plans, and goals from the MBTA <i>Strategic Plan</i>.</p>	Policy and Program	MBTA OTP	Ongoing	Short term	N/A
<p>RAI1.8 Pavement and bridge reliability improvements. MassDOT's Highway Division will continue to address state of good repair issues that affect reliability along roadways according to MassDOT TAMP recommendations.</p>	Operational Improvements	Highway	Ongoing	Short term	RAI1.9
<p>RAI1.9 Expand roadway asset management activities. MassDOT will develop a plan for expanding asset management activities to include additional assets, including the condition of sidewalks and bicycle facilities as well as safety treatments to improve reliability.</p>	Capital Planning Research Operational Improvements	Highway OTP	New	Short term	RAI1.8



Reliability Problem Statement 2

Roadway congestion diminishes the reliability of public transit bus service, limiting its attractiveness and competitiveness.

Table 5.7 Reliability Action Items—Problem Statement 2

Action Items	Category	Division(s)	Status	Timeframe	Related
<p>RAI2.1 Roadway investments for transit reliability. MassDOT, the MBTA, and RTD will continue to coordinate with other transit providers, municipalities, and partner agencies during project development to identify and support potential roadway investments that will improve transit reliability. At the MBTA, this work will build upon the existing Bus Priority Vision and Toolkit initiative. MassDOT will also develop guidelines for municipalities and transit agencies on the design and implementation of bus lanes and other transit-priority infrastructure to ensure its placement accounts for all modes and does not diminish safety.</p>	Partnership and Engagement	<p>Highway MBTA OTP RTD</p>	Ongoing	Short term	RAI1.1; 1.2; 1.4; 2.3 DCAI2.1; 4.2; 5.1
<p>RAI2.2 Enforcement of traffic violations. MassDOT and the MBTA will coordinate with municipalities and other state agencies including the State Police to encourage and facilitate stricter enforcement of traffic violations involving transit-priority infrastructure, such as driving or parking in designated bus lanes, and will pursue statewide authority for automated enforcement of bus stops and bus lanes.</p>	Partnership and Engagement	<p>OTP MBTA Highway RMV Legislative Affairs</p>	New	Short term	N/A
<p>RAI2.3 Funding program for transit priority projects. MassDOT will work with the MBTA, RTAs, and municipalities to expand access to transit-priority infrastructure for the state's transit riders that reduces delay due to congestion. These projects will be formalized within a dedicated funding program for transit-priority projects on municipal roadways to improve reliability and competitiveness of transit.</p>	<p>Policy and Program Capital Planning</p>	<p>Highway OTP RTD</p>	New	Short term	RAI1.2; 2.1 DCAI2.1; 4.2; 5.1



Reliability Problem Statement 3

Congestion and freight bottlenecks impact the efficient movement of goods, which drives up labor costs, lowers capital productivity, and often results in higher costs for households and businesses.

Table 5.8 Reliability Action Items—Problem Statement 3

Action Items	Category	Division(s)	Status	Timeframe	Related
RAI3.1 Infrastructure projects. Using existing funding resources and consistent with MassDOT’s 2023 <i>Freight Plan</i> update, MassDOT will invest in infrastructure improvements that improve the flow of freight travel, including maintaining uncongested last-mile access to freight-generating facilities, resolving identified truck bottlenecks, and using critical freight corridors to support projects that improve multimodal freight mobility.	Capital Planning	Highway OTP RTD Aeronautics	New	Mid term	SAI2.4 RAI1.1; 3.2 SCTAI1.4
RAI3.2 Multimodal freight movement. MassDOT will continue to explore and support investments in innovative multimodal freight movement opportunities like Advanced Air Mobility (AAM) that may improve reliability of freight travel and reduce the negative externalities of existing transportation systems.	Policy and Program	Aeronautics RTD Highway	Ongoing	Short term	SAI2.4 RAI3.1 SCAI1.3
RAI3.3 Coordination with Rail-Based Freight Providers. MassDOT’s Rail and Transit Division will continue to coordinate with rail-based freight transportation providers that own railroads to improve collaboration with the goal of reducing the delay of passenger rail service that operates on freight lines.	Operational Improvements	RTD	Ongoing	Short term	

5.4 Supporting Clean Transportation

Ongoing Clean Transportation Efforts

In line with the Global Warming Solutions Act (as amended by An Act Creating A Next-Generation Roadmap for Massachusetts Climate Policy), and as referenced in Massachusetts’ *Clean Energy and Climate Plan for 2025/2030* (CECP), the Commonwealth of Massachusetts has set transportation greenhouse gas sub-limits for 2025, 2030, and 2050 at 18 percent, 34 percent, and 86 percent below the 1990 level, respectively. The statewide emissions limit for 2050 was set at Net Zero, defined as “A level of statewide greenhouse gas emissions that is equal in quantity to the amount of carbon dioxide or its equivalent that is removed from the atmosphere and stored annually by, or attributable to, the Commonwealth; provided, however, that in no event shall the level of



emissions be greater than a level that is 85 percent below the 1990 level.” The sector-specific emissions sublimits add up to an emissions reduction level that is slightly above the required statewide 85% GHG emissions reduction target.

MassDOT is committed to realizing the transportation sector sublimits established in the CECP by 2050 through the actions described in this section. The CECP spells out the most impactful actions that can be taken to achieve these targets. For transportation, these actions include electrification of both transit and personal vehicles through major investments in charging infrastructure, as well as making streets more complete, among others. MassDOT and the MBTA actions support the achievement of reducing GHG emissions in the transportation sector. For example, in 2022 MassDOT completed the *National Electric Vehicle Infrastructure Deployment Program Plan* to expand the supply of electric vehicle (EV) highway fast-charging stations serving long-distance travel corridors in Massachusetts.

The MBTA’s *2024–2028 Capital Investment Plan* (CIP) supports the MBTA’s Bus Electrification Strategy to achieve full bus electrification by 2040 through the modernization of major bus facilities to provide capacity for electrification, the continued conversion of bus fleet to zero-emissions technology, and the procurement of battery electric buses (BEBs), among other investments. The MBTA’s CIP also supports the MBTA’s commitment to the first phase of Regional Rail Transformation through key electrification investments. In a similar vein, MassDOT’s Rail and Transit Division (RTD) is continually providing the Commonwealth’s fifteen RTAs with opportunities for zero-emission fleet transition.

MassDOT RTD’s electrification initiatives have included, but are not limited to, analyses of the potential for zero-emission bus and battery electric bus deployment, Federal discretionary grant coordination to assist RTAs in winning Federal grants for low- and no-emission vehicles, incentive programs, partnerships with other state agencies, as well as capital investments in electrification across a variety of different programs. From 2015 to 2022, MassDOT has supported the replacement of 24 diesel-powered buses with BEBs through the CIP process. Additionally, MassDOT RTD’s Community Transit Grant Program (CTGP) has recently added EVs as an eligible vehicle type, with the first EV projects delivered in June of 2023.

In October 2023, Massachusetts Climate Chief Melissa Hoffer published a report with recommendations to implement the Healey-Driscoll Administration’s whole-of-government approach to addressing the climate crisis. MassDOT and the MBTA are continuing to coordinate with the Governor’s office and Climate Chief’s office to implement applicable recommendations. For example, MassDOT participated in the development of the *Massachusetts Climate Report Card* to inform residents of progress toward achieving the CECP’s mandates, and is in the process of establishing a Climate Project Management Office (PMPO) to fully operationalize climate work into the structure of MassDOT. An additional *Beyond Mobility* Action Item has been added below to address other items within the Climate Chief’s report.

Other ongoing efforts that support clean transportation at MassDOT include the Bicycle and Pedestrian Programs in MassDOT’s *Capital Investment Plan*, which funds tens of millions of dollars of projects over five years to improve bicycle and pedestrian infrastructure in line with MassDOT’s vision and goals adopted as part of MassDOT’s *Bicycle Plan* and *Pedestrian Plan*. Additionally, the MassTrails Grant Program provides grants to communities, public entities and non-profit organizations to plan, design, create, and maintain a diverse network of trails.



The Aeronautics Division is also exploring how advanced aviation air vehicles, such as battery- or hydrogen-powered aircraft can reduce aviation’s carbon footprint. The Aeronautics Division is also exploring options for clean power infrastructure such as electric charging stations and independent power generation systems (microgrids).

Supporting Clean Transportation Action Items

Supporting Clean Transportation Problem Statement 1

Transportation is the largest contributor of Massachusetts’ carbon emissions and transportation-related emissions are disproportionately concentrated in Environmental Justice communities.

Table 5.9 Supporting Clean Transportation Action Items—Problem Statement 1

Action Items	Category	Division(s)	Status	Timeframe	Related
SCTAI1.1 Complete streets. MassDOT will expand programs that make the Commonwealth’s streets more complete. Specifically, Federal Carbon Reduction Program (CRP) apportionment may be used to provide additional construction project funding for MassDOT’s Complete Streets and Safe Routes to Schools (SRTS) Programs to advance projects. Eligible projects will include new or expanded pedestrian and bicycle facilities, traffic calming, intersection redesign, transit improvements, streetscape investments, and more.	Capital Planning	OTP Highway RTD MBTA	New	Short term	SAI1.1; 2.2; 2.3; 3.1; 3.3; 3.4 RAI1.4 DCAI2.1; 2.2; 3.1; 3.2 TEAI2.2; 4.2
SCTAI1.2 Bus and other transit electrification. Consistent with MassDOT’s <i>Carbon Reduction Strategy</i> and Phase II of the <i>Zero-Emission Bus/Battery Electric Bus Implementation Plan</i> as well as the <i>Massachusetts Clean Energy and Climate Plan</i> , MassDOT and the MBTA will support the electrification of public transit buses alongside similar initiatives in paratransit and Commuter Rail services. Specifically, Federal CRP funding may be used to procure zero-emission public transit MBTA and RTA buses and charging infrastructure for the MBTA’s Bus Modernization program and other RTA initiatives. Hydrogen-fueled buses and vehicles will also be procured as part of this work.	Capital Planning	MBTA RTD OTP	Ongoing	Short Term	SCTAI2.2
SCTAI1.3 Freight greenhouse gas emissions. Consistent with the <i>Massachusetts Freight Plan</i> , MassDOT will support policies to reduce greenhouse gas emissions from freight vehicles.	Policy and Program	OTP Highway RTD Aeronautics	New	Short term	SAI2.4 RAI3.1 SCTAI1.4; 1.5



Action Items	Category	Division(s)	Status	Timeframe	Related
<p>SCTAI1.4 Equity in freight projects. MassDOT will establish a framework for prioritizing multimodal freight projects with a focus on equity, such as better understanding the proximity and impacts of freight infrastructure including truck emissions, warehousing and intermodal facility siting, refueling centers, and other sites to and on Environmental Justice communities.</p>	Policy and Program	<p>OTP Highway RTD Aeronautics</p>	New	Mid term	<p>SAI2.4 RAI3.1 SCTAI1.3</p>
<p>SCTAI1.5 Addressing recommendations in the Climate Chief’s report. The Massachusetts Climate Chief’s report released in October 2023 included several items relevant to MassDOT and the MBTA, including calls for new analyses, initiatives, and operational changes to make progress toward Massachusetts’ long-term climate goals. MassDOT will coordinate with the Massachusetts Office of Climate Innovation and Resilience to ensure all applicable actions move forward.</p>	Research Capital Planning	<p>OTP Highway MBTA RTD Aeronautics</p>	New	Mid term	SCTAI1.3

Supporting Clean Transportation Problem Statement 2

Availability of suitable infrastructure is a potential barrier to low-emission transportation choices.

Table 5.10 Supporting Clean Transportation Action Items—Problem Statement 2

Action Items	Category	Division(s)	Status	Timeframe	Related
<p>SCTAI2.1 EV Alternative Fuel Corridors. By implementing the MassDOT <i>NEVI Plan</i>, MassDOT will eliminate all gaps greater than 50 miles between 4x150kW fast charging stations on the Federally designated EV Alternative Fuel Corridor network. Federal NEVI Program and CRP funding may be used to support this effort, with the goal of ensuring drivers of personal and commercial vehicles have ease of access to charging on all designated Alternative Fuel Corridors.</p>	Capital Planning	Highway	New	Mid term	
<p>SCTAI2.2 Projects to support electrification. The MBTA will continue to invest in projects that support system electrification, building on its most recent CIP, which includes over 20 projects that support fleet, facilities, and energy asset upgrades to support electrification.</p>	Capital Planning	MBTA	Ongoing	Mid term	SCTAI1.2



Action Items	Category	Division(s)	Status	Timeframe	Related
SCTAI2.3 Sustainable aviation fuels. MassDOT Aeronautics will continue to work with the US Department of Energy and other state partners on funding strategies to bring sustainable aviation fuels to the Northeast and make them available to operators.	Policy and Program	Aeronautics	Ongoing	Mid term	
SCTAI2.4 Modernizing power infrastructure and energy procurement and generation. MassDOT and the MBTA will coordinate with other state departments (including the Executive Office of Energy and Environmental Affairs) and utility providers to support grid modernization, which is a critical effort to ensure that the Massachusetts electric grid is sufficient to support the degree of electrification required to meet the Commonwealth's electrification goals.	Capital Planning	Highway MBTA OTP	Ongoing	Short term	SCTAI1 .2 SCTAI2 .2

5.5 Destination Connectivity

Ongoing Destination Connectivity Efforts

In the spirit of the idea that transportation is more important for what it *does* than for what it *is*, MassDOT and the MBTA are involved in a number of initiatives that promote access to and from critical destinations that provide opportunities—economic opportunity, educational opportunity, and healthcare opportunities, among others. For example, the MBTA and MassDOT's Rail and Transit Division manages several programs providing access to opportunities using both formula and discretionary funding sources. MassDOT's competitive programs in this area include the Community Transit Grant Program (CTGP), which expands mobility for older adults and people with disabilities, and the Regional Transit Innovation Grant Program, which promotes transit improvements at RTAs and supportive transit improvements across the Commonwealth. Additionally, MassDOT's "Compass Rail" initiative calls for new intercity passenger rail routes that connect north-south routes through the Connecticut River Valley with east-west routes from Albany to Boston, with Springfield as the hub of the compass. As of the time of this plan (in June 2024), the following reflects the latest status of the Compass Rail Initiative:

- Preliminary engineering and environmental review for the Springfield Area Track Reconfiguration Project is ongoing with completion expected in spring 2025 (\$1.75 million in FY 2021 Federal Railroad Administration CRISI grant funding).
- Springfield Area Track Reconfiguration Project final design application submitted to FY23-24 FRA's CRISI program; under review. (\$36.8 million request, \$9.2 million match)
- Progress is being made in the Early Actions for the Inland Route project (\$108 million FY22 FRA CRISI). The foundational service model was completed in March 2024, and the infrastructure to be designed/constructed was identified in May.



- Boston & Albany Corridor accepted into FRA Corridor ID Program.
- State-funded Palmer Station Planning and Design is underway (\$4 million).
- State-funded Pittsfield Track Capacity Improvements (\$8 million) planning is underway. Design and construction to follow.
- Designer is being solicited for West Springfield Grade Crossing Elimination project.

Additionally, MassDOT has consistently been working with Amtrak and CTDOT to implement new service schedules that have resulted in an additional Northeast Regional round trip between Springfield and New York City, an additional CTrail trip between Springfield and New Haven, and better-positioned Valley Flyer trains. Ridership continues to exceed forecasts and break previous records, demonstrating strong demand for passenger rail in Western Massachusetts. MassDOT is also studying the potential to implement passenger rail service from North Adams to Greenfield and Boston (also known as the Northern Tier), with the speed, frequency, and reliability necessary to be a competitive option for travel along this corridor.

At the MBTA, a number of ongoing initiatives and projects address the important role the MBTA plays in allowing residents to access critical destinations. In addition to the agency's CIP, which funds a great deal of infrastructure projects to advance reliability and safety across all MBTA lines and modes, other MBTA initiatives in this area include but are not limited to the Better Bus Project, the Bus Network Redesign, and the Bus Priority Vision and Toolkit resources to expand bus priority within the MBTA's service area. Additionally, the future Silver Line Expansion from Chelsea through Everett toward Sullivan Square and potentially beyond is an example that represents the MBTA's work coordinating with municipalities to expand service and provide critical connections between destinations. The numerous service and infrastructure improvements currently underway, in development, or planned by the MBTA, MassDOT, and municipalities will enhance the competitiveness of transit relative to single-occupancy car travel.

From the standpoint of roadway and active transportation initiatives, MassDOT's Complete Streets Program provides municipalities funding, technical assistance, and training to bridge gaps in the multimodal transportation system using street and intersection redesigns, traffic calming, pedestrian crossing modifications, bicycle and pedestrian network connections, and transit investments. As of 2023, 260 municipalities have adopted Complete Streets policies, 243 municipalities have developed Complete Streets prioritization plans, and over 250 capital funding awards have been granted. MassDOT's Safe Routes to School (SRTS) Program also funds projects that promote access to education for the Commonwealth's K-12 students. Over 70 SRTS infrastructure projects have been completed in Massachusetts to date, and over 1,000 schools throughout Massachusetts are SRTS partners.

Other funding programs that promote multimodal accessibility include the MassTrails Program (in partnership with the Massachusetts Department of Conservation and Recreation and other partners) and the MassDOT Shared Use Path Program in the *Capital Investment Plan*. Additionally, MassDOT's Bicycle and Pedestrian Program within the *Capital Investment Plan* is both informed by MassDOT's *Bicycle Plan* and *Pedestrian Plan* as well as data sources such as the Potential for Everyday Walking and Bicycling. Additionally, the Highway Division's Engineering Directives and design guidelines require project proponents to include bicycle, pedestrian, and transit infrastructure



as part of all projects MassDOT oversees, ensuring that infrastructure is as safe and connected as possible for all users of the transportation system. The criteria MassDOT uses to select projects also include factors related to access to destinations.

Additionally, MassDOT planning studies increasingly address the housing and land use contexts of our network operations. The recent Route 128/I-95 study is a call to urgency around this issue, as transportation challenges are often not borne by the network itself, but by the land use context in which it operates. For example, the recent Route 128/I-95 Land Use and Transportation Policy found that just 500 out of 56,000 employees in a high-density Waltham research and lab use environment live near where they work and that 60 percent of all its workers live at least ten miles away. Of the 7,000 people that live in the study area, 92 percent commute out of it to go to work. When people are unable to live near where they work—and housing costs and vacancy rates being what they are—they often incur significant commutes, which are further exacerbated by limited transit options, all of which limit people’s ability to get places. This is the case in many of the key employment centers throughout the state, which are burdened by the effects of many commuters using the same roads to get to the same places around the same times. While MassDOT supports the growth in commercial enterprises throughout the state, many analyses support the need to simultaneously expand housing opportunities—especially high-density units—in areas of economic significance.

This plan acknowledges and accounts for the vast diversity in land use types and community contexts across the state. From Williamstown to Wellesley to Wellfleet, Massachusetts has it all, from farmlands to beachside resorts, and the hum of the Financial District to the lull of the salt marshes. We know that different parts of the state have different needs and challenges and are committed to implementing flexible policies and strategies to be responsive to these differences. Many significant issues are raised in the [Rural Policy Plan](#) that was released in 2019, including concerns around public transit provision and affordability in lower-density parts of the state. We look forward to working with many stakeholders in Berkshire, Franklin, Hampden, and Hampshire counties on opportunities to execute on the action items in rural areas, as described in this Plan.

Destination Connectivity Action Items

Destination Connectivity Problem Statement 1

People living in Environmental Justice communities are burdened by connectivity inequities across our transportation system, limiting their access to opportunities.



Table 5.11 Destination Connectivity Action Items—Problem Statement 1

Action Items	Category	Division(s)	Status	Timeframe	Related
DCAI1.1 Commute time disparities. MassDOT will further study where the greatest disparities in commute time are across different demographic groups, and coordinate with transit providers and municipalities to consider service and network changes that reduce these disparities, including bus-only lanes, regional rail expansion, and other transit prioritization techniques. A focus on qualitative data on people’s lived experiences will be part of this analysis.	Research Operational Improvements	OPMI OTP Highway MBTA RTD	New	Mid term	RAI1.1; 1.4; 1.5 DCAI1.2; 2.1; 2.2; 3.1; 3.2; 3.3; 4.1
DCAI1.2 Tracker metrics for destination connectivity. MassDOT will explore adding performance metrics on access to destinations to Tracker. These metrics will include the number of critical destinations and essential services accessible by different modes including micromobility and demographic groups including disability status across different times of day.	Research	OPMI OTP	New	Short term	SAI1.3 DCAI1.1
DCAI1.3 Options for people who are low income or who have disabilities. MassDOT will explore opportunities to use discretionary funds to support expanding employment transportation to low income individuals and people with disabilities. MassDOT will work with the Executive Office of Labor and Workforce Development (EOLWD) to set up this program.	Policy and Program	OTP RTD	New	Mid term	TEA3.5; 3.6

Destination Connectivity Problem Statement 2

The lack of contiguous, safe, high-comfort bike or pedestrian pathways connecting existing pedestrian and bicycle facilities limits the ability of people walking, bicycling, and using other non-motorized modes, including mobility-assistive devices, to access critical destinations.



Table 5.12 Destination Connectivity Action Items—Problem Statement 2

Action Items	Category	Division(s)	Status	Timeframe	Related
<p>DCAI2.1 Funding program for multimodal transit connections. MassDOT will create a new program (either as part of the <i>Capital Investment Plan</i> or as a state-funded grant program) intentionally prioritizing a list of non-vehicular modernization projects. This program could potentially start with projects on state-owned roadways that contain MBTA or RTA stops (including flag stops) or stations to promote access to transit and ADA accessibility. Environmental Justice communities where there are network gaps referenced in the NextGen Bike/Pedestrian Vision initiative, high potential for everyday walking and bicycling and that contain transit stops, and that receive less investment dollars than other places will be prioritized as part of this framework.</p>	Policy and Program	<p>Highway OTP RTD MBTA Aeronautics</p>	New	Mid term	SAI3.4 RAI2.1; 2.3 SCTAI1. 1 DCAI1.1; 2.2; 3.1; 3.2; 4.2; 5.1 TEA1.3
<p>DCAI2.2 Shared Use Path Program and MassTrails Grants. MassDOT will continue to encourage applications and provide technical support for the MassTrails grant program in partnership with the Massachusetts Department of Conservation and Recreation, which currently provides funding for both local trails and larger trails that demonstrate network connectivity. These grants are typically used to advance the design of gaps in the shared-use path network as well as improve trail amenities and wayfinding signage. MassDOT will also advance shared use paths through its capital investment planning process.</p>	Partnerships	<p>Highway OTP</p>	Ongoing	Short term	SAI3.1; 3.4 SCTAI1. 1 DCAI1.1; 2.1; 3.2 TEA1.3; 4.2



Action Items	Category	Division(s)	Status	Timeframe	Related
DCAI2.3 Municipal Sidewalk Program. MassDOT will explore the creation of a new sidewalk formula program for municipalities to support expansion, accessibility, maintenance, and operations (including supporting snow and ice operations) of local networks.	Policy and Program	Highway OTP	New	Short term	DCAI3.2, SAI1.1, SAI2.3, SAI3.2, SAI3.4, SCTAI1.1
DCAI2.4 Americans with Disabilities Act (ADA) Transition Plan Update. MassDOT will continue efforts to update its ADA Transition Plan by 2025, which will include a new sidewalk accessibility assessment and updates to MassDOT's curb ramp inventory. This assessment will document (among other items) missing ramps (coordinates of the locations); ADA compliance for each ramp; ramps at driveways; ramp cracking and other defects; and ramp material types.	Policy and Program	ODCR	Ongoing	Short term	SAI3.1 DCAI2.1

Destination Connectivity Problem Statement 3

Residents outside of inner core areas across the Commonwealth, particularly those in rural areas, lack convenient transit services and other non-vehicular transportation options and feel disconnected from cultural, economic, and other opportunities. Additionally, current passenger rail service opportunities for the western half of the Commonwealth are extremely limited.



Table 5.13 Destination Connectivity Action Items—Problem Statement 3

Action Items	Category	Division(s)	Status	Timeframe	Related
DCAI3.1 Expand local and regional funding opportunities for destination connectivity purposes. As increased Federal and state funding becomes available, MassDOT will expand existing programs and develop more robust and targeted funding opportunities focused on closing first- and last-mile gaps to fixed route transit, as well as access to healthcare services, employment, and other critical destinations to include more types of transit service through local transportation providers (e.g., municipalities, non-profits, RTAs, and the MBTA). These programs include, but are not limited to, the Community Transit Grant Program and future discretionary grant programs when funding allows.	Policy and Program Capital Planning Partnerships	RTD OTP MBTA Aeronautics	New	Mid term	SAI3.4 SCTAI1.1 DCAI1.1; 3.2; 4.2; 5.1 TEA1.3
DCAI3.2 First- and last-mile MBTA projects. The MBTA will be directed to seek and spend funds for first- and last-mile purposes. These efforts may involve opportunities to support new microtransit services and advance Transit Improvement Districts to support public-private partnerships. New service in this area will focus on less dense areas within the MBTA service area, promoting access to Commuter Rail stations and other critical destinations.	Policy and Program Partnerships	MBTA	New	Mid term	SCTAI1.1 DCAI1.1; 2.1; 2.2; 3.1; 5.1
DCAI3.3 Compass Rail. MassDOT will continue efforts to advance Compass Rail, an expanded intercity rail network, with a defined mission statement, key milestones, and detailed project schedules as projects obtain funding.”	Policy and Program Capital Planning	RTD	Ongoing	Short term – mid term	RAI1.7

Destination Connectivity Problem Statement 4

Though the Commonwealth supports reduced vehicle travel as a climate change strategy, people traveling in Massachusetts find it difficult to get around using other modes including transit, cycling, and water transportation.

Table 5.14 Destination Connectivity Action Items—Problem Statement 4

Action Items	Category	Division(s)	Status	Timeframe	Related
DCAI4.1 Vehicle vs. transit accessibility ratios. MassDOT will analyze and compare accessibility outcomes for vehicle versus transit trips to better understand the competitiveness of transit versus private vehicle travel in the interest of improved and more efficient transit service planning.	Research	OPMI OTP MBTA RTD Highway	New	Short term	DCAI1.1



Action Items	Category	Division(s)	Status	Timeframe	Related
<p>DCAI4.2 Coordinating bus transit improvements with RTA providers. MassDOT will continue to coordinate with transit providers in Massachusetts to explore opportunities to make targeted improvements in the areas of reliability, frequency, coverage, and on time performance. Specific considerations will include expanding weekend service and increasing frequency overall. For example, RTD is implementing a program focused on transit innovation.</p>	Partnerships Policy and Program	RTD OTP Highway	Ongoing	Mid term	RAI1.2; 2.1; 2.3 DCAI1.1; 2.1; 3.1; 5.1
<p>DCAI4.3 Expanded water transportation options. MassDOT and the MBTA will coordinate to expand water transportation options. This expansion of water transportation service will be informed by a <i>Water Transportation Plan</i> and emphasize connections from waterfront communities that lack convenient public transportation service to employment centers and other critical destinations.</p>	Policy and Program Research Capital Planning	MBTA OTP	New	Mid term	DCAI3.1

Destination Connectivity Problem Statement 5

Existing land use patterns reinforce vehicle travel and exclude many Massachusetts residents from having sufficient modal choices.

Table 5.15 Destination Connectivity Action Items—Problem Statement 5

Action Items	Category	Division(s)	Status	Timeframe	Related
<p>DCAI5.1 Identify areas for high-impact transit-oriented investments, both in the MBTA service area and elsewhere in the state. Through geospatial analysis, MassDOT will identify locations that contain high concentrations of households with no vehicle access and high demand for transit in order to prioritize investments and service delivery as well as better coordinate transportation with housing production goals. Outside of the MBTA service area, particular attention in this analysis will be paid to areas where there is existing or planned passenger rail service as part of the Compass Rail initiative.</p>	Research	OTP	New	Short Term	RAI1.1; 1.7; 2.1 DCAI3.1; 3.2; 4.2

5.6 Resiliency

Ongoing Resiliency Efforts

MassDOT and its partner agencies are continually involved in evaluating the transportation system's resiliency. Specifically, MassDOT is in the process of developing a Flood Risk Assessment to quantify risks to a range of critical transportation assets, and the MBTA has conducted similar vulnerability assessments across all of its lines and assets. This work will build on the Massachusetts Coast Flood Risk Model (MC-FRM), which display extents and depths of flooding produced for 2030, 2050, and 2070 while accounting for sea level rise due to continued high emissions of greenhouse gases and storm surges associated with coastal storms (hurricanes and northeasters). Additionally, in response to BIL's Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation (PROTECT) Formula and Discretionary Grant Program, MassDOT's Highway Division has prepared potential candidate projects for the use of this funding.

For integrating resiliency with asset management efforts, MassDOT has incorporated resiliency considerations into its most recent TAMP. Since pavements are susceptible to temperature extremes and fluctuations and given New England's distinct seasonality, MassDOT is committed to improving resiliency through pavement design. Additionally, through its asset management efforts, MassDOT will continue to emphasize routine preservation to ensure pavements are safe for all modal users in any weather conditions, while also able to withstand the challenges of extreme weather. MassDOT's Highway Division has also developed a *Resiliency Improvement Plan* to demonstrate the Division's systematic approach to surface transportation system resilience and how it informs immediate and long range planning activities and investments.

[*ResilientMass*](#)—also known as the is Massachusetts' 2023 *State Hazard Mitigation and Climate Adaptation Plan* (SHMCAP)—is the Commonwealth's initiative for building statewide capacity for climate change adaptation and resilience. It aims to ensure the Commonwealth is prepared to withstand, rapidly recover from, adapt to, and mitigate natural hazard events. MassDOT's Highway Division and the MBTA are two of 29 state agencies included in *ResilientMass*. The *ResilientMass* Action Team (RMAT) is an inter-agency team comprised of representatives from each Secretariat. Both MassDOT and the MBTA submitted actions as part of this effort.

The MBTA's *ResilientMass* actions include work on the agency's Tunnel Flood Mitigation program, begun in 2021, which involves the development of conceptual designs for flood protection of the Alewife Storage Tracks and the Airport Portal. The program is also seeking to address—presently through initial scoping and next into design and construction—upgrades to flood control measures. By protecting portals, the MBTA is seeking to keep coastal flood water out of the transit system. Additionally, the MBTA Office of the Chief Engineer is in the process of updating its design standards for the entire system. The design standards have been drafted to incorporate climate resiliency across all areas. The final design standards will ensure that climate resiliency considerations, such as designing for extreme temperatures, managing stormwater for both improved water quality and resilience, addressing coastal flooding, and designing for high winds, among others, are incorporated into all of the MBTA's design requirements.



Resiliency Action Items

Resiliency Problem Statement 1

Significant transportation infrastructure in Massachusetts is exposed to natural hazards.

Table 5.16 Resiliency Action Items—Problem Statement 1

Action Items	Category	Division(s)	Status	Timeframe	Related
RSAI1.1 High-risk asset identification. MassDOT will continue to identify and address transportation assets that are at risk due to flooding, extreme weather events and storms, and hazards over the coming decades through ongoing analyses and planning efforts. Future capital projects and discretionary grant applications focused on resiliency improvements will address these identified locations, and will identify opportunities to prioritize assets in Environmental Justice communities.	Research Capital Planning	OTP Highway MBTA RTD Aeronautics	Ongoing	Mid term	RSAI1.2; 1.4; 1.7; 1.14
RSAI1.2 Project screening for climate risk. MassDOT will enhance project screening through geospatial tools and multi-disciplined project scoping to ensure that infrastructure projects are scoped using the best available information to assess climate risk.	Research	OTP Highway MBTA	New	Short term	RSAI1.3; 1.12; 1.14
RSAI1.3 Funding opportunities. MassDOT will take advantage of funding opportunities that are focused on resiliency improvements to address known resiliency issues, including the replacement of undersized culverts, stabilization of roadway embankments and slopes in areas subject to erosion during heavy rain events, and improved drainage systems to manage stormwater more efficiently for improved roadway operational safety and environmental quality.	Capital Planning	Highway	Ongoing	Mid term	RSAI1.5; 1.8
RSAI1.4 Comprehensive culvert and drainage inventory and mapping. MassDOT will explore the creation of a culvert inspection program, a culvert replacement and improvement program, as well as develop full inventories of drainage systems and geohazard mapping of ledges and slopes.	Capital Planning Program and Policy	Highway RTD MBTA OTP	New	Short term	SAI3.4 RSAI1.4
RSAI1.5 Resiliency grant program. MassDOT will explore the creation of a state-managed discretionary capital improvements program focused on soliciting resiliency projects from communities based upon vulnerability assessments performed as part of planning grants through the Municipal Vulnerability Preparedness (MVP) program.	Partnerships Policy and Program Capital Planning	OTP Highway Division	New	Mid term	RSAI1.1

Action Items	Category	Division(s)	Status	Timeframe	Related
RSAI1.6 UAS for disaster assessment. MassDOT Aeronautics Division will explore the use of unmanned aerial systems (UAS) to assess the impacts of natural disasters on transportation infrastructure and assist in emergency response.	Research	Aeronautics	New	Short term	SAI5.3; 5.5
RSAI1.7 Freight system assets. Consistent with the <i>Freight Plan</i> , MassDOT will prioritize the protection of freight system assets and operations from climate change and extreme weather impacts.	Capital Planning Policy and Program Research	Highway OTP RTD Aeronautics	New	Short term	SAI2.4 RAI3.1 RSAI1.3; 1.14
RSAI1.8 MBTA investments in resiliency. The MBTA will continue to make investments that involve systemwide resiliency benefits, asset hardening, maintenance, and flood protection, building on the most recent CIP. The 2024-2028 CIP contains 70 projects with a nexus to resiliency, a subset of which are projects specifically motivated by resiliency concerns.	Capital Planning	MBTA	Ongoing	Short term	RSAI1.1; 1.10; 1.13; 1.16; 1.17
RSAI1.9 Climate change adaptation training and guidance. Invest in internal and external training, including continuation of the fluvial geomorphology based "Rivers & Roads" training program which provides guidance on bridge and culvert design interaction with emerging fluvial geomorphology practices. Coordinate with resource agencies on this effort, as needed. Update existing guidance documents to ensure proposed bridge and culvert projects are appropriately sized. Conduct internal staff training to ensure compliance with the Massachusetts Stream Crossing Standards.	Policy and Program Partnerships	Highway OTP	Ongoing	Mid term	
RSAI1.10 Conduct MBTA climate vulnerability assessments. Complete a vulnerability assessment of critical locations across the Commuter Rail system (especially in historic flood locations), and assess the vulnerability of all three major Commuter Rail facilities as well as assets used as part of the RIDE paratransit program. Finish conducting the Cabot Yard Vulnerability Assessment, and complete additional bus facility vulnerability assessments (in coordination with the Bus Modernization Program).	Policy and Program	MBTA	Ongoing	Mid term	RSAI1.2; 1.3; 1.8; 1.12; 1.13
RSAI1.11 Implement the Highway Resiliency Improvement Plan. MassDOT's Highway Division will implement its <i>Resiliency Improvement Plan</i> in coordination with other agencies as applicable.	Policy and Program	Highway OTP	New	Mid term	RSAI1.7; 1.14; 1.15; 1.18



Action Items	Category	Division(s)	Status	Timeframe	Related
<p>RSA1.12 MBTA Design Standards Update. The MBTA Office of the Chief Engineer is in the process of updating its design standards for the entire system. The design standards have been drafted to incorporate climate resiliency in all of the standards. Significant editing and revisions are needed, as well as stakeholder engagement from departments across the MBTA. When this project is complete, the goal is to have climate resiliency considerations (such as designing for extreme temperatures, managing stormwater for both improved water quality and resilience, addressing coastal flooding, and designing for high winds) incorporated into the design requirements. These will be the requirements that all new construction at the MBTA (and retrofits) must adhere to.</p>	Policy and Program	MBTA	Ongoing	Mid term	RSAI1.8; 1.10; 1.15
<p>RSA1.13 Resilience improvement prioritization. Screen and prioritize resilience improvements to vulnerable roadway/bridge assets utilizing information from the MassDOT <i>Resiliency Improvement Plan</i> evaluation, CAVA, MaPIT, and similar sources. Coordinate with other agencies and engage stakeholders, as applicable, through the project development process. Ensure transparency to communities on the process.</p>	Policy and Program Research	Highway OTP	Ongoing	Mid term	RSAI1.2; 1.3; 1.7; 1.11; 1.12; 1.15
<p>RSA1.14 Resilient design research and planning. Research best practices and leading examples of transportation asset resilient designs and standards to inform future MassDOT initiatives and design guidance. Prepare a summary of findings.</p>	Research	OTP Highway	Ongoing	Mid term	RSAI1.11; 1.12; 1.13; 1.14
<p>RSA1.15 Tunnel Flood Mitigation Program. The MBTA's Tunnel Flood Mitigation program, which began in 2021, is presently working on conceptual designs for flood protection of the Alewife Storage Tracks and the Airport Portal. The program is also seeking to address upgrades to track dewatering pump rooms. By protecting portals, the MBTA is seeking to keep coastal flood water out. Improving the pump rooms that handle everyday water on the tracks will help mitigate flooding internally. The next steps in this program will be addressing the D Street Portal on the Silver Line in the Seaport (designing flood protection), and addressing flood protection for the MBTA's lowest critical flood locations (especially the ones exposed to coastal flooding in the near term), such as vent shafts, manholes, emergency egresses, etc.</p>	Policy and Program	MBTA	Ongoing	Mid term	RSAI1.8; 1.17



Action Items	Category	Division(s)	Status	Timeframe	Related
RSA1.16 Update the MBTA's Emergency Response Plans and GIS viewer for real-time storm response. The MBTA will revise and update its <i>Severe Weather Operations Plan</i> as well as its <i>Snow and Ice Plan</i> to reflect both the latest climate science and expectations about operating in severe weather. The completion of an updated <i>Comprehensive Emergency Management Plan</i> (CEMP) is underway as part of the MBTA's Tunnel Flood Mitigation program. The updated CEMP, which accounts for all climate hazards, will directly inform an update to the <i>Severe Weather Operations Plan</i> and <i>Snow and Ice Plan</i> . The <i>Severe Weather Operations Plan</i> currently in place requires more robust coordination between different MBTA departments, and a verification that the resources that each department says it plans to rely upon will be available in the event of a major storm. Having a GIS viewer for real-time storm response (a deliverable that is part of the Tunnel Flood Protection Program) will help with this coordination and revision of the plans.	Policy and Program	MBTA	Ongoing	Short term	RSAI1.8
RSAI1.17 Review TRB's self-assessment tool for project development. Review the Transportation Research Board (TRB)'s self-assessment tool to identify opportunities to incorporate components into the project review process. This will focus on incorporating opportunities for reducing hazards and climate change concerns into the project screening and implementation process.	Policy and Program	Highway	New	Mid term	RSAI1.11; 1.12

5.7 Travel Experience

Ongoing Travel Experience Efforts

In the context of *Beyond Mobility*, “travel experience” refers to the ability to use Massachusetts’ transportation system with comfort and ease. More specifically, travel experience encompasses asset management considerations (e.g., pavement condition in a roadway context or transit vehicle age in a transit context) as well as various areas that characterize the ease with which the transportation system can be navigated, including affordability, wayfinding, and available trip planning resources, among others.

MassDOT conceives of this “travel experience” as similar to the idea of “user experience”; that is, it represents how someone who uses the transportation system interacts with the system or service. For many, a high-quality travel experience centers on the core functions of a transportation system, including travel that is low-stress, comfortable, consistent, and navigable.



MassDOT and its partner agencies have completed several analyses on—and have made investments in—projects that enhance users’ experience of traveling throughout the transportation network in Massachusetts. These efforts have included everything from studying the state of good repair of transportation facilities in Massachusetts through plans like MassDOT’s TAMP and ADA Transition Plan as well as transit vehicles through transit providers’ Transit Asset Management Plans to MassDOT’s Ride Match initiative, which provides a one-stop searchable directory of public, private and accessible transportation options in Massachusetts. At the MBTA, initiatives such as the means-tested fare program aim to increase access to transit services for low-income riders and efforts to enhance and expand real-time information are also underway.

Travel Experience Action Items

Travel Experience Problem Statement 1

All transit riders, including users of paratransit and human services transportation (HST), deserve a better user experience and increased affordability on transit, in Environmental Justice communities and across the Commonwealth.

Table 5.17 Travel Experience Action Items—Problem Statement 1

Action Items	Category	Division(s)	Status	Timeframe	Related
TEA11.1 Fare program results. The MBTA will continue to explore expanded access to the Free/Reduced Fare Program for eligible riders with disabilities, older adults, young people and low-income individuals. Decision-makers will proactively engage with options to increase ridership and equity of the MBTA system while maintaining fares as a key source of revenue for the MBTA.	Policy and Program	MBTA	Ongoing	Short term	TEA11.2
TEA11.2 Fare-free transit options. MassDOT will coordinate with the RTAs to continue piloting fare-affordability transit programs as recommended by the FY23 RTA Fare Free Pilot Program final report. Future analyses or considerations for transitioning to fare-free transit should examine the opportunity for longer pilot durations and additional analysis on equity impacts, maximum load or existing capacity of revenue vehicles, and the cost to collect fares, including recurring costs to upgrade fare collection technology.	Policy and Program Partnerships	RTD MBTA Legislative Affairs	Ongoing	Mid term	TEA11.1; 3.2



Action Items	Category	Division(s)	Status	Timeframe	Related
<p>TEAI1.3 Capital enhancements for transit station access improvements. MassDOT will support the MBTA and the state’s RTAs to identify bus stops and other transit system access points and elements in need of capital enhancement, including increasing the comfort and safety of these access points and customer amenities offered at them. Since municipalities and private companies often own bus stop infrastructure, these entities will be engaged as appropriate.</p>	Partnerships Capital Planning	MBTA RTD	New	Mid term	SAI4.4 DCAI2.1; 2.2; 3.1 TEAI3.1
<p>TEAI1.4 Enhance coordination of services involved in human services transportation (HST). Develop more robust collaboration efforts between all agencies involved in providing human services transportation, including seniors, paratransit, and non-emergency medical and social service needs. MassDOT’s Rail and Transit Division will look to further develop its partnership and collaboration with other agencies that support these services, particularly the Executive Office of Health and Human Services’ Human Service Transportation Office, the Department of Developmental Services, the Massachusetts Rehabilitation Commission, the Massachusetts Commission for the Blind, the Department of Mental Health, Councils on Aging, the MBTA, RTAs, and other identified agencies and their relevant departments and offices</p>	Partnerships Policy and Program	RTD MBTA	New	Short term	

Travel Experience Problem Statement 2

Missing sidewalks, curb ramps, and crosswalks limit mobility options, especially for older adults, people with disabilities, and children. This is a particular issue in rural communities, where many such residents live.

Table 5.18 Travel Experience Action Items—Problem Statement 2

Action Items	Category	Division(s)	Status	Timeframe	Related
<p>TEAI2.1 Data layers. MassDOT will make special efforts to build out high-quality, frequently updated data layers regarding pedestrian and bicycle infrastructure to ensure that our agency and partners are equipped with the most up-to-date information regarding conditions along these network elements. This includes investing in LiDAR and exploring best practices for collecting and maintaining this data, especially in low-density areas.</p>	Research	OTP OPMI	New	Mid term	TEAI2.2; 3.4; 4.2



Action Items	Category	Division(s)	Status	Timeframe	Related
TEAI2.2 Funding and technical assistance. MassDOT will use updated data and resources, including those reflecting bicycle and pedestrian infrastructure, to pursue Federal and state funding for discretionary grant-making purposes to cities and towns and provide enhanced technical assistance for Complete Streets and Safe Routes to School projects.	Policy and Program Research	OTP Highway	New	Mid term	SAI1.2 SCTAI1.1 TEAI2.1; 3.4
TEAI2.3 Issue briefs for traditionally underrepresented communities. MassDOT will develop issue briefs that more fully document unique transportation challenges and concerns of traditionally underrepresented demographic groups. These groups include but are not limited to people with disabilities; residents of rural communities; people of color; older adults; the LGBTQIA+ community; Asset Limited, Income Constrained, Employed (ALICE) people; the immigrant community; women; indigenous people; and youth. These Massachusetts-specific issue briefs will provide an in-depth summary of these communities' unique transportation needs and document action items and best practices for addressing them.	Research	OTP	New	Short term	

Travel Experience Problem Statement 3

Transit riders, people with disabilities, and limited English proficient (LEP) community members find it challenging to understand and navigate transit infrastructure, including stations, service changes involving diversions, and alternative routing options.

Table 5.19 Travel Experience Action Items—Problem Statement 3

Action Items	Category	Division(s)	Status	Timeframe	Related
TEAI3.1 Station and vehicle improvements. The MBTA and RTAs will continue to invest in station and vehicle improvements that increase accessibility for people with disabilities including installing new elevators in stations, enabling the real-time broadcast of information audibly and visually, purchasing new buses, and launching initiatives that provide riders with accessibility resources. Those stations, stops, and vehicles that are currently inaccessible will be prioritized.	Capital Planning	MBTA RTD	Ongoing	Mid term	SAI4.4 TEAI1.3
TEAI3.2 Signage and customer information. In addition to the standard capital program process, MassDOT will look for new opportunities to offer funding to RTAs to expand signage and real-time customer information-sharing systems, with a particular focus on translating materials into languages other than English.	Policy and Program	RTD	New	Mid term	TEAI3.4; 4.1



Action Items	Category	Division(s)	Status	Timeframe	Related
TEAI3.3 Inventory of wayfinding gaps. MassDOT, in coordination with regional planning partners and municipalities, the MBTA, and the RTAs, will develop an inventory of bus stops and transit stations that lack sufficient wayfinding signage and the translation of information into appropriate languages. This inventory will be accompanied by an analysis of bus stop and transit station usage by different demographic groups to better understand the needs of these communities. This inventory will inform a capital funding program targeting improved wayfinding for critical locations and populations.	Policy and Program	OTP ODCR MBTA RTD	New	Short term	TEAI2.1; 2.2; 3.3; 4.1
TEAI3.4 Regional Mobility Manager network. MassDOT will continue to explore the development of a network of Regional Mobility Managers across the state, consistent with the Regional Mobility Management study. Regional Mobility Managers assist older adults, people with disabilities, low-income individuals, and others who lack access to transportation in learning about and learning to use existing transportation options—and assisting organizations in partnering to fill gaps in the transportation network.	Policy and Program	RTD OTP	New	Mid term	DCAI1.3 TEAI3.6
TEAI3.5 Ride Match. Ride Match is an online, searchable database of public and private transportation options. MassDOT will develop processes and protocols to ensure that the data is regularly updated and a fully functional resource for people to learn about transit options available through all sources including transit authorities, Councils on Aging, local nonprofits, and private operators.	Policy and Program	RTD OTP	New	Mid term	DCAI1.3 TEAI3.6

Travel Experience Problem Statement 4

Bicyclists report that wayfinding and amenities at facilities are confusing or substandard.

Table 5.20 Travel Experience Action Items—Problem Statement 4

Action Items	Category	Division(s)	Status	Timeframe	Related
TEAI4.1 Guidance on wayfinding and signage. MassDOT will provide technical assistance to municipalities and partner agencies for bicycle routes and wayfinding signage.	Policy and Program Partnerships	OTP Highway	New	Mid term	TEAI3.3; 3.4
TEAI4.2 Inventory of active transportation amenities. MassDOT will conduct a full inventory of amenities like bicycle repair stations, benches, restroom facilities and shelters, water fountains, and bicycle parking available at key points along rail trails and major bicycle and pedestrian corridors.	Research	OTP	New	Short term	SAI3.1; 3.2 SCTAI1.1 DCAI2.2 TEAI2.1



Travel Experience Problem Statement 5

The systems and protocols that support excellent customer service are not always prioritized.

Table 5.21 Travel Experience Action Items—Problem Statement 5

Action Items	Category	Division(s)	Status	Timeframe	Related
TEAI5.1 Customer surveys. MassDOT and the RTAs will continue to expand customer survey efforts to better understand overall customer satisfaction issues and to log customer complaints.	Policy and Program	OPMI RTD	New	Short term	N/A
TEAI5.2 RMV Customer service improvements. MassDOT’s RMV will improve and modernize facilities and online services to improve operational efficiency, effectiveness and customer service. Specifically, this effort will involve the continued digitization of RMV service to reduce VMT to RMV service centers as well as the advancement of credentialing with multiple privileges (e.g., consolidating state processes to expand the use of driver’s licenses for multiple purposes, including accessing public transportation, demonstrating professional credentials, and eligibility for state-funded programs administered by other agencies).	Operational Improvements	RMV	Ongoing	Short term	N/A
TEAI5.3 Improvements to MassDOT Highway Service Centers and Rest Areas. MassDOT’s Highway Division will identify and implement improvements for highway service centers and rest areas under its jurisdiction.	Operational Improvements	Highway	New	Short term	N/A



6.0 Performance-Based Planning

This chapter describes a number of performance measures that could be implemented to track the impacts of the *Beyond Mobility* Action Items on overall performance of the transportation system in Massachusetts. Performance-based planning is a strategic approach that uses data to support decisions to help achieve desired performance outcomes. Given *Beyond Mobility's* focus on equity and centering people as part of the transportation planning process, data analyzed as part of this chapter address multiple modes of travel and the experience of all communities in the Commonwealth through an equity lens. Using these data, MassDOT has identified three categories of metrics that illustrate performance:

- Measures that can be analyzed and reported longitudinally (in multiple years across time) within the *Beyond Mobility* report and Appendix D (*System Performance Report*).
- Measures that are important to track and could be analyzed and reported in the near future. These measures may require some additional analysis or maturation of data in order to produce analyses over time and targets for the future.
- Measures that may be desirable to track but that require additional effort to collect data in order to build MassDOT's understanding to a point where data can be reported and targets can be set.

Across all categories, MassDOT has identified a subset of measures to further define in the future and for potential inclusion in future editions of MassDOT's annual performance report *Tracker*. These are summarized in Table 6.1.

Table 6.1 Measures Recommended for Inclusion in *Tracker*

Priority Area	Measure
Safety	Number of pedestrian crashes per population in REJ+ and non-REJ+ communities
	Pedestrian crash cluster area per population in REJ+ and non-REJ+ communities
	Number of non-motorist serious injuries and fatalities per population in REJ+ and non-REJ+ communities
	Number of vehicular fatal and serious injury crashes per population in REJ+ and non-REJ+ communities
	Percent difference in roadway risk miles between REJ+ and non-REJ+ communities
	Number of fatalities on principal or minor arterials
	Miles of sidewalk gaps in areas with older adults and people with disabilities
	Miles of sidewalk gaps within one-half mile of transit
Destination Connectivity	Difference in travel times between white and non-white commuters
	Percent of potential for bicycling (high) miles of total road miles
	Average number of critical destinations (hospitals, food retailers, higher education institutions, jobs, and parks) available to people living in block groups



Priority Area	Measure
	<p>with high % of non-white households vs. all else within 30 minutes of travel time by transit</p> <hr/> <p>Average number of critical destinations (hospitals, food retailers, higher education institutions, jobs, and parks) available to people living in block groups with high % of non-white households vs all else within 30 minutes of travel time by car</p> <hr/> <p>Percent of residents who drive alone to work</p> <hr/> <p>Number of existing and planned bike facilities per capital in REJ+ and non REJ+ communities</p> <hr/> <p>MassDOT-owned roads with sidewalks</p> <hr/> <p>Percent of sidewalk gaps on roadway miles near rural transit stops</p> <hr/> <p>Difference in average commute time between driving and public transportation</p>
Travel Experience	<p>Difference of deficient curb ramps between REJ+ and non-REJ+ communities</p> <hr/> <p>Difference of sidewalk gaps as a percentage of total roadway miles between rural and urban communities</p> <hr/> <p>Difference of percent of poor/fair road condition per capita between rural and urban communities</p> <hr/> <p>Difference of poor/deficient bridges per capita between rural and urban communities</p> <hr/> <p>Difference of deficient curb ramps between rural and urban communities</p> <hr/> <p>Percentage of MBTA and RTA riders that are low income</p>
Reliability	<p>Corrective measures implemented (or dollars invested) at truck bottlenecks</p>
Supporting Clean Transportation	<p>Ozone precursor pollutants (e.g., particulate matter, nitrogen oxides, volatile organic compounds, etc.) and other emissions from transportation sources broken down by EJ vs. non-EJ communities</p> <hr/> <p>Percent of absolute statewide GHG emissions attributed to transportation sources (in line with the statewide goal achieve Net Zero by 2050).</p> <hr/> <p>GHG avoided through electric charging station sessions</p> <hr/> <p>Fuel-use avoided through electric charging station use</p> <hr/> <p>Number of miles of shared paths, separated bike lanes, and bicycle-friendly streets</p> <hr/> <p>Number of bicycle miles traveled</p> <hr/> <p>Non-single-occupant-vehicle mode share</p> <hr/> <p>Percent of rental housing units in transit overlay zoning districts, year-over-year</p> <hr/> <p>Housing units per acre near transit stops</p> <hr/> <p>Share of vehicles registered in Massachusetts that are EV or hybrid</p> <hr/> <p>Average miles per day driven by EV vs. fossil fuel vehicles</p> <hr/> <p>Number of electric charging station sessions (overall and broken down by REJ+ vs. non REJ+ communities and by rural vs. non-rural communities).</p>



6.1 System Performance Report

The performance measures contained in this chapter were developed directly in response to *Beyond Mobility* data analysis as part of the Plan's Needs Assessment task as well as public engagement feedback, and are organized by *Beyond Mobility*'s six Priority Areas. In addition to these plan-specific performance measures, MassDOT is required by Federal regulation to submit a *System Performance Report* to FHWA as a companion to *Beyond Mobility*. The measures in the *System Performance Report* fall under four classes established by USDOT's regulations in 2016, 2017, and 2023 establishing National Performance Management (NPM) measures in the following areas: Safety, Infrastructure Condition, System Performance, and Greenhouse Gas Emissions. This information on federally-required measures and targets in line with national goals is available in Appendix D. Outside of the *System Performance Report*, these measures are reported regularly to the Federal government within five-year "periods of performance." The current period is 2022–2026.

6.2 Safety

MassDOT has identified several measures to evaluate progress toward addressing the *Beyond Mobility* vision for safety. Given the disparity in transportation safety outcomes between Environmental Justice communities (referred to here as REJ+ communities based on the use of the REJ+ data described in Chapter 2), equity is at the center of the measures proposed to evaluate transportation safety in Massachusetts. In addition to the data described in this chapter, more information on overall trends on crashes and a variety of other safety analyses can be found in MassDOT's 2023 [Strategic Highway Safety Plan](#) (SHSP) and [Vulnerable Road User Safety Assessment](#).

Measuring Over Time: Number of Pedestrian Crashes per Population in REJ+ and non-REJ+ Communities

A key Problem Statement included as part of the safety section of *Beyond Mobility* is that **people of color, older adults, and low-income populations are disproportionately burdened by transportation-related injuries and deaths, particularly those involving pedestrians and people on bicycles**. In order to contextualize progress toward addressing this problem, MassDOT has conducted a longitudinal analysis of the number of pedestrian crashes per population in REJ+ and non-REJ+ communities using data from MassDOT's IMPACT portal for the years 2018 through 2022. This analysis was done by assigning pedestrian crashes to either REJ+ or non-REJ+ block groups based on their location and then compared pedestrian crashes per 100,000 population.⁹²

Table 6.2 and Figure 6.1 presents the disparity between REJ+ and non-REJ+ communities as it relates to pedestrian crashes per population. Pedestrian crashes per population decreased in both REJ+ and non-REJ+ communities from 2018 to 2020, and then began to rise in 2021 and 2022.

These data analyzed in this section show a clear disparity in non-vehicular crashes, as well as crash severity, between REJ+ and non-REJ+ communities. As such, through its ongoing initiatives and

⁹² Per 100,000 population is used to produce a more readable decimal (as compared to per million population), unless otherwise noted.



additional Action Items described in Chapter 5, MassDOT will take several steps intended to reduce this disparity as well as the overall magnitude of crashes decreasing over time. Chapter 4 of *Beyond Mobility* contains additional key facts on this topic as well as maps overlaying REJ+ data with crash data to visualize where disparities exist.

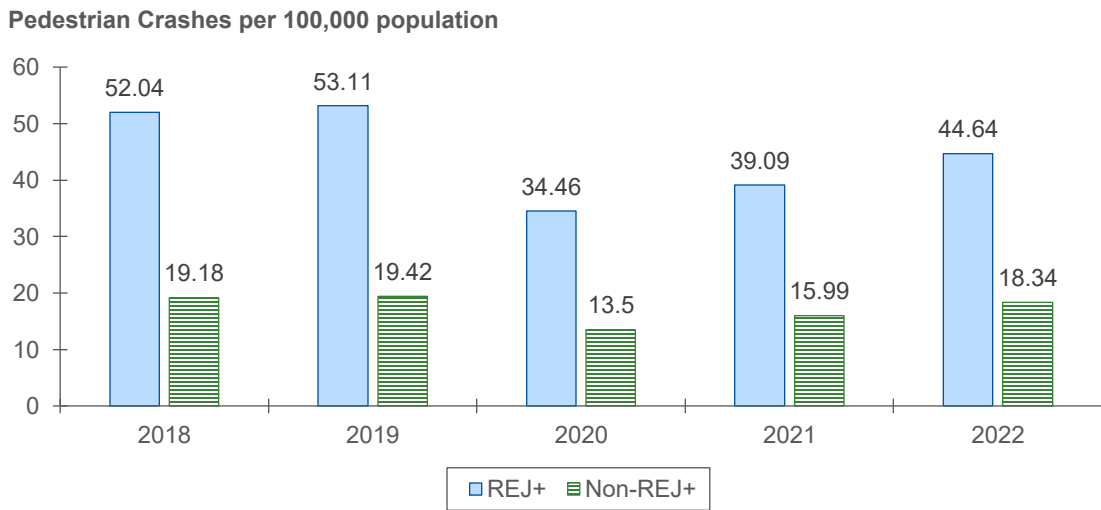
Table 6.2 Pedestrian Crashes per 100,000 Population in REJ+ and non-REJ+ Communities, 2018–2022

Year	REJ+	Non-REJ+	Difference ¹	% Difference ²
2018	52.0	19.2	32.9	63%
2019	53.1	19.4	33.7	63%
2020	34.5	13.5	21.0	61%
2021	39.1	16.0	23.1	59%
2022	44.6	18.3	26.3	59%

¹ Difference of REJ+ and non-REJ+.

² Percent difference of REJ+ and non-REJ+ pedestrian crashes per population.

Figure 6.1 Pedestrian Crashes per 100,000 Population in REJ+ and non-REJ+ Communities, 2018–2022



Additional longitudinal safety analyses comparing REJ+ communities and non-REJ+ communities (including pedestrian crash cluster areas, non-motorist serious injuries and fatalities, vehicular fatal and serious injury crashes, percent difference in roadway risk miles, and fatalities on principal or minor arterials) are available in Appendix D (System Performance Report).



Measures To Analyze Using Most Recent Available Data

An additional key safety problem statement in *Beyond Mobility* is that **people walking, bicycling, and rolling experience an unsafe and low-comfort system**. To address this problem, MassDOT will explore developing the following performance measures for incorporation into its Performance Management Report, *Tracker*:

- **Miles of sidewalk gaps in areas with older adults and people with disabilities.** MassDOT has a goal of eliminating sidewalk gaps across the Commonwealth as a means of promoting active transportation and reducing reliance on cars for travel. This process should also be equitable across communities. Data to support these measures can be drawn from the MassDOT *Road Inventory File* and the *Next Generation Bicycle and Pedestrian Vision Mapping Initiative*.
- **Miles of sidewalk gaps within one-half mile of transit.** MassDOT has a goal of eliminating sidewalk gaps in close proximity to public transit across the Commonwealth as public feedback and other analyses have shown it is critically important that Massachusetts residents can access transit on-foot. This process should also be equitable across communities. Data to support these measures can be drawn from the MassDOT *Road Inventory File*. The length of sidewalk gaps within one-half mile of transit should decrease over time.

Measures We Will Develop Further

Beyond Mobility has also identified measures that are desirable to monitor in the area of Safety. These are presented in Table 6.3.

Table 6.3 Safety Measures Identified for Future Development

Problem Statement	Measures for Future Development	Desirable Direction
Safety Measures Proposed for Tracker		
People walking, bicycling, and rolling experience an unsafe and low-comfort system.	Number of pedestrian crashes per population in REJ+ and non-REJ+ communities	Decrease
	Pedestrian crash cluster area per population in REJ+ and non-REJ+ communities	Decrease
	Number of non-motorist serious injuries and fatalities per population in REJ+ and non-REJ+ communities	Decrease
	Number of vehicular fatal and serious injury crashes per population in REJ+ and non-REJ+ communities	Decrease
	Percent difference in roadway risk miles between REJ+ and non-REJ+ communities	Decrease
	Number of fatalities on principal or minor arterials	Decrease



Problem Statement	Measures for Future Development	Desirable Direction
	Miles of sidewalk gaps in areas with older adults and people with disabilities	Decrease
	Miles of sidewalk gaps within one-half mile of transit	Decrease
Safety Metrics for Future Development		
People of color, older adults, and low-income populations are disproportionately burdened by transportation-related injuries and deaths, particularly those involving pedestrians and people on bicycles.	Difference in non-fatal pedestrian injury rates (hospital stays/100,000 residents) by racial identification	Decrease
Massachusetts traffic fatalities and fatality rates rose between 2019 and 2022, but have since begun trending downward.	Noted crash characteristics of the number of fatalities ¹	Decrease
	Noted crash characteristics of serious injuries ²	Decrease
People walking, bicycling, and rolling experience an unsafe and low-comfort system.	Number of unprotected at-grade rail crossings	Decrease
	Number of safety incidents at at-grade rail crossings	Decrease
Residents perceive an unsafe environment on public transportation.	Number of safety events resulting from deferred maintenance	Decrease
There is a need for additional safety-related research and education in a number of other areas, including emerging technologies, drivers' education, and implications of the lack of cellular service in rural areas.	Average emergency response time to vehicular crashes by community, census tract, or ZIP code.	Decrease

¹ The overall number of fatalities is a performance measure tracked in the System Performance Report as discussed in Section 1.1. MassDOT is recommending that it track additional characteristics of crashes that cause fatalities in the future.

² The overall number of serious injuries is a performance measure tracked in the System Performance Report as discussed in Section 1.1. MassDOT is recommending that it track additional characteristics of crashes that cause serious injuries in the future.

6.3 Reliability

The *Beyond Mobility* vision for the Reliability Priority Area centers on increased predictability of travel times across all modes. As such, the data proposed to measure performance in this area described below is intended to address all modes of travel. Since MassDOT's Performance Management Report, *Tracker*, already tracks data such as on time performance for transit and other key reliability metrics, the measures proposed in this section are described to build on existing efforts.



Measures To Analyze Using Most Recent Available Data

MassDOT has documented as a problem statement that **supply chains are disrupted when freight travel is unreliable**. To track progress toward addressing this problem, MassDOT will develop the following performance measure:

- o **Corrective measures implemented (or dollars invested) at truck bottlenecks.** In 2022, MassDOT completed a study of truck bottlenecks that identified low, medium, and high effort options to improve performance at these locations. MassDOT’s *2023 Freight Plan Update* also includes a list of updated bottlenecks. MassDOT’s investments in these options can be tracked through the annual *Capital Investment Plan* (CIP), with the goal of increasing corrective measures to address truck bottlenecks.

Measures We Will Develop Further

Beyond Mobility has also identified measures that are desirable to monitor in the area of Reliability. These are presented in Table 6.4.

Table 6.4 Reliability Measures Identified for Future Development

Problem Statement	Measures for Future Development	Desirable Direction
Massachusetts travelers by any mode are highly vulnerable to reliability issues, resulting in lower access to everyday needs.	Percent of active transportation infrastructure included in snow removal procedures	Increase
	Travel time reliability in Greater Boston	Increase
	Travel time reliability and day-of-week variation	Increase
MassDOT’s roadway and transit networks do not optimize travel during off-peak periods and must adapt to changing congestion patterns.	Duration of peak periods on key corridors	Contextual measure, neither direction is more desirable
Roadway congestion diminishes transit reliability, limiting the competitiveness of sustainable transportation options.	Percent of scheduled fixed route bus trips operated (by transit provider)	Increase
	Number of blocked bus-lane incidents	Decrease
	Number of bus-lane citations issued	Increase until violations decrease
Supply chains are disrupted when freight travel is unreliable.	Occupancy rate for truck parking areas	Increase
	Crashes caused by shoulder-parked trucks	Decrease

6.4 Supporting Clean Transportation

Consistent with other statewide efforts such as the *Massachusetts Clean Energy and Climate Plan for 2025 and 2030* and the Massachusetts Climate Chief’s report, *ResilientMass*, the *Beyond Mobility* vision for Supporting Clean Transportation, centers equity in the process of advancing Massachusetts’ climate goals. Additionally, the *Supporting Clean Transportation* vision and values



statements acknowledge that the achievement of these climate goals is a multifaceted process that must involve efforts in the areas of electrification, mode shift, improved coordination between housing and transportation, and land use and zoning reform, among others. As such, the performance measures proposed in this section represent a variety of perspectives.

Measures To Analyze Using Most Recent Available Data

MassDOT has documented as a key problem statement that **availability of suitable infrastructure is a potential barrier to low-emission transportation choices**. To address this problem, and consistent with the Massachusetts Climate Chief’s Report released in October 2023, MassDOT will explore the development of the following performance measure for inclusion in its annual Performance Management Report, *Tracker*:

- o **Number of electric vehicle charging stations (overall and broken down by REJ+ vs. non REJ+ communities and by rural vs. non-rural communities)**. In 2022, MassDOT completed the *National Electric Vehicle Infrastructure (NEVI) Plan*, funded by and following the NEVI Program included in BIL. NEVI and the Charging and Fueling Infrastructure (CFI) grant program are sources of Federal funding for MassDOT and other public agencies in Massachusetts to build charging infrastructure. Municipalities and the private sector are also pursuing the installation of charging stations on a variety of sites. The *NEVI Plan* identifies current infrastructure and prioritizes locations for future infrastructure, and MassDOT is tracking progress toward its goals and objectives. MassDOT has a goal of increasing charging stations over time. Additionally, in line with the Massachusetts Climate Chief’s Report, MassDOT is committed to tracking equity in this area, “such that Environmental Justice (EJ) communities are served by NEVI-funded direct current fast chargers (DCFCs) at a rate equal to or greater than non-EJ communities.”⁹³

Measures We Will Develop Further

Beyond Mobility has also identified measures that are desirable to monitor in the area of Clean Transportation. These are presented in Table 6.5.

Table 6.5 Supporting Clean Transportation Measures Identified for Future Development

Problem Statement	Measures for Future Development	Desirable Direction
Supporting Clean Transportation Measures Proposed for <i>Tracker</i>		
Transportation is the largest contributor of Massachusetts’ carbon emissions and transportation-related emissions are disproportionately concentrated in historically marginalized communities.	Share of vehicles registered in MA that are electric	Increase
	Share of transit vehicles that are electric, broken down by each RTA and the MBTA and by transit mode	Increase
	Number of combustion vehicles registered in Massachusetts	Decrease
	Average miles per day driven by EV vs. fossil fuel vehicles	Increase

⁹³ Hoffer, Melissa. “Recommendations of the Climate Chief.” Page 45.



Problem Statement	Measures for Future Development	Desirable Direction
	Ozone precursor pollutants (e.g., particulate matter, nitrogen oxides, volatile organic compounds, etc.) and other emissions from transportation sources broken down by EJ vs. non-EJ communities	Decrease
	Percent of absolute statewide GHG emissions attributed to transportation sources (in line with the statewide goal to achieve Net Zero by 2050).	At least 34% below the 1990 baseline level by 2030
	GHG avoided through electric charging station sessions	Increase
	Fuel-use avoided through electric charging station use	Increase
Availability of suitable infrastructure is a potential barrier to low-emission transportation choices.	Number of miles of shared paths, separated bike lanes, and bicycle-friendly streets	Increase
	Number of bicycle miles traveled	Increase
	Non-single-occupant-vehicle mode share	Increase
Existing land use patterns reinforce car travel and exclude lower-income people from living multimodal lives.	Percent of rental housing units in transit overlay zoning districts, year-over-year	Increase
	Housing units per acre near transit stops	Increase

6.5 Destination Connectivity

To measure progress toward achieving the *Beyond Mobility* Destination Connectivity vision, a variety of data summarizing issues like access to destinations, commute times, modal choice, presence of bicycle and pedestrian facilities, and others were analyzed and are reported in this section with a focus on social and geographic equity.

Measuring Over Time: Difference in Average Commute Time for Driving and Public Transportation

To better understand differences in travel times across modes, a longitudinal analysis of the difference in average commute time for driving and public transit using Census data for 2017–2021 was performed for each of the three urbanized areas (UZAs) within Massachusetts (Boston–Cambridge–Newton, Worcester, and Springfield) as well as statewide. These results were developed by compiling 5-Year American Community Survey (ACS) commute time by means of transportation data, and then calculating the mean travel time for each method of transportation. The mean was calculated for each range of the data (assuming 60+ minutes is 60–120 minutes), and then combined to determine the total mean time per transportation method.

Table 6.6 presents the difference in travel time between driving and taking public transit for the UZAs and statewide regions. Figure 6.2 and Figure 6.3 also illustrate these data. MassDOT has a goal of decreasing this percentage over time. The table also indicates that residents in the Worcester and Boston urban areas have a much higher commuting time for public transit riders compared to people



who drive in the same region. This could indicate that there are less direct options when considering origin-destination pairs compared to Springfield urban area residents.

Through its ongoing initiatives and projects, as well as additional Action Items described in Chapter 5, MassDOT aims to address the disparities in travel time across modes presented here to make transit travel times more competitive with driving.

Table 6.6 Comparison of Commute Time between Driving and Public Transit (minutes) by Urbanized Area, 2017–2021

Year	Boston		Springfield		Worcester		Statewide	
	Driving	Public Transit	Driving	Public Transit	Driving	Public Transit	Driving	Public Transit
2017	33	54	25	37	32	63	31	55
2018	34	55	25	38	32	64	32	55
2019	34	56	26	37	33	64	32	56
2020	34	55	26	37	33	66	32	56
2021	33	56	26	36	33	67	32	56

Notes: Commuting time listed in minutes; analysis based on the population of working age residents (aged 15-64), not total population.

Figure 6.2 Difference in Statewide Commute Time between Driving and Public Transit, 2017–2021

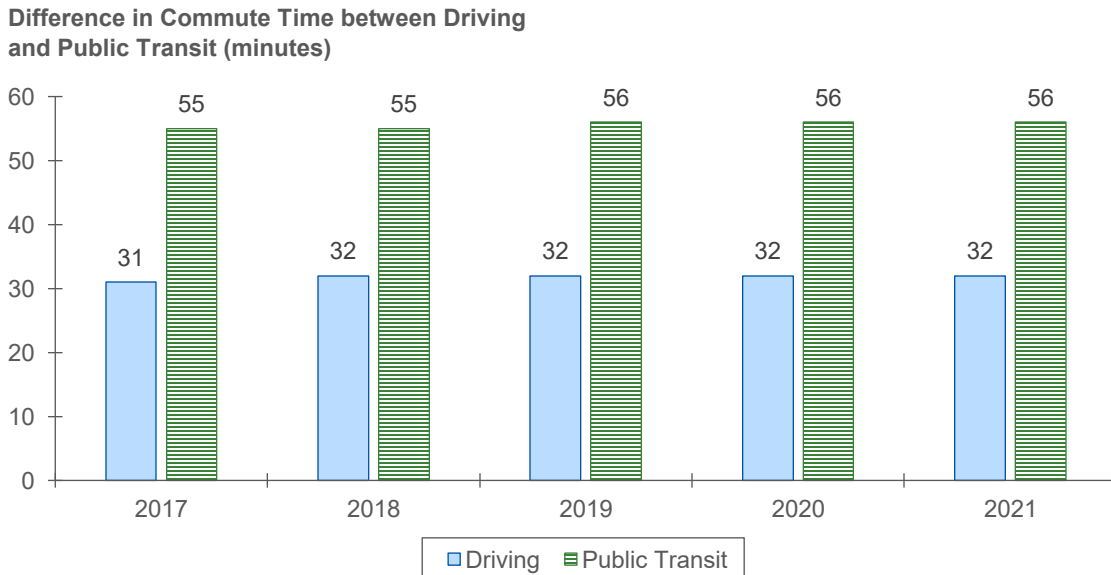
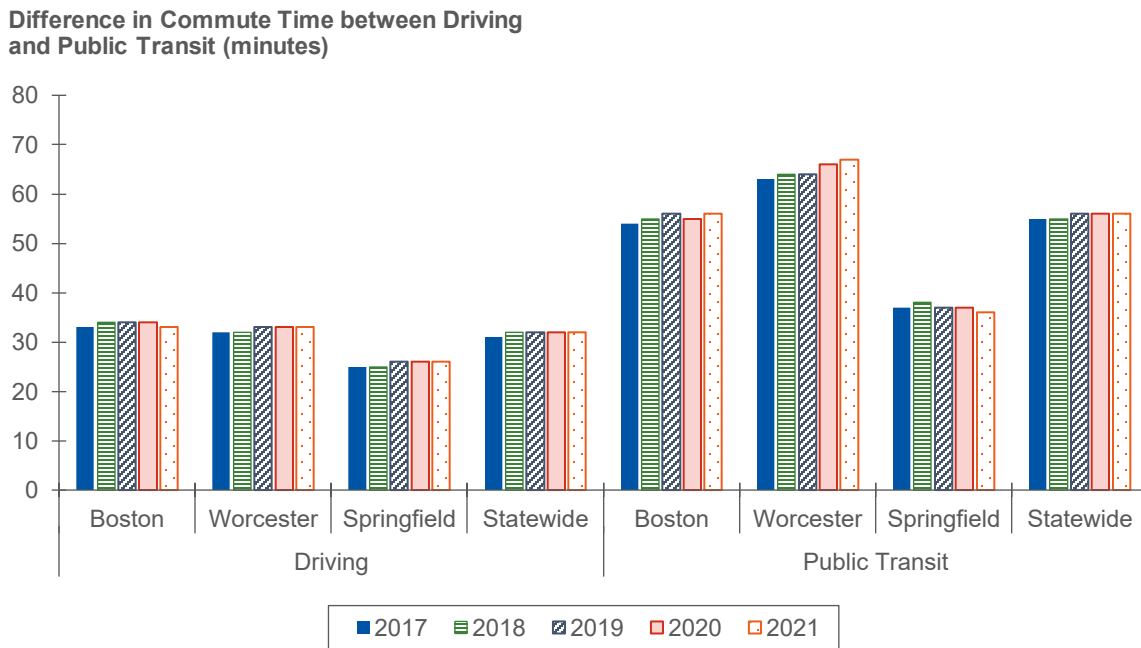




Figure 6.3 Comparison of Statewide Commute Time between Driving and Public Transit by Urbanized Area, 2017–2021



Measures To Analyze Using Most Recent Available Data

Another key Problem Statement is that **people living in historically marginalized communities are burdened by connectivity inequities**. Additionally, despite having more areas with high potential for bicycling, REJ+ communities have fewer existing and planned bike facilities per population than all other communities. To address these problems, MassDOT will explore developing the following performance measures as part of its Performance Management Report, *Tracker*:

- **Number of existing and planned bike facilities per population in REJ+ and non-REJ+ communities.** MassDOT has a goal of increasing the number of existing and planned bicycle facilities across the Commonwealth as a means of promoting active transportation and reducing reliance on cars for travel. This process should also be equitable across communities. Data to support these measures can be drawn from the MassDOT *Road Inventory File*.
- **Percent for potential for bicycling (high) miles of total road miles in REJ+ and non-REJ+ communities.** MassDOT has a goal of increasing the miles of high potential for bicycling across the Commonwealth as a means of promoting active transportation and reducing reliance on cars for travel. This process should also be equitable across communities. Data to support these measures can be drawn from the MassDOT *Road Inventory File* and *Potential for Everyday Biking Maps*.

MassDOT has also documented the **lack of continuous, safe, high-comfort bike or pedestrian pathways connecting existing bicycle facilities limits the ability of people bicycling to access key destinations** as a Problem Statement. To address this problem, MassDOT will develop the following performance measure:



- MassDOT-owned roads with sidewalks.** MassDOT has a goal of increasing the miles of sidewalk on MassDOT roadways across the Commonwealth as a means of promoting active transportation and reducing reliance on cars for travel. This process should also be equitable across communities. Data to support these measures can be drawn from the MassDOT Road Inventory File.

Measures We Will Develop Further

Beyond Mobility has also identified measures that are desirable to monitor in the area of Destination Connectivity. These are presented in Table 6.7.

Table 6.7 Destination Connectivity Measures Identified for Future Development

Problem Statement	Measures for Future Development	Desirable Direction
Destination Connectivity Measures Proposed for Tracker		
Though reduced car travel is a desired and crucial step toward decarbonization, Massachusetts community members find it difficult to get around using other modes including transit	Percent of residents who drive alone to work	Decrease
	Difference in average commute time for driving and public transportation	Decrease
People living in historically marginalized communities are burdened by connectivity inequities across our transportation systems, limiting their access to opportunities.	Difference in travel times between white and non-white commuters	Decrease
	Average number of critical destinations (hospitals, food retailers, higher education institutions, jobs, and parks) available to people living in block groups with high % of non-white households vs all else within 30 minutes of travel time by car	Increase
	Average number of critical destinations (hospitals, food retailers, higher education institutions, jobs, and parks) available to people living in block groups with high % of non-white households vs all else within 30 minutes of travel time by transit	Increase
Destination Connectivity Metrics for Future Development		
Rural residents especially lack convenient transit services and other non-vehicular transportation options, and feel disconnected from cultural, economic, and other opportunities.	Percent of sidewalk gaps on roadway miles near rural transit stops	Decrease
	Average reservation lead time for rural transit services	Decrease
Though reduced car travel is a desired and crucial step toward decarbonization, Massachusetts community members find it difficult to get around using other modes including transit.	Bicycle mode share	Increase
	Commuter Rail frequency	Increase



Problem Statement	Measures for Future Development	Desirable Direction
The lack of contiguous, safe, high-comfort bike or pedestrian pathways connecting existing bicycle facilities limits the ability of people bicycling to access key destinations.	Percentage of MassDOT pedestrian facilities that are covered by regular snow and ice operations	Increase
	Percentage of MassDOT bike facilities that are a part of regular snow and ice operations	Increase
	Percentage of MassDOT-owned centerline miles of roadway with bicycle lanes	Increase

6.6 Resiliency

MassDOT has undertaken several analyses of asset vulnerability over the past decade, such as the Massachusetts Coast Flood Risk Model (MC-FRM) to document the extent of flooding produced for 2030, 2050, and 2070, as well as the *Statewide Drainage Study* on the Deerfield River watershed to both identify stream crossings using GIS analysis and then analyze their vulnerability to riverine flooding under current and projected future conditions. At a systemwide level, MassDOT applied in August 2023 for a PROTECT discretionary grant to conduct a Statewide Flood Risk Assessment. One of the elements of this assessment is to “prioritize assets, identify resilience strategies, and improve planning processes.”

MassDOT and the MBTA also participated in the SHMCAP (also known as *ResilientMass*). Both MassDOT and the MBTA submitted actions as part of this effort.

Measures We Will Develop Further

Beyond Mobility has identified measures that are desirable to monitor in the area of Resiliency. These are presented in Table 6.8. In addition to these measures, the general state of good repair of MassDOT’s transportation assets is considered relevant to resiliency as a focus area. These measures are addressed in the *System Performance Report* (Appendix D) provided as a companion to *Beyond Mobility*.

Table 6.8 Resiliency Measures Identified for Future Development

Problem Statement	Measures for Future Development	Desirable Direction
Resiliency Measures for Future Development		
Significant transportation infrastructure in Massachusetts is potentially exposed to natural hazards.	Number of CIP projects that address locations found (through a statewide flood risk assessment) to be vulnerable or at high risk for flooding and other natural hazards	Increase
	Amount of Federal relief funding Massachusetts has received as a result of natural hazards or declared disaster events	N/A

6.7 Travel Experience

The *Beyond Mobility* vision for the Travel Experience Priority Area encompasses affordability of transit, state of good repair, wayfinding, and other important elements addressing the ease of



navigating the transportation system. Data addressing these items and proposed to evaluate the quality of travel experience in Massachusetts are documented in this section.

Measuring Over Time: Percentage of MBTA Riders who are Low Income

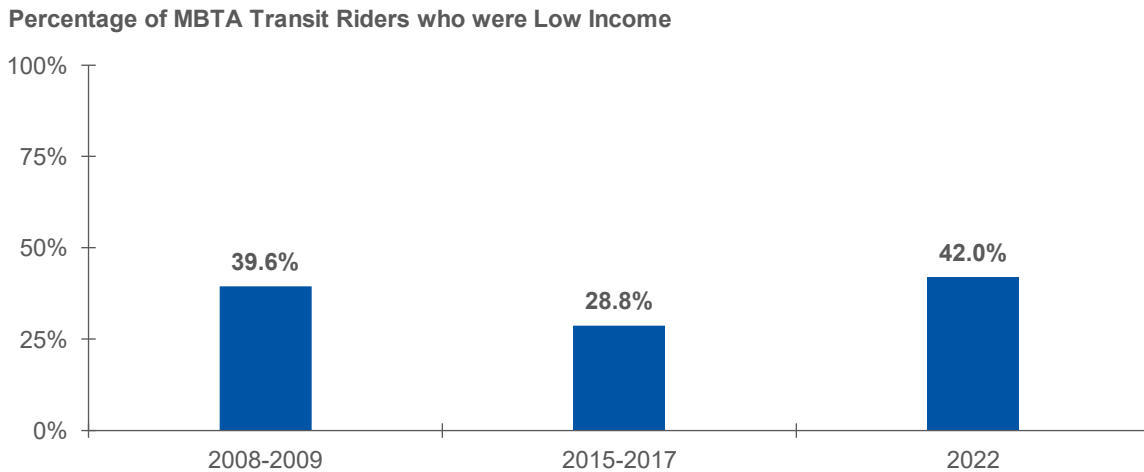
MassDOT has documented as a key problem statement that **Environmental Justice communities are in need of an enhanced user experience and increased affordability on transit.** In order to contextualize progress toward this goal, MassDOT has conducted a longitudinal analysis of the percentage of MBTA riders who are low income using MBTA systemwide passenger surveys from the years 2008-2009, 2015-2017, and 2022. It is critically important to collect, analyze, and report usage of transit by low-income riders in order to better understand the performance of the system.

The definition of “low income” has varied among surveys over the past 15 years. The most recent survey defines riders who are low income earn as a household less than 60 percent of the annual median income for the MBTA service area, defined using the most recent available American Community Survey (ACS) from the US Census Bureau. The 2021 ACS placed this figure at just over \$60,000 per year. MBTA passenger surveys have also used a Federal definition of low income as 150 percent of the Federal poverty line. This definition varies with household size, but in 2023 a family of four would be classified as low income if their annual household earnings were less than \$45,000.

With a consideration for the effect of inflation and the varying definitions across time, Figure 6.4 presents the percentage of MBTA riders who were low income in 2008-2009, 2015-2017, and 2022, and indicates that about two out of every five MBTA riders are low income.

A number of *Beyond Mobility* Action Items presented in Chapter 5 seek to address the need for increased affordability of transit, particularly for low-income riders.

Figure 6.4 Percentage of MBTA Transit Riders who were Low Income across Time





Measures To Analyze Using Most Recent Available Data

MassDOT has documented as a problem statement that **missing sidewalks, curb ramps, and crosswalks limit mobility options for older adults and people with disabilities. This is a particular issue in rural communities which have higher concentrations of these residents.** To address this problem, MassDOT will explore the development of the following performance measures:

- o **Difference of deficient curb ramps between REJ+ and non-REJ+ communities; and difference of deficient curb ramps between rural and urban communities.** The Americans with Disabilities Act (ADA) includes geometric and maintenance standards that define curb ramps that are sufficient and deficient. The percentage that are deficient should be equitable across communities. Data to support these measures can be drawn from the *MassDOT Pedestrian Curb Cuts Database*. MassDOT has a goal of decreasing the difference in deficient curb ramps over time.
- o **Difference of percent of lane-miles of roadway that are in poor and fair condition between rural and urban communities; and difference of percent of deck area of bridges that are in poor and fair condition between rural and urban communities.** Data to support these measures are collected through regular inspections by the MassDOT Highway Division. The data are reported annually to FHWA at a statewide level, but it is also valuable to ensure that asset condition and investment are equitably distributed across Massachusetts communities. For more detail on how these data are used, reported, and collected, see the *Beyond Mobility Statewide Performance Report* and the *MassDOT Transportation Asset Management Plan*. MassDOT has a goal of decreasing this difference over time.

Measures We Will Develop Further

Beyond Mobility has also identified measures that are desirable to monitor in the area of Travel Experience. These are presented in Table 6.9.

Table 6.9 Travel Experience Measures Identified for Future Development

Problem Statement	Measures for Future Development	Desirable Direction
Missing sidewalks, curb ramps, and crosswalks limit mobility options for older adults and people with disabilities. This is a particular issue in rural communities, which have higher concentrations of these residents.	Failed or missing curb ramps	Decrease
Transit riders, people with disabilities, and LEP community members find it challenging to understand and navigate the transit options available to them.	Percent of transit system accessible through multilingual wayfinding	Increase
	Percent of transit system accessible through universal design	Increase
Bicycle riders report that wayfinding and amenities at facilities are confusing or substandard.	Number of bicycle facilities at transit stops and stations	Increase



Final Plan

The systems and protocols that support excellent customer service are not always prioritized.	RMV customer satisfaction from annual survey	Increase
	Fare collection reliability	Increase

7.0 Funding the Transportation System

7.1 Introduction

This chapter outlines the funding resources expected to be available between now and 2050 to improve transportation in Massachusetts. An important item to note in the context of reporting this information is that *Beyond Mobility* does not constitute a listing of transportation projects and unfunded needs. Rather, this Plan serves as a policy document that establishes a strategic framework and priorities for MassDOT to address largely using existing resources.

The purpose of this *Beyond Mobility* chapter is to describe and estimate the amounts of these existing resources that will be available for transportation capital investment, maintenance, and operations on a regular basis, and to articulate the process by which MassDOT and its partner transportation agencies use this information to address the needs of Massachusetts' transportation system.

MassDOT acknowledges that there are significant challenges when it comes to ensuring sustainable funding streams for the MBTA, RTAs, and the ability to maintain bridges and roads statewide. That said, in line with the idea that the primary focus of *Beyond Mobility* is to serve as a policy document and strategic framework, it is important to note here that additional future work at MassDOT will focus more exclusively on defining specific dollar amounts needed to implement new initiatives resulting from *Beyond Mobility* as they unfold.

7.2 Overview of Transportation Funding in the Commonwealth

Transportation funding for MassDOT's services and responsibilities comes from various sources, including Federal, State, and local dollars. The CIP and the STIP are the most comprehensive budgetary documents that summarize MassDOT's available funding. These documents are developed annually and typically cover a five-year period.

The Problem Statements and corresponding Action Items outlined in *Beyond Mobility* will help to structure the CIP and STIP going forward. Additionally, Action Items in Chapter 5 categorized as "capital planning" efforts will serve as an input as part of this process.

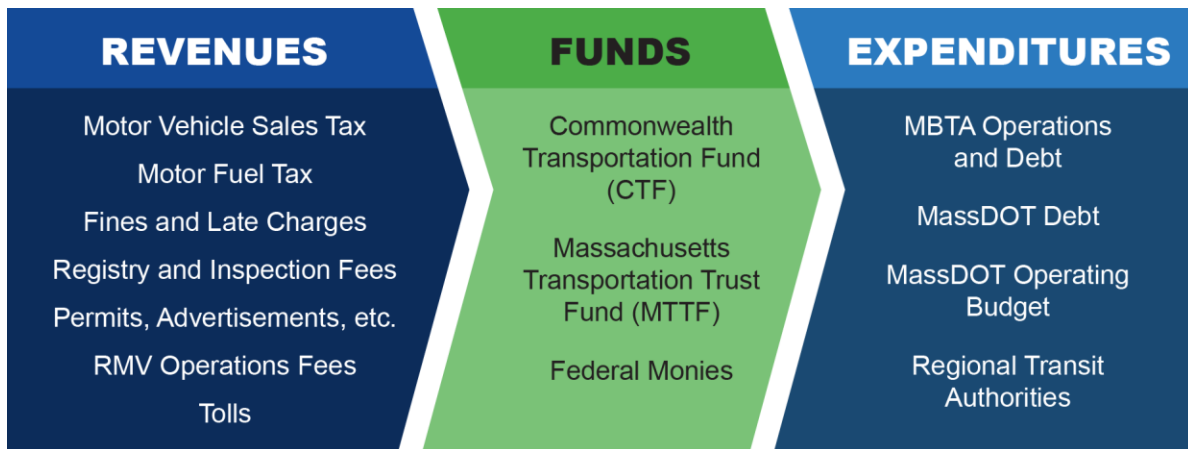
State Sources of Transportation Funding

The Transportation Reform Law of 2009 consolidated many agencies under MassDOT and created funding sources/mechanisms to manage the collection and disbursement of monies for transportation operations, capital projects, and debt servicing. The first fund, called the Commonwealth Transportation Fund (CTF), collects money and fees as per the law. These include fees received by the Registry of Motor Vehicles, motor vehicle fuel and sales taxes, and amounts



appropriated into the fund by the Massachusetts General Court.⁹⁴ The second fund, called the Massachusetts Transportation Trust Fund (MTTF), was created in 1991 as part of the Massachusetts Clean Environment Act and collects fares, fees, and toll revenue.⁹⁵ Figure 7.1 below shows the revenues collected to support State transportation funds along with the general categories of expenses these funds support.

Figure 7.1 State Transportation Revenues, Funds, and Expenditures



The State issues bonds to provide the statutorily required State match to Federal aid and to support State-funded projects and local transportation grant programs. Bonds, along with toll revenue, make up nearly all State contributions to State transportation capital spending. Bonds are issued either as General Obligation (GO) bonds, which are backed by the general revenues of the Commonwealth, or as Special Obligation bonds, which are backed by dedicated transportation revenues such as the gas tax and vehicle registration fees. These, along with toll revenue, make up nearly all State contributions to State transportation capital spending. Commonwealth GO bond proceeds—referred to as the State bond cap—are allocated to specific projects, primarily for Federal-aid match, project design/development, project management, capital maintenance, and other construction support provided to MassDOT Divisions and the MBTA. Special obligation bond proceeds are allocated to specific projects or initiatives, such as the Rail Enhancement Program, which supports reliability, modernization, and expansion initiatives at the MBTA. Another program supported by special obligation bonds—Massachusetts’ Next Generation Bridge Program (NGBP)—focuses on funding bridge preservation and the bundling of smaller MassDOT bridge projects. These projects will be advertised for construction during the five-year 2024–2028 STIP period and are initially funded with non-Federal aid funding (i.e., State funds), and will be repaid in the future with debt repayments using Federal aid. This is reflected in the Highway Funding Program as Grant Anticipation Notes (GANs).

The MBTA also issues debt instruments to fund capital projects, which can include bonds, sustainability bonds, commercial paper, and bond anticipation notes. These funds are used to support projects 100 percent funded by MBTA debt and also provide the local match (typically 20 to 50 percent) for Federally-funded projects.

⁹⁴ <https://malegislature.gov/Laws/GeneralLaws/PartI/TitleIII/Chapter29/Section2ZZZ>.

⁹⁵ <https://malegislature.gov/Laws/GeneralLaws/PartI/TitleII/Chapter6C/Section4>.



Another source of state funding for transportation is Chapter 90. Authorized through Massachusetts General Laws (M.G.L) Chapter 90, Section 34, the Chapter 90 Program provides funding to municipalities for the implementation of capital improvements on local public ways. Every municipality in the Commonwealth is allocated a portion of total program dollars. The amount of annual funding a municipality receives is based on local road mileage (58.33%), population (20.83%), and employment (20.83%). Local road mileage is gathered from MassDOT's Road Inventory File. Population data is collected using decennial census data from United States Census Bureau. Employment figures are provided by the Massachusetts Department of Unemployment Assistance. This formula was developed by the Legislative Rural Caucus of the Massachusetts Legislature's Transportation Committee in 1972. In acknowledgement that rural communities are in need of greater funding, Chapter 27 of the Acts of 2023 authorized \$25 million in funding to support the construction and reconstruction of municipal ways. Per the legislation, these funds are to be distributed to all 351 municipalities in the Commonwealth using a formula based on local road mileage, municipal population, and rurality. A municipality is considered rural for the purposes of this funding if it has a population of less than 10,000 and a population density under 500 people per square mile.

Additionally, In November 2022, the voters of Massachusetts approved a new 4 percent surtax on income above \$1 million annually, known as the Fair Share amendment. This new source is constitutionally dedicated to “quality public education and affordable public colleges and universities, and for the repair and maintenance of roads, bridges, and public transportation.” Investments are spread across multiple segments of education and transportation, with a focus on achieving meaningful, equitable impacts for each. In FY 2024, a total of \$490 million funds were dedicated to transportation. Going forward, this funding will continue to be allocated to transportation projects in the Commonwealth.

Federal Funding Sources

Most Federal transportation dollars are allocated to States, Regional Transit Agencies, and Tribal lands through formula funding, which is decided by the USDOT Office of the Secretary of Transportation (OST) and Congress. Administrations within USDOT, such as FHWA and FTA, and OST administer competitive discretionary grants. These Administrations put out a Notice of Funding Opportunity (NOFO) to solicit applications from States and transit agencies. They select projects based on various criteria and project funding priorities.

Federal funding for transportation is primarily allocated through formula funding for each State. The Commonwealth of Massachusetts receives substantial Federal funding for transportation infrastructure through several programs, including: ⁹⁶

- **National Highway Performance Program (NHPP):** The NHPP provides support for the condition and performance of the National Highway System (NHS), for the construction of new facilities on the NHS, and ensures that investments of Federal-aid funds in highway construction are directed to support progress toward the achievement of performance targets established in a state's asset management plan for the NHS.

⁹⁶ <https://www.mass.gov/service-details/funding-considerations>.



- **Highway Safety Improvement Program (HSIP):** The HSIP targets a significant reduction in traffic fatalities and serious injuries on all public roads, including both state-and local-owned public roads.
- **Surface Transportation Block Grant (STBG) Program:** The STBG program promotes flexibility in state and local transportation decisions and provides flexible funding to best address state and local transportation needs.
- **Congestion Mitigation and Air Quality Improvement (CMAQ) Program:** The CMAQ program provides a flexible funding source to state and local governments for transportation projects and programs to help meet the requirements of the Clean Air Act.
- **Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation (PROTECT) Formula Program:** Established in 2021 as part of BIL, the PROTECT program provides funding for resiliency improvements; community resilience and evacuation routes; and at-risk coastal infrastructure. Highway, transit, and certain port projects are also eligible.
- **Carbon Reduction Program (CRP):** This program provides funding for projects that reduce transportation emissions or the development of carbon reduction strategies. States, in consultation with MPOs, are required to develop and update a carbon reduction strategy every five years and submit it to FHWA for approval. Sixty-five percent of a state's CRP funds are to be distributed to areas based on population (suballocated), with the remainder to be used in any area of the state.
- **National Electric Vehicle Infrastructure Formula (NEVI Formula) Program:** The NEVI Formula Program provides funding to strategically deploy electric vehicle (EV) charging infrastructure and establish an interconnected network to facilitate data collection, access, and reliability. Funded projects must be located along designated alternative fuel corridors and the state must submit a plan to FHWA describing the planned use of funds. Ten percent of funding is set aside for discretionary grants to state and local governments that require additional assistance to strategically deploy EV charging infrastructure. This is a non-core formula program and not subject to obligation limitation.
- **Federal Transit Administration (FTA) programs:** Various FTA programs provide formula and competitive discretionary funding for transit in Massachusetts. The largest formula programs for Massachusetts are the Urbanized Area Formula Grant Program (Section 5307) and the State of Good Repair Grants Program (Section 5337).

In addition to formula funds, the Commonwealth's transportation agencies receive funding from other Federal sources. MassDOT applies for Federal Aviation Administration (FAA) grant funds every Federal fiscal year and draws down those approved grant amounts to pay for the Aeronautics Division's project spending. MassDOT also draws down approved grant amounts from the Federal Railroad Administration (FRA) to pay for the Rail and Transit Division, MBTA, and Office of Transportation Planning project spending. MassDOT, the MBTA, regional transit authorities, municipalities, and other entities can apply for Federal funding made available through other competitive programs administered by Federal agencies. Recent discretionary grants include over \$30 million in Rebuilding American Infrastructure with Sustainability and Equity (RAISE) grants for three projects in 2023, \$996 million in FTA New Starts grants for the Green Line Extension project,



and \$4 million in 2023 from the Strengthening Mobility and Revolutionizing Transportation (SMART) grant program. Federal and State earmarks for transportation projects have historically been a common source of project-specific transportation funding. The USDOT administers loans and credit assistance programs, such as the Transportation Infrastructure Finance and Innovation Act (TIFIA) credit assistance program, to provide low-cost financing for large-scale surface transportation projects.

Other Funding

In addition to State and Federal funding, several other sources of funding are used for transportation in the Commonwealth. These include:

- **MBTA and RTA farebox revenues:** An important source of operating revenue for transit agencies, fare revenue stays directly within the agency.
- **MBTA municipal assessments:** Cities and towns within the MBTA service area are required to contribute to the MBTA State and Local Assistance Fund through an assessment based on population.
- **Reimbursable and third-party funds for the MBTA:** This category includes funds received via reimbursable agreements with the Rhode Island Department of Transportation, Amtrak, and other parties.
- **Other MBTA revenue:** The MBTA generates revenue from parking fees in the facilities it owns, advertising on vehicles and at stops and stations, and through real estate revenue sources.
- **Transportation funds from other Commonwealth agencies:** Transportation funding comes in part from other State agencies. One example is the MassWorks Infrastructure Program, which provides competitive grants to support capital investment in infrastructure and includes eligibility for small-town road improvement projects. The Department of Public Utilities (DPU) oversees rideshare services in Massachusetts and collects transportation network company (TNC) fees. These funds are distributed to cities and towns, MassDevelopment, and the Commonwealth's Transportation Fund.
- **Central Artery Tunnel Project Repair and Maintenance Trust Fund (CARM):** A fund for Central Artery/Tunnel infrastructure repairs resulting from substandard construction or design.
- **Municipal contributions to projects and developer mitigation:** This includes funding from municipalities and/or developers that is tied to a specific project.

7.3 Factors That Influence Transportation Funding Levels

The *Beyond Mobility* Action Items identified in Chapter 5 categorized in the areas of capital planning and new programs are most likely to be funded using the resources described in this section. In some cases, programs and projects may need to be re-prioritized to maintain the fiscal constraint of MassDOT's CIP and STIP.



Maintaining existing infrastructure in a state of good repair and delivering new projects to improve the transportation network requires a substantial budget and incremental funding increases to keep pace with inflation. As previously discussed, available funding for transportation comes from a variety of sources. Over time, the Commonwealth's transportation budget has grown steadily to keep pace with resource needs for existing transportation infrastructure and to secure funding for new projects. While the Commonwealth has steady sources of local transportation funding from revenues, fees, tolls, and taxes, many factors can influence the overall forecast of transportation funding levels available, including:

- Revenues generated by traditional sources of funding including motor fuel taxes, sales taxes, and tolls.
- Decisions made by the Commonwealth's legislature and outcomes of the Commonwealth's budget process.
- Allocation of Federal dollars as per formula funding.
- Discretionary funding awards from Federal grant programs.
- Federal legislation that provides funding, such as the recent BIL.

A challenge for transportation agencies when selecting projects and programs to fund is that project costs are expected to inflate by four percent per year, while Federal funding is only expected to increase by roughly two percent per year. If these projections hold, project cost growth will outpace funding growth, resulting in diminished buying power over time.

State Transportation Policy

As previously discussed, the Commonwealth issues bonds to provide the statutorily required State match to Federal aid as well as support State-funded projects and local transportation grant programs. Changes to the bond cap process or changes to the levels of capital funding from this source would have a major impact on transportation funding levels in the future. Figure 7.2 shows year-to-year variations in the baseline level of the bond cap provided to MassDOT by the Executive Office of Administration and Finance (ANF). Baseline bond cap levels—and any adjustments depending on agency needs and requests—are determined on an annual basis as the Commonwealth's rolling five-year CIP is developed.



Figure 7.2 Base Bond Cap Comparison, 2024–2028 versus 2023–2027 (Millions)

	FY 24	FY 25	FY 26	FY 27	FY 28
LAST YEAR	\$1,099.7	\$1,039.8	\$1,047.7	\$1,049.6	n/a
THIS YEAR	\$1,135.5	\$1,094.4	\$1,074.4	\$1,168.2	\$1,179.5
	+\$35.7	+\$54.5	+\$26.7	+\$118.6	New Year

Source: MassDOT Capital Investment Plan Update (2024–2028), available at <https://www.mass.gov/doc/2024-2028-capital-investment-plan-cip-presentation-to-the-board-on-april-27-2023/download>.

Federal Transportation Policy

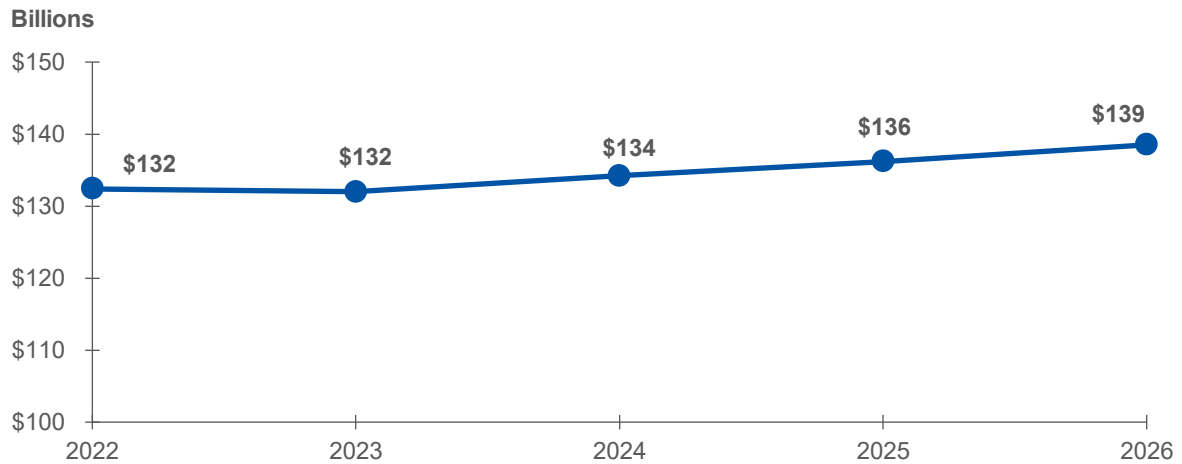
Federal transportation policy has a significant impact on transportation funding at the state level. The Federal government appropriates funding for transportation in various ways, including through the annual budget resolution process and by passing standalone bills that enable direct spending in a particular area. Notably, the established funding formulas for transportation are determined by Congress and implemented by USDOT agencies such as FHWA and FTA. This is an example of dedicated transportation funding that is disbursed regularly and upon which states depend.

BIL included historic levels of transportation and infrastructure funding. BIL provides \$673.8 billion in transportation funding through 2026, of which \$573.5 billion is designated for guaranteed transportation funding.⁹⁷ In addition, BIL has placed additional focus and funding into discretionary grant programs, which are awarded through a competitive process and are not guaranteed. Forecasts of Federal transportation funding beyond 2026 are uncertain and dependent on the actions of Congress. Figure 7.3 shows the total transportation funding amounts included in BIL by Federal fiscal year.

⁹⁷ Bureau of Transportation Statistics, available at <https://data.bts.gov/stories/s/cvki-zubk>.



Figure 7.3 Total BIL Formula Funding Amounts by Year (Billions)



Source: Bureau of Transportation Statistics, available at <https://data.bts.gov/stories/s/cvki-zubk>.

Economic and Population Growth

As the economy and the population in the Commonwealth grow over the next 25 years, there will be a corresponding increase in sales tax and motor fuel tax receipts. Any changes to the trajectory of economic and population growth will impact revenues for transportation within the State.

Impact of VMT on Gas Tax and Toll Revenue

Vehicle miles traveled (VMT) can have a significant impact on both gas and toll revenues. The more miles that vehicles travel, the more fuel they consume and the more tax revenue they generate. An increase in VMT generally leads to an increase in gas tax revenue. As VMT increases, more drivers may use toll roads, increasing toll revenue. Conversely, when people drive less, VMT decreases lead to less fuel consumption and changes in route choice may result in drivers paying less in tolls, resulting in a decrease in fuel tax and toll revenues.

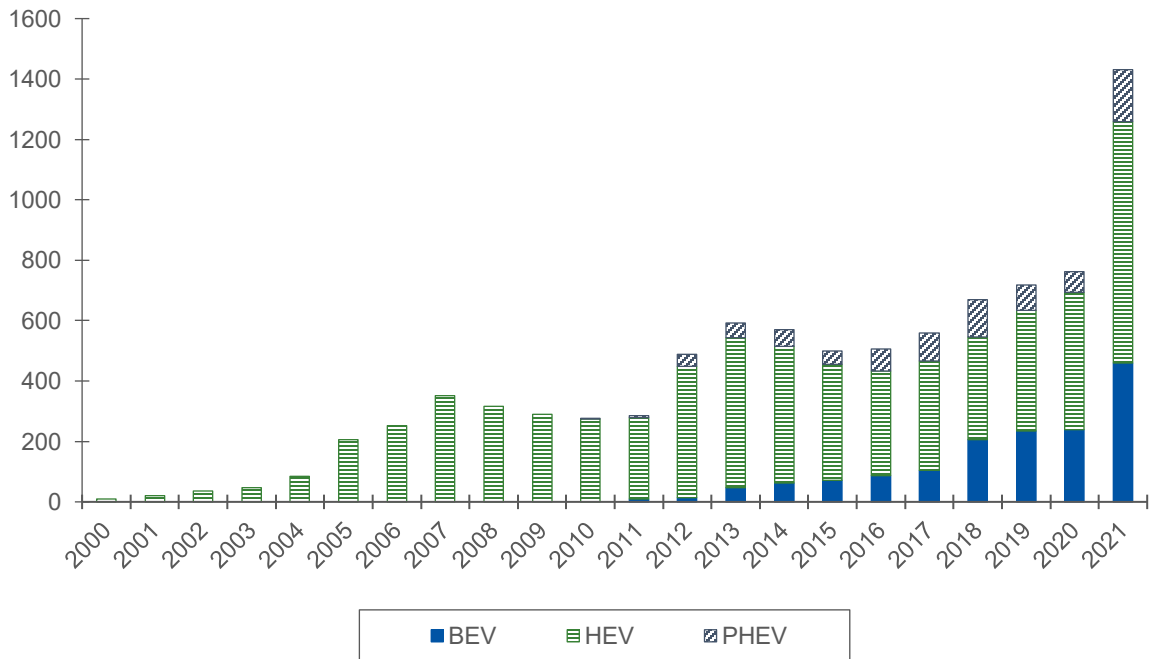


Adoption of Electric Vehicles

The transition to electric vehicles will have a significant impact on transportation funding in the medium and long term. The widespread adoption of electric vehicles and state and Federal fuel efficiency standards will help decarbonize the transportation sector, but these trends will also lead to less reliance on gas and diesel fuel. As a result, there will be a decrease in fuel tax receipts, which is a significant source of transportation funding. Sales of battery electric, plug-in hybrid, and hybrid vehicles have risen significantly in recent years, as shown in Figure 7.4.

Figure 7.4 National Sales of Hybrid, Plug-in Hybrid, and Battery Electric Vehicles

Sales of Personal Vehicles (Thousands)



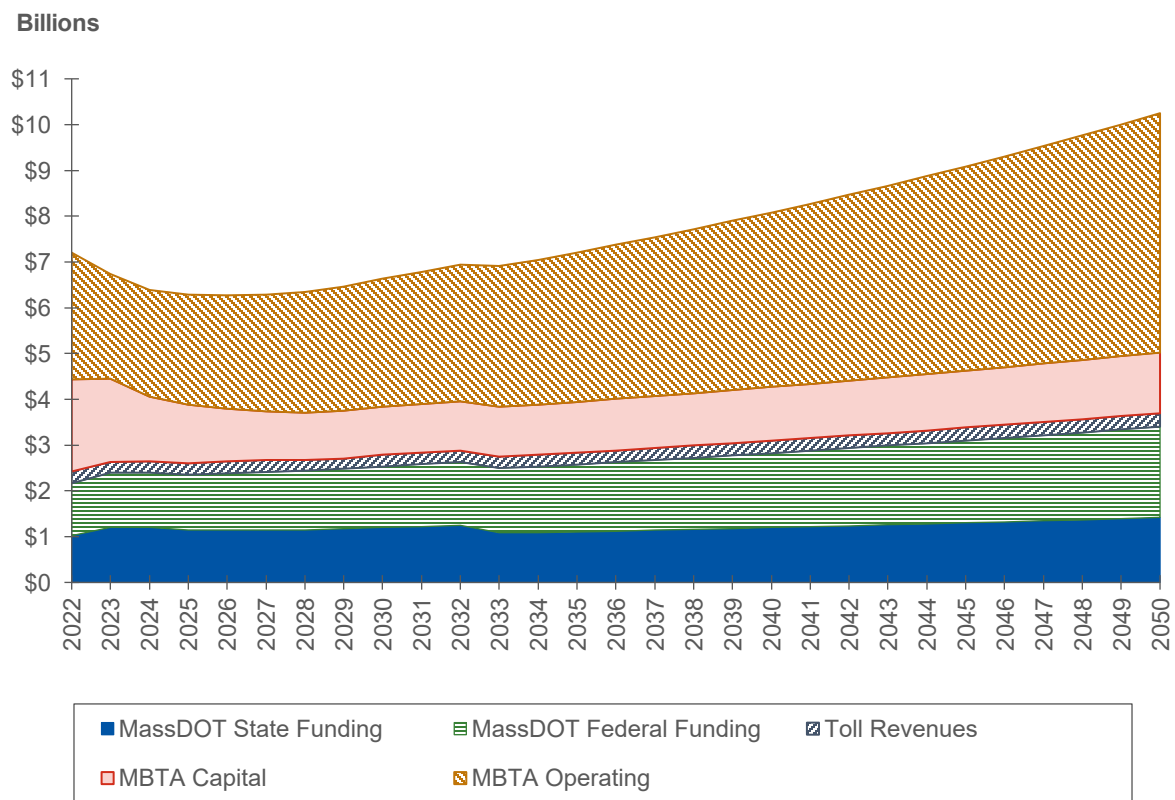
Source: Bureau of Transportation Statistics, available at <https://data.bts.gov/dataset/Sales-of-Hybrid-Plug-in-Hybrid-and-Battery-Electric-Vehicles>.



7.4 Funding Forecast for *Beyond Mobility*

This funding forecast takes into consideration expected changes to funding levels across all revenue sources. These projections may change over time depending on the state of the economy, national transportation priorities, and State and Federal laws. Based on reasonable expectations of funding growth based on current policy, a 1.3 percent compound annual growth rate in total revenues is forecasted through 2050. Overall revenues are projected to increase from \$7.2 billion to \$10.2 billion by 2050. Figure 7.5 illustrates the growth of this funding across the categories of State and Federal funding for MassDOT, capital and operating funding for MBTA, and toll revenues.

Figure 7.5 Transportation Revenue Forecast Through 2050



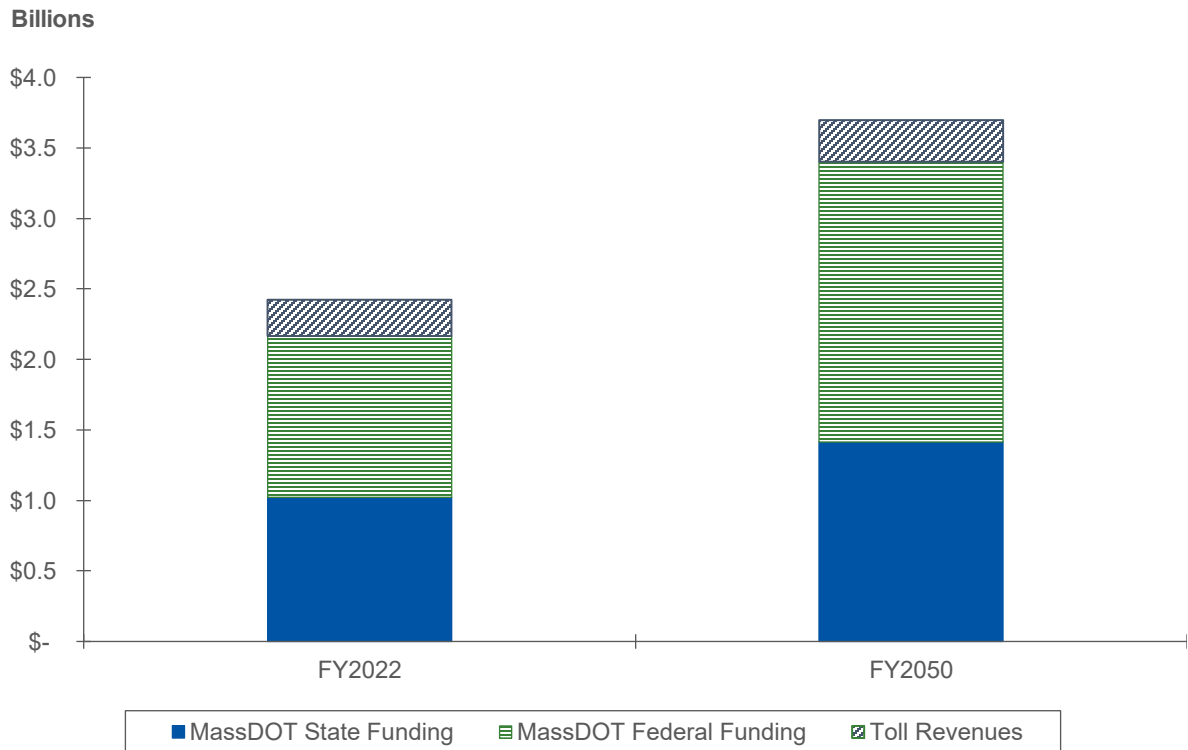
Source: MassDOT and MBTA Projections, Spring 2023.



MassDOT Funding

Revenues for MassDOT, excluding the MBTA, stand at \$2.4 billion. Revenue is expected to grow by about 1.5 percent on average each year and to reach \$3.7 billion by the year 2050.⁹⁸ During this time, it is projected that the revenues and funding levels for the bond cap, Federal assistance, and toll revenues will remain stable and continue to be reliable sources of funding for MassDOT transportation projects. Figure 7.6 provides a comparison of current and expected future revenue for MassDOT.

Figure 7.6 MassDOT FY2022 and FY2050 Projected Revenue



Source: MassDOT and MBTA Projections, Spring 2023.

⁹⁸ Funding source growth rates are based on MassDOT and MBTA projections. Expected long-term growth rates for the state’s primary transportation funding sources include two percent for BIL funds, two percent for Bond Cap, one percent for toll revenue, 3.4 percent for MBTA sales tax, 3.5 percent for MBTA fare revenue, and 2.2 percent for MBTA Federal formula funding.

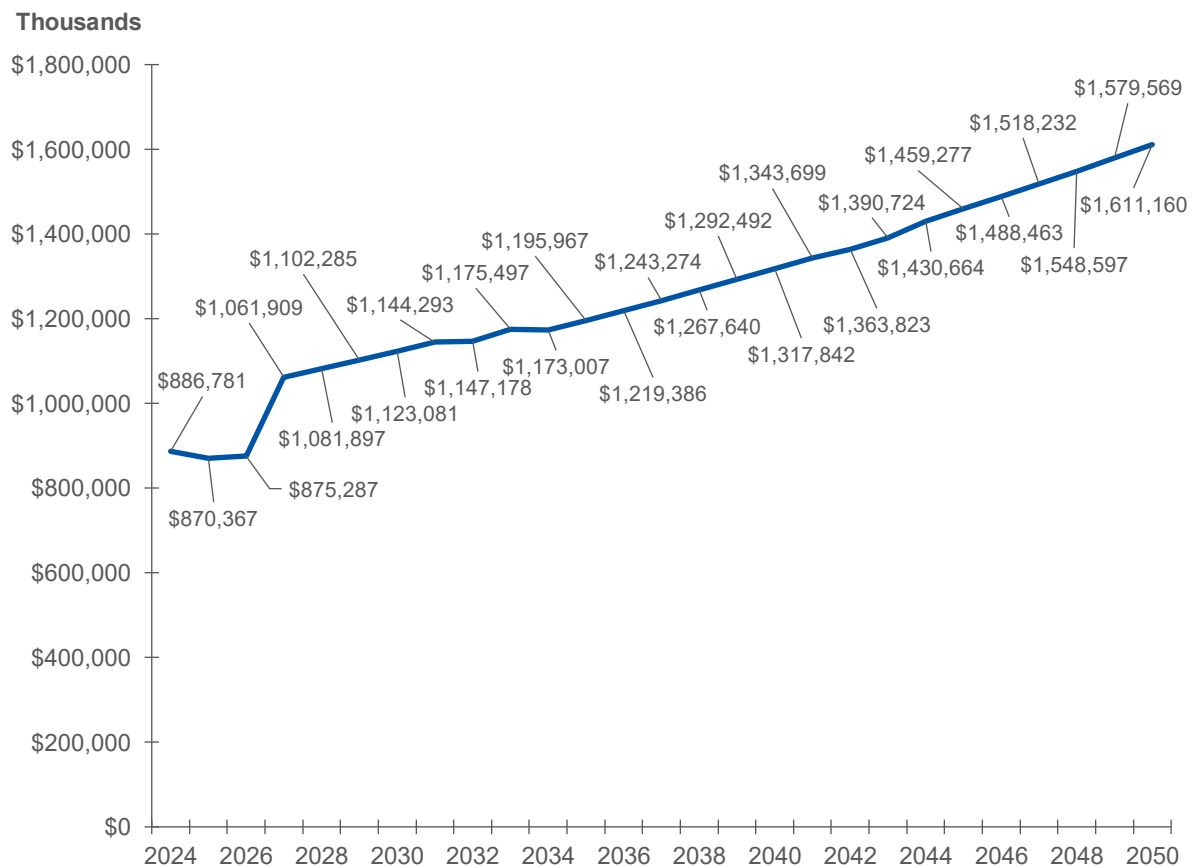


BIL Funding Apportioned to Massachusetts for Roadway Projects

Figure 7.7 represents the total amount of BIL formula funding received by MassDOT for roadway projects minus the amount of Grant Anticipation Notes (GANs) owed. GANs repayments represent debt that is owed on previous bonds that were issued to fund the Accelerated Bridge Program and Next Generation Bridge Program. The total GANs repayments are subtracted from the total Federal formula funding that is received due to funds being reimbursed for the use of future Federal formula dollars.

As shown in Figure 7.7, after accounting for GANs repayments, MassDOT is a recipient of \$886.8 million of Federal BIL formula funding in fiscal year 2024 and is estimated to receive \$1.6 billion in 2050. The reason the amount of funding decreases between 2024 and 2026 and again between 2031 and 2032 is a result of the GANs repayment schedule (shown in Table 7.1), which increases in these years.

Figure 7.7 Total Highway BIL Formula Funding Amounts Apportioned to Massachusetts by Year Accounting for GANs Repayments (Thousands)



Source: MassDOT Analysis Combining Federal Highway Administration BIL Apportionment Notices and GANs Repayments. Spring 2023 analysis.



Table 7.1 Estimated Massachusetts Grant Anticipation Notes (GANs) Repayment Schedule (FY2024–FY2050)

Year	GANs Repayment	Year	GANs Repayment
2024	\$93,985,000	2038	\$30,000,000
2025	\$122,185,000	2039	\$30,000,000
2026	\$133,620,000	2040	\$30,000,000
2027	\$0	2041	\$30,000,000
2028	\$0	2042	\$35,000,000
2029	\$0	2043	\$35,000,000
2030	\$0	2044	\$25,000,000
2031	\$0	2045	\$0
2032	\$15,000,000	2046	\$0
2033	\$10,000,000	2047	\$0
2034	\$30,000,000	2048	\$0
2035	\$30,000,000	2049	\$0
2036	\$30,000,000	2050	\$0
2037	\$30,000,000		

Source: *MassDOT Analysis of MA Administration & Finance GANs repayment schedule, Spring 2023 analysis.*

State of Good Repair Investment

As part of this section, it is important to note that combined State and Federal investments are needed to ensure that Massachusetts’ bridges and pavement are in a state of good repair, and that these investments are often critical as a precursor to investments that modernize the transportation system. As documented in MassDOT’s 2023 *Transportation Asset Management Plan (TAMP)*, Massachusetts has the fourth-largest percent in the nation of its National Highway System (NHS) deck area in poor condition, and is 15th worst in the nation for the number of poor bridges. Massachusetts is one of five States that exceeds the Federal minimum condition threshold in this area. The historical performance of MassDOT’s bridges is marked by year over year volatility due to large structures becoming poor or replaced and affecting performance in proportion to size. It’s also evident that the Massachusetts Accelerated Bridge Program (\$3 billion, major construction 2008-2018) was successful in controlling the backlog growth but sustained high levels of investment are needed to make meaningful, long-term progress. Many of the funding sources documented in this section (as well as state funding for the Next Generation Bridge Program, to be repaid with Federal funds) will continue to address these issues.

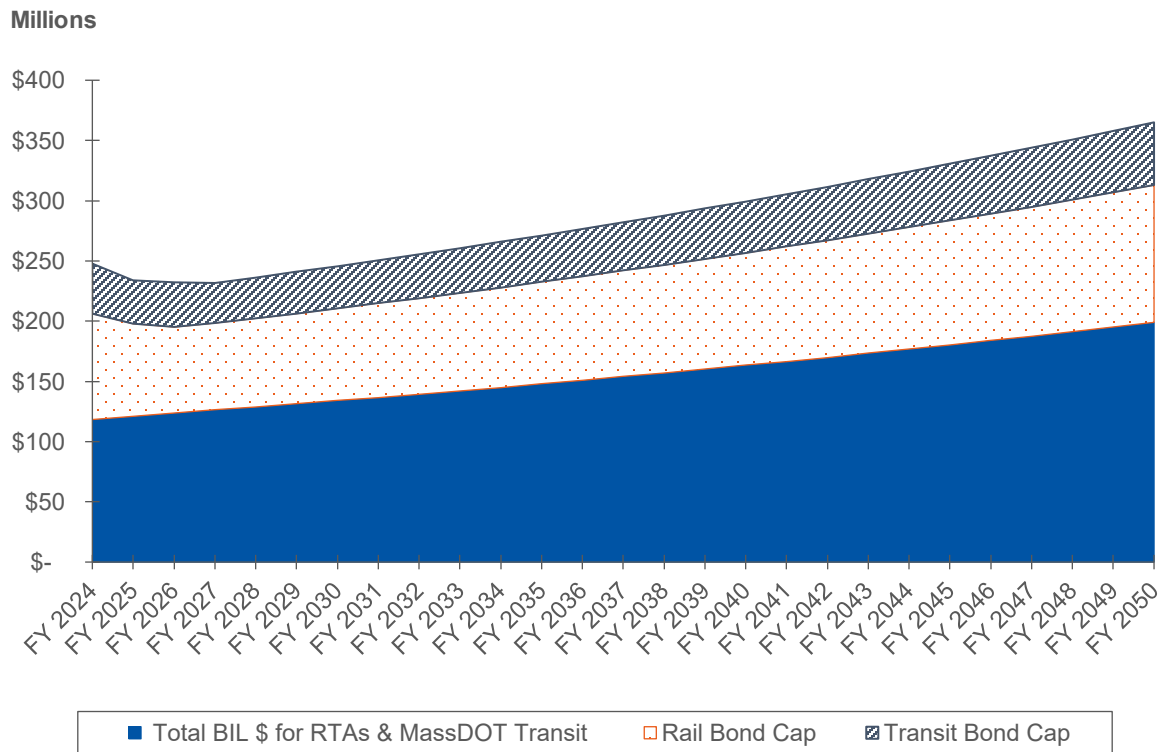
MassDOT Rail and Transit Division and the Regional Transit Authorities

MassDOT RTD and the RTAs receive funding through both BIL and the bond cap. BIL funding for RTD and the RTAs is \$118 million in FY2024 and is expected to grow at two percent per year through FY2050.



Bond cap revenue for rail projects is expected to grow by two percent per year, from \$50 million in FY2022 to \$113 million in FY2050. For transit projects, bond cap revenue is expected to fall somewhat between FY2022 and FY2027, then grow at two percent per year reaching \$52 million by FY2050. Figure 7.8 shows the total BIL and bond cap funding expected for RTD and the RTAs.

Figure 7.8 Total Estimates of Federal Reauthorization and Bond Cap Money for RTD and RTAs



Source: MassDOT Projection, Spring 2023.

MassDOT Aeronautics Division

The Aeronautics division is expected to receive \$244 million in aeronautics grants from the FAA through BIL, representing a steady \$48.8 million per year. With up to a 10 percent State match from bond cap funding, Aeronautics revenues are expected to be about \$54.2 million per year throughout the forecast period.

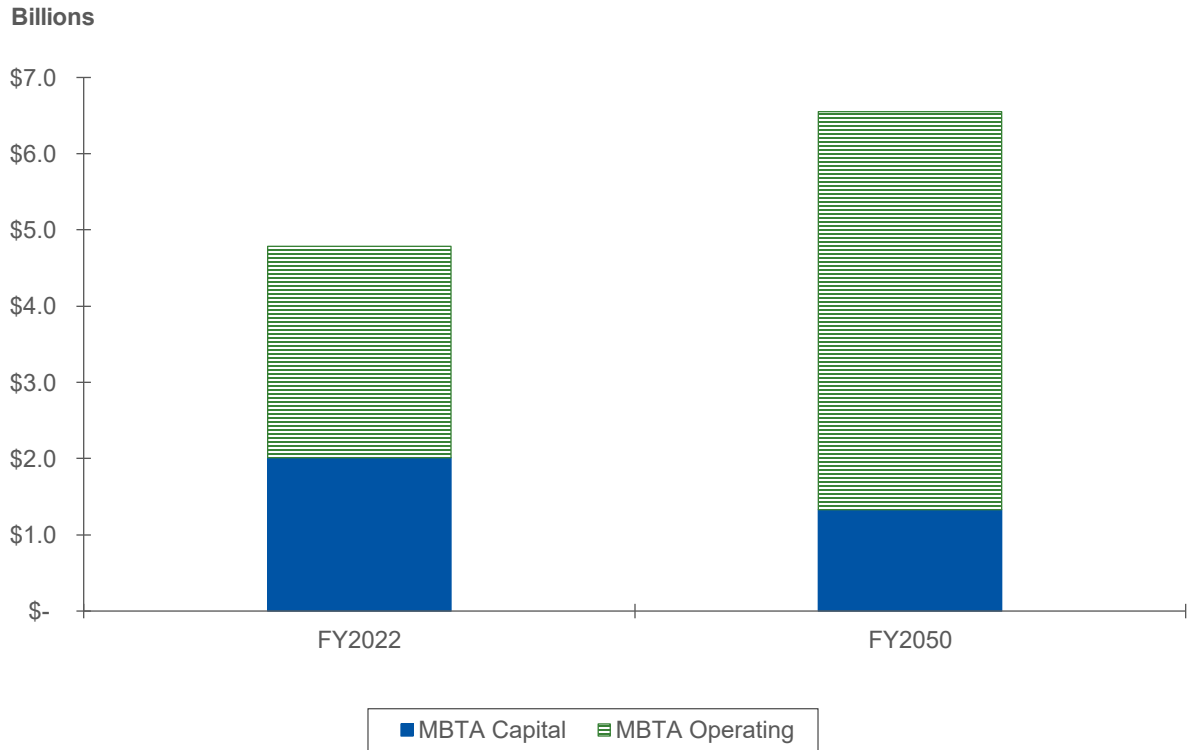
MBTA Funding

The MBTA manages one of the largest public transportation systems in the country and had a combined operating and capital budget of \$4.7 billion in FY2022. Over the next 25 years, the MBTA's revenues are expected to increase by 1.1 percent annually overall, with a decrease through FY2027 followed then by increases of roughly 2.5 percent per year, growing to \$6.5 billion by 2050. Capital revenues are expected to comprise the largest part of revenue decreases over the next several years as the MBTA completes major infrastructure projects. Operating-specific revenues are expected to more than double by 2050, primarily driven by forecasted growth in sales tax revenues.



Figure 7.9 compares MBTA operating and capital revenue in FY2022 and revenue forecasts for FY2050.

Figure 7.9 MBTA FY2022 and FY2050 Projected Revenue



Source: MBTA Revenue Project, 2022.

8.0 Conclusions

In November of 2024, MassDOT turns fifteen years old. When it comes to ensuring we are prepared for our next fifteen years and beyond, we are at a critical juncture. As a result of the Federal BIL of 2021, MassDOT has more funding resources now than it has had in the past. At the state level, the Healey-Driscoll Administration’s Transportation Funding Task Force will be developing recommendations for a long-term, sustainable transportation finance plan that looks well into the future.

As the specifics surrounding how resources are allocated take shape, the Problem Statements and Action Items included in *Beyond Mobility* are guideposts for MassDOT and the MBTA. Informed by rigorous data-driven analysis and over 5,000 pieces of community feedback with a focus on historically underserved residents, the priorities and actions described in this Plan are directly reflective of the transportation needs that the people of our Commonwealth are facing.

Chapter 5 highlights a number of ongoing activities, projects, and programs that MassDOT and the MBTA are already involved in that address these needs. Although current initiatives represent great progress, we know there is more work to do. Pedestrian and bicycle crashes, for example, remain heavily concentrated in our Gateway Cities; the lack of predictable travel times (whether due to congestion or transit delays) continue to frustrate our residents; severe weather is worsening and further damaging transportation infrastructure across the Commonwealth; and major investments in clean transportation, transit-oriented development, and carbon-free transportation modes are needed to meet our climate goals. Additionally, there has been historic underinvestment in certain communities, such as Massachusetts’ Gateway Cities; this underinvestment has generated significant inconsistencies in how these communities are affected by and able to benefit from the transportation system. These communities also experience a disproportionate share of burdens, including high travel times, crash rates, and levels of pollution.

The actions described in *Beyond Mobility* will set MassDOT and the MBTA up to address these and other challenges head on, and contribute to an equitable and resilient transportation system that all Massachusetts residents and visitors can depend on.

MassDOT cannot solve all of the problems described in this Plan alone. The voices, experiences, and respective areas of expertise of Massachusetts’ residents, elected and appointed officials, community-based organizations, and other stakeholders are crucial to addressing the transportation needs of today, and anticipating the challenges and opportunities of tomorrow. MassDOT encourages all Massachusetts communities to use this Plan as a call to action to highlight key problems and serve as a foundation for ongoing planning, research, and advocacy.

A reliable transportation system is critical to ensure that our residents—especially those who do not have the luxury of owning one or more vehicles—can access their jobs, important health care for themselves or loved ones, recreational opportunities, and other places they need to go. Transportation is more than just a way to get around; it is a lifeline. This is why we must continue to move beyond planning for the sake of mobility alone, and toward planning for a sustainable transportation system that prioritizes safe and reliable access to opportunity for those who need it most.

Thank you

