



MBTA Climate Assessment

September 2024



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Executive Summary

Executive Summary

Sustainability and resilience are central to the MBTA's mission to serve the public by providing safe, reliable, and accessible transportation. Its services are themselves a climate solution for the transportation sector, offering an alternative to single occupancy vehicle travel for the greater Boston region. The Authority has also adopted a goal to increase sustainability and enhance resilience of the transit system. This Climate Assessment (the "Assessment") was developed to support the organization in achieving this goal, ensuring our ability to continue to move the region and protecting our infrastructure, workforce and riders even as the effects of climate change become more severe.

The Commonwealth and the Legislature have also adopted new policies and legal frameworks that require the MBTA to address the threat of climate change. To fulfill both new mandates and its own strategic goals, the MBTA has taken stock of its impacts and accomplishments to date and assessed its sustainability and resilience priorities. The resulting Assessment orients the MBTA's next steps to plan, implement and integrate sustainability and resilience into capital planning, design, engineering, operations and workforce development, and to request the necessary funding and support to realize this transformation.

Informed by a series of internal workshops and stakeholder interviews, the Assessment builds on a strong foundation of climate action at the MBTA. Various plans and initiatives, including Focus40, the Capital Investment Plan (CIP), Rail Modernization, and the Bus Electrification Plan, are critical companions to this Assessment. This work and numerous ongoing initiatives have led to successes such as: a 43.8% reduction in greenhouse gas emissions and a 20% decrease in energy consumption since 2009, completion of many climate vulnerability assessments with more underway, and creation of a new Office of Climate Policy and Planning to oversee implementation of next steps.

The Climate Assessment outlines next steps to advance climate planning and embed sustainability and resilience across MBTA processes and projects, including specific actions that facilitate organization-wide engagement and set the MBTA up for long-term success. This comprehensive approach will support the MBTA in building toward a resilient, energy-efficient and carbon-free transit system. This work will strengthen our system's reliability and attractiveness and supports our strategic goal to retain existing riders and draw new riders.



Executive Summary

This Assessment identifies next steps organized into five focus areas. The MBTA will work to engage stakeholders and the riding public to ground implementation in equity and environmental justice. Achieving our goals will rely on sustained funding and strong external support to transform our transit system and make it resilient and sustainable.

Planning and Prioritization



- 1.1 Develop a systemwide resilience plan
- 1.2 Identify geographic resilience needs and coordinate with external partners
- 1.3 Complete decarbonization planning across asset classes
- 1.4 Develop a power master plan
- 1.5 Update emergency response plans and strengthen organizational preparedness
- 1.6 Deepen integration of climate goals into capital planning

Organizational and Workforce Needs



- 2.1 Establish clear governance with designated executive ownership and decision-making authority
- 2.2 Carry out workforce development initiatives to support technology adoption and to build capacity to identify resilience and sustainability challenges and solutions to meet climate goals
- 2.3 Review MBTA project management processes to further integrate sustainability and resilience in project planning and delivery
- 2.4 Review staffing levels needed to implement climate-related initiatives and ensure continuity of service during climate events
- 2.5 Review procurement strategies

Design Enablement and Integration



- 3.1 Develop sustainability and resilience design standards for new capital projects
- 3.2 Create energy efficiency protocols for projects outside the capital planning process

- 3.3 Further integrate climate risk and sustainability reviews across asset lifecycle management and capital project design
- 3.4 Strengthen alignment of the Capital Investment Plan (CIP) with the MBTA's sustainability and resilience goal
- 3.5 Assess opportunities to integrate Buy Clean purchasing principles into procurement

Analysis and Quantification



- 4.1 Complete climate vulnerability assessments
- 4.2 Conduct comprehensive economic analysis of necessary resilience and net-zero investments through 2050 and identification of funding strategies
- 4.3 Evaluate opportunities for renewable energy generation, energy storage and transmission/distribution
- 4.4 Conduct electrification studies for ferry, paratransit and non-revenue service vehicles
- 4.5 Assess and pilot new technologies and reliability advancements

Communication of Risks, Priorities and Needs



- 5.1 Develop an internal communications and education strategy
- 5.2 Participate in regular inter-agency climate coordination meetings
- 5.3 Create an external engagement framework for climate priorities
- 5.4 Develop external communications and public relations strategy around climate impacts and strategic goals

A photograph of a city street during a rainstorm. A white bus with a yellow stripe and a 'T' logo is on the right. The bus number '2070' is visible. In the center, a cyclist on a blue bike is riding across the wet pavement. Other cyclists are visible in the background. The street is lined with trees, some with red flowers. A brick building is in the background. The sky is overcast and grey. The overall mood is somber and atmospheric.

Context and History

Chapter 1

How MBTA Contributes to the Commonwealth's Goals

The Commonwealth of Massachusetts sets ambitious climate goals in its laws and plans. The transportation sector is the state's largest source of emissions, representing 38% of total emissions in 2021, whereas the MBTA was responsible for just 1% of those sector emissions, while accounting for 10% of commuter trips.*

A sustainable MBTA system contributes to statewide emission reduction goals by providing low-carbon transportation for the region. The MBTA's services are themselves a climate solution and play a crucial role in advancing the state's climate goals for a cleaner, more sustainable future. The MBTA's efforts to promote public transit usage, transition to zero-emission buses and trains, invest in renewable energy and energy efficiency, and integrate sustainability and resilience into its operations further help to decrease reliance on personal vehicles. While increasing transit ridership could result in a small emissions increase from MBTA operations, mode shift, when combined with land use planning and partnership with regional transportation authorities, can deliver critical emissions reductions.

To shape Massachusetts' approach to climate change, Climate Chief Melissa Hoffer released a set of recommendations in 2023 along with guiding principles for whole-of-government action, including centering equity and environmental justice and aligning spending with climate mandates, with several recommendations highlighting the MBTA's role in fighting climate change.

Legislation

Global Warming Solutions Act (2008)

The Massachusetts Global Warming Solutions Act (GWSA) is a landmark piece of legislation enacted in 2008 with the goal of reducing greenhouse gas (GHG) emissions across the state. The GWSA set ambitious targets for emissions reductions and established a framework for Massachusetts to mitigate climate change and transition towards a low-carbon economy.

In response to the GWSA, the EEA has set the GHG transportation-sector sub-limits for 2025 and 2030 (but has not specified sub-limits for the MBTA):

- 18 percent below 1990 levels by 2025;
- 34 percent below 1990 levels by 2030.

An Act Driving Clean Energy and Offshore Wind (2022)

In 2022, Massachusetts adopted a new set of rules and mandates to accelerate carbon emissions reductions, including several measures for the transportation sector:

- Electrify the MBTA bus fleet by 2040 and buy only zero-emission buses beginning in 2030.
- Support electric vehicle charger installation in lots.
- Factor emissions and resilience into long-range planning.

Plans

Clean Energy and Climate Action Plan

The Clean Energy and Climate Action Plan, updated every 5 years, outlines the state's approach meet the limits and sub-limits set by the GWSA. In 2022, the state released a 2050 roadmap, as well as a detailed plan for 2025 and 2030. Given the significant contribution of transportation to the state's emissions, the plans include initiatives to promote clean, sustainable transportation by incentivizing electric vehicle adoption and expanding public transit and active transportation infrastructure.

ResilientMass Plan

ResilientMass is the umbrella initiative for the state's climate adaptation and resilience programs, policies, and initiatives. This includes the 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan (SHMCAP) that identifies risks to the Commonwealth and actions to reduce those risks. The SHMCAP is updated every 5 years in compliance with the U.S. Disaster Mitigation Act.

Damage to rails causing loss of transit service, to inland buildings, and to electric transmission and utility distribution infrastructure are identified as the most urgent impacts to the infrastructure sector.

* Based on MassDEP 2021 emissions inventory, MBTA 2021 greenhouse emissions data and U.S. Census Bureau 2017-2021 American Community Survey 5-Year Estimates

MBTA Actions in State Climate Laws and Plans

Legal mandates, policy frameworks and statewide plans provide a policy and regulatory context in which the MBTA operates, influencing decision-making processes and shaping the trajectory of sustainability and resilience initiatives within the transit agency. Highlights of key policies and plans are listed below. By aligning with legal mandates and leveraging policy opportunities, the MBTA advance its goal to create a more sustainable, resilient, and reliable transportation system for the communities it serves.

Completed In-progress Not started

CONTEXT

Laws and Regulations

An Act Driving Clean Energy and Offshore Wind of 2022

- MBTA purchases and leases of passenger buses shall be exclusively zero-emission by 2030
- Passenger buses operated by MBTA shall be exclusively zero-emission vehicles by 2040
- MassDOT, working with MBTA, installs and maintains EV charging stations for at least 5 commuter rail stations, 5 subway stations, and 1 ferry terminal

Regulations for Reporting of GHG Emissions 310 CMR 7.71

- Ongoing report of scope 1 emissions for all MBTA assets to MassDEP

Recommendations from the Climate Chief (2023)

- Collaborate with MassDOT on a Program Management Office (PMO) responsible for achieving Clean Energy and Climate Plan (CECP) and resilience mandates
- Create a facility decarbonization and resilience roadmap
- Collaborate in state-led comprehensive economic analysis of necessary resilience and net-zero investments through 2050 and identification of funding strategies

Clean Energy and Climate Plan for 2025 and 2030 (2022)

- Implement Bus Electrification Plan and facility modernization
- Implement Regional Rail transition and Decarbonization

ResilientMass Plan (2023)

- Complete climate vulnerability assessments of across commuter rail system, Cabot Yard vulnerability assessment, and additional bus facility vulnerability assessments
- Update MBTA design standards to incorporate climate resilience in all standards
- Advance Tunnel Flood Mitigation Program
- Update the MBTA's emergency response plans and GIS viewer for real-time storm response

MBTA Strategic Plan

Sustainability Underpins the MBTA's Mission

MBTA Values and Strategic Goals

Sustainability is one of the MBTA's core values that guide us in our work and is closely connected to our other values of safety, service, equity and culture. The MBTA's sustainability value supports broader objectives, including augmenting ridership, increasing transit trips, and fostering economic opportunity.

The MBTA's Strategic Planning Goals and Metrics report, released in January 2024, includes the goal to increase the environmental sustainability and resilience of our transit system. It also highlights other strategic planning goals with critical tie-ins to sustainability:

- Fostering regional economic vitality;
- Encouraging mode shift from cars to rail and transit;
- Growing our ridership.

The MBTA Strategic Plan informs the principles and objectives of this Assessment, which builds upon existing planning processes and past reports.

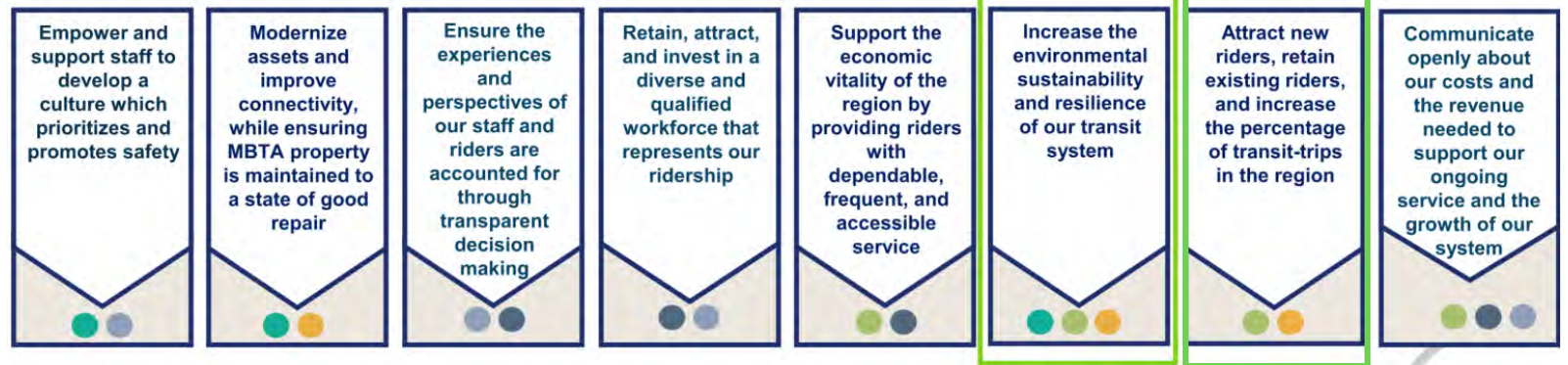
Mission: We serve the public by providing safe, reliable, and accessible transportation.

Vision: We envision a thriving region enabled by a best-in-class transit system.

Values: Our work is guided in the principles of safety, service, equity and sustainability.

Sustainability Value Statement: We invest resources wisely in solutions for our team, our communities and our environment.

Strategic Planning Goals:



MassDOT Planning

The MBTA is a division of the Massachusetts Department of Transportation (MassDOT). The two entities were unified as a single transportation agency in 2009. Future planning efforts at the MBTA will be consistent with and directly informed by MassDOT plans.

MassDOT is also developing a Climate Project Management Office (PMO) to fully operationalize climate work into the structure of the organization. The Climate Chief's October 2023 report highlighted the role of a Climate PMO in helping to achieve the Commonwealth's climate and resilience goals.

Beyond Mobility

Released in July 2024, the Beyond Mobility Statewide Long-Range Transportation Plan 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. Beyond Mobility serves as a policy document that establishes a strategic framework and priorities for MassDOT to address to improve the safety, reliability, equity, and sustainability of Massachusetts' transportation system, and to advance a people-centered transportation system in Massachusetts. The priorities and strategies established in Beyond Mobility reflect the Healey-Driscoll Administration's vision for enhancing transportation and economic development in Massachusetts, structured around six priority areas:

1. **Safety:** The ability of travelers to move through the transportation system free of physical or other harms.
2. **Reliability:** The consistency of transportation network conditions and predictability of travel times across all transportation modes.
3. **Supporting Clean Transportation:** The transportation network's ability to accommodate 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.

Beyond Mobility identifies MBTA as the lead division or as a key contributor for a suite of action items across the priority areas, such as the following action items in the Supporting Clean Transportation priority area:

- SCTAI1.2 Bus and other transit electrification;
- SCTAI1.5 Addressing recommendations in the Climate Chief's report.
- SCTAI2.2 Projects to support electrification;
- SCTAI2.4 Modernizing power infrastructure and energy procurement and generation.

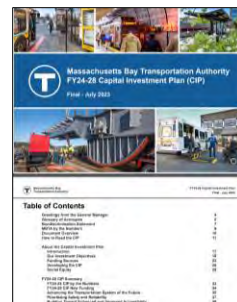
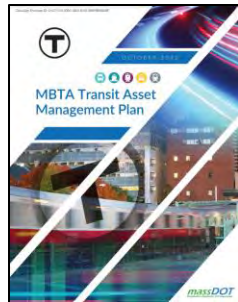
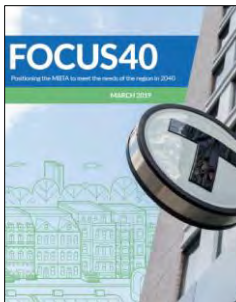


MBTA Guiding Plans and Initiatives

In addition to the Strategic Plan, this Assessment draws on key MBTA documents to identify next steps, including opportunities to further integrate climate goals into ongoing planning processes. Continued investment in strategic planning is necessary to ensure plans, and their implementation, meet the evolving needs of the region in the face of a changing climate.

Focus40

Published in 2019, Focus40 is a strategic vision for the MBTA's capital investment program to improve and modernize the transportation system by 2040. The plan emphasizes sustainability by promoting transit-oriented development, enhancing accessibility, and investing in green infrastructure and renewable energy. Focus40 also serves as the most recent update to the MBTA's 25-year investment plan known as the Program for Mass Transportation (PMT). The PMT is updated every 5 years, with the next update in development.



Capital Investment Plan (CIP)

The CIP outlines the MBTA's priorities for infrastructure investments. Updated annually, the CIP is a financially constrained rolling 5-year plan that identifies projects and initiatives to maintain, upgrade, and expand the transit network. CIP project scoring factors in sustainability and resilience, as well as the MBTA's other strategic planning goals.

Transit Asset Management (TAM) Plan

Updated every 4 years, the TAM Plan documents the MBTA's asset portfolio, current condition, and asset management practices, taking a lifecycle management approach. The MBTA also released a **Capital Needs Assessment and Inventory** in 2023 to support asset management and CIP development.

Rail Modernization

In 2020, the Fiscal Management Control Board received the Rail Vision report, which studied how the MBTA can leverage the existing commuter rail system to support economic growth and achieve the Commonwealth's equity and sustainability goals. The Board mandated that a new Rail Modernization office be created to transform the system toward a decarbonized, higher-frequency all-day regional rail service, which was one of the alternatives identified in the Rail Vision study that would both meet the economic needs of the region, increase ridership and achieve emissions reductions. In July 2024, the MBTA Board approved a \$54 million plan to introduce battery electric multiple unit (BEMU) trains to the Fairmount line as part of the first phase of rail transformation.

Bus Electrification Plan

The MBTA released its plan to transition to a zero-emission bus fleet to reduce emissions and improve air quality in May 2022. The Plan involves procuring electric buses, modernizing bus facilities, installing charging infrastructure, and implementing policies to support the adoption of zero-emission vehicles within the MBTA's operations. Implementation prioritizes facilities that will start deploying electric buses on routes that serve a high percentage of people of color and low-income households, as well as routes with high ridership.

MBTA Accomplishments to Date

The MBTA has made progress towards climate goals, with major contributions from several divisions, including the Environmental Department, the Engineering & Capital Division (ECD), Operations, Capital Program Planning, and more. In alignment with the Climate Chief's report, the MBTA established the Office of Climate Policy and Planning in 2023 to spearhead climate initiatives.

Since 2009, the MBTA has reduced greenhouse gas (GHG) emissions by 44% and energy consumption by 20%. To do so, the MBTA has procured Renewable Energy Certificates (RECs) to offset its electricity load, improved bus fleet fuel economy, and invested \$22 million in energy efficiency projects over a decade resulting in \$17 million in annual savings. Leveraging advanced energy management systems like the Energy Enterprise Management System (EEMS) and integrating energy considerations into all new projects, the MBTA tracks valuable sustainability data, including utility costs, energy efficiency projects, and GHG emissions, that informs decision-making.

Additionally, the MBTA has advanced resilience planning through vulnerability assessments of future climate conditions across rapid transit lines, critical facilities, and tunnel networks. Furthermore, climate sustainability and resilience scores have been incorporated into the Capital Investments Plan (CIP) evaluation process to support integration of climate considerations into capital decision-making and prioritization.

Cross-Cutting Actions



Created the Office of Climate Policy and Planning in alignment with the Climate Chief's recommendation



Incorporated sustainability and climate resilience scores into project evaluation for the Capital Investment Plan (CIP), as well as other scoring criteria like equity

Resilience



Completed climate vulnerability assessments for future climate conditions for a portion of MBTA assets including rapid transit lines, critical facilities, and tunnel networks



Mapped infrastructure against real-time storm data



Adopted the Flood Resiliency Design Directive to inform capital project design

Energy + Emissions



Reduced GHG emissions 43.8% and energy consumption 20% from 2009 baseline



Improved bus fleet fuel economy by 55% since 2008 and created Bus Electrification Plan to modernize facilities and transition to zero-emission buses, based on criteria such as facility condition and benefits for environmental justice communities



Created a rail modernization initiative that prioritizes service improvements and decarbonization, based on criteria such as travel demand, potential for mode shift and benefits for environmental justice communities



Procured RECs to offset the entirety of MBTA's electricity load



Invested \$22 million in energy efficiency projects over 10 years, yielding \$17 million in annual savings (81 total projects)



Implemented Energy Enterprise Management System (EEMS) to manage energy and factor energy load into all new projects

MBTA Initiatives Underway

The MBTA's ongoing initiatives encompass an array of projects and programs. Among the ongoing efforts are sustainable design standards for new construction projects, the installation of Electric Vehicle (EV) chargers, ongoing station lighting upgrades coupled with accessibility improvements, expansion of energy management systems, and building upgrades. The MBTA is also exploring renewable energy opportunities to reduce its carbon footprint and dependence on fossil fuels.

The MBTA is also continuing to assess climate vulnerability for over 65 facilities and 75,000 assets, working to address tunnel flooding, incorporating resilience into design reviews and risk management processes, and securing funding for climate resilience projects through the Capital Investment Plan (CIP) and various grants. Additional and sustained financial investment is critical to ensure the successful delivery of several ongoing resilience and decarbonization initiatives, such as bus facility modernization.

Underpinning its efforts, the MBTA engages with other governments and coalitions as a regional partner in climate adaptation and decarbonization planning, participating in regional and local working and advisory groups on specific projects or planning initiatives, and in state and regional convenings like the ResilientMass Action Team and the Electric Vehicle Infrastructure Coordinating Council (EVICC).

Energy + Emissions



Updates to sustainable design standards for new construction projects



Battery electric multiple unit (BEMU) train pilot on the Fairmount Line



Electric vehicle infrastructure installation to support battery-electric buses and trains, including modernized maintenance facilities



Station lighting upgrades with accessibility and track improvements, tunnel lighting pilot



Energy Management System expansion with additional sub-metering, demand and building management systems, 5-minute interval data



Building upgrades for HVAC, energy recovery systems, metering, windows, and insulation



Bus operator and technician training to operate and maintain battery-electric buses

Resilience



Developing systemwide tunnel flood mitigation program



Integrating resilience into design reviews and risk management



Funding climate resilience projects through the CIP and various federal and state grants programs

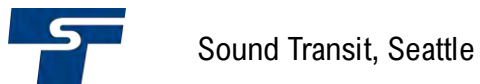
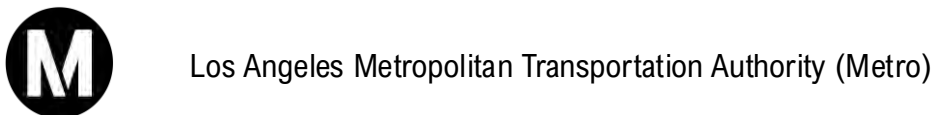
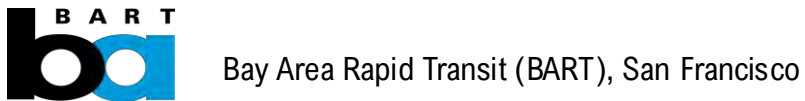


Engaging in ongoing regional collaboration on adaptation strategies for priority infrastructure, in collaboration with municipalities, state agencies, watershed associations, other regional entities, and the federal government, such as the U.S. Army Corps of Engineers

Best Practices

Peer Benchmarking

Sustainability and resilience best practices were reviewed for transit agencies that are similar to the MBTA. The analysis revealed valuable insights into areas of strength and opportunities for improvement for the MBTA. Best practices employed by peer agencies, spanning technological innovations, operational strategies, and community engagement efforts have been incorporated into this assessment and provided actionable steps to enhance the MBTA's sustainability and resilience initiatives. The following peer agencies were reviewed:

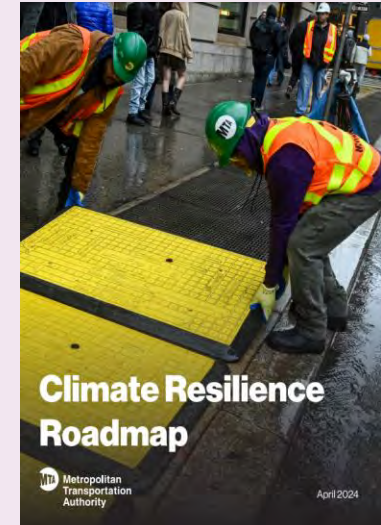


Case Study: MTA Climate Resilience Roadmap

In April 2024, the New York City Metropolitan Transit Authority (MTA) released the Climate Resilience Roadmap, which describes how NYC's transit system will adapt to climate change over the next 10 years, including its subway, bus, Metro-North and Long Island Rail Road services.

Led by a dedicated and cross-functional team sponsored by top leadership, the Roadmap is based on a vulnerability assessment that studied current and future climate risks. To identify a list of key goals, MTA paired the most urgent needs with the highest impact projects. The resulting Roadmap outlines 10 goals and accompanying short- and long-term strategies to address coastal storm surge, sea level rise, torrential rain and extreme heat.

The Roadmap also includes a multi-pronged implementation framework consisting of capital plan integration, resilient design practices, proactive operating actions and better coordination between partner agencies.



Sustainability and Resilience Vision

Chapter 2

Our Vision for a Sustainable and Resilient MBTA

What We Aspire to Achieve

Sustainability underpins the MBTA's mission to serve the public by providing safe, reliable, and accessible transportation, and its vision for a thriving region enabled by a best-in-class transit system.

As part of achieving our vision, the MBTA will transport people in a safe, equitable and efficient manner that minimizes energy use, resource consumption and greenhouse gas emissions to support the health and vibrancy of the broader community.

The MBTA will be prepared for sea level rise, extreme temperatures and storms, able to quickly recover and rapidly return to providing service for the communities it serves, helping people get to their destinations safely even during climate events.

A sustainable and resilient MBTA is a climate solution twice over: providing reliable, accessible and safe transportation solutions for the greater Boston region and making those services themselves environmentally sustainable and ready for a changing climate.

Defining Sustainability and Resilience at the MBTA

MBTA-Specific Definitions

Internal stakeholders noted a need to define sustainability and resilience in the context of the MBTA's operations. Clear definitions allow the organization to better articulate its goals to stakeholders, including employees, passengers, federal and state funding agencies, and the broader community.

A defined framework for sustainability and resilience helps to align efforts and resources to achieve these goals and provides a baseline for accountability. It also promotes transparency by clearly communicating the agency's commitments, progress, and challenges in these areas. Clarity also fosters a culture of continuous improvement. It encourages employees to explore new ideas, technologies, and practices that contribute to sustainability and resilience goals.

Environmental Justice at the MBTA

The MBTA has adopted a set of values, including sustainability and equity. Environmental justice is achieved at the nexus of these two values. As the MBTA responds to climate change, the Authority must work intentionally to avoid replicating inequalities caused by transportation infrastructure and to ensure that the burdens and benefits of public transit service are shared equitably.

Sustainability

Sustainability at the MBTA encompasses GHG emissions reduction, including energy management and power planning, to enable decarbonization of its operations, maintenance and construction activities.

The MBTA, as a public transit agency, decreases sector-wide carbon emissions by making shared transportation modes more competitive with driving, reducing emissions from private vehicles. In addition to increasing avoided emissions (i.e., emissions that would otherwise occur if present-day passengers drove instead of taking public transit), the MBTA is also committed to reducing its energy consumption and GHG emissions to align with the state's goal of net-zero emissions by 2050. GHG reductions can also yield environmental, social and health co-benefits, such as air quality improvements.

Note: While this Assessment focuses on GHG mitigation and energy initiatives, the MBTA also pursues sustainability activities beyond GHG emissions reduction and energy management, including waste and materials management, water management and air quality improvements. Learn more at mbta.com/sustainability.

Resilience

Resilience at the MBTA encompasses activities to plan for, mitigate and adapt to risks from adverse climate impacts to minimize disruption and rapidly restore service where disrupted.

Safety of both riders and workers is essential to resilience at the MBTA; resilience in turn enhances safety and functionality of service. Ensuring reliable service and functionality over time will require a balance of short- and long-range interventions, including investing for a State of Good Repair while anticipating future service needs.

The MBTA has identified its top climate risks as coastal and stormwater flooding, extreme temperatures, and heavy winds, as well as hazard impacts like damage to electricity infrastructure. The MBTA must implement strategies that mitigate the impacts of these hazards with an equity and accessibility lens to ensure resilience benefits all riders.

Strategic Planning at the MBTA

Embedding Sustainability and Resilience throughout the Strategic Planning Process

As a result of many contextual drivers, the MBTA is working to incorporate sustainability throughout its planning process. This includes the MBTA's overarching strategic plan, and the Program for Mass Transportation (PMT), which identifies objectives over the course of a 25-year timeframe, and the Capital Investment Plan which has incorporated sustainability and resilience scoring for proposed projects. Informing the CIP are sustainability and resilience plans that have been developed to date or are in development for specific asset classes, responding to priorities set in the Strategic Plan and PMT, as well as legislative mandates or priorities identified in other state plans like Beyond Mobility or ResilientMass.

This Climate Assessment seeks to build an overall framework for sustainability and resilience planning at the MBTA and to identify critical process changes to enable deeper integration of sustainability and resilience from planning through to implementation. The Assessment considered the prioritization of actions, financial constraints, and staff capacity. As the PMT and CIP continue to evolve over the coming years, the MBTA will seek to iteratively strengthen its strategic planning approach in response to the changing socioeconomic and political context, as well as our changing climate.

Responding to Major Drivers...



Climate risks and damages from heat, flooding, wind and stormwater



Legislative and policy mandates



Fiscal constraints balancing short-term funding opportunities, low revenue projections and deferred maintenance



Energy transition towards renewable sources away from fossil fuels



Building and transportation electrification increasing demands on electrical grid



Aging infrastructure with increased energy demands



Sociodemographic, economic, and political factors, such as population growth, migration and fuel cost volatility

... At All Levels of Planning

MBTA Strategic Plan

- Value statement for sustainability and strategic goal focused on sustainability and resilience
- Additional connected goals, e.g., mode shift, state of good repair, promoting workforce safety

Program for Mass Transportation (PMT)

- Focus40 (most recent PMT) adopted goals of systemwide resilience and sustainability, as well as a GHG reduction metric
- Forthcoming update with a 2050 planning horizon

Sustainability and Resilience Plans

- Completed plans (e.g., Bus Electrification Plan)
- Ongoing and future planning initiatives (e.g., Facility Master Plan, Power Master Plan)

Capital Investment Plan (CIP)

- Addressing sustainability, resilience, and other strategic planning goals in capital programs, in response to CNAI and other needs

Cross-Agency Action

To carry out this vision, the MBTA's climate program will act as an umbrella initiative for its resilience and decarbonization policy, planning and implementation across asset classes and operations. Several departments contributed to the development of this vision, are leading implementation of several important climate initiatives, and will play key roles in implementing next steps to make the MBTA's transit system sustainable and resilient.

Achieving the vision for a sustainable and resilient MBTA depends on cross-cutting implementation across the Authority. As we plan and adopt new technologies, we will also need to invest in our workforce, so they stand ready to deliver, operate and maintain a resilient, net-zero transit system. Our ability to achieve resilience and sustainability goals also relies on timely, adequate and sustained funding from federal, regional, state and municipal partners for shared capital and operational priorities, as well as public engagement and support. In transforming our system, the MBTA will also share lessons learned and best practices with the other Massachusetts regional transit authorities and peer agencies beyond our region.

To develop this Assessment, the MBTA engaged internal stakeholders to review work to date and identify key priorities. As the MBTA engages external stakeholders and the riding public through planning initiatives like updates to the Program for Mass Transportation (PMT), public input will shape the climate policy and planning initiatives described in this Assessment.



What's Next?

Chapter 3



Establishing Next Steps for the MBTA

Enabling sustainability and resilience across MBTA processes and projects

The Climate Assessment serves as a tangible manifestation of the MBTA's strategic planning efforts, reflecting its commitment to long-term climate policy and planning. Central to the Assessment are emissions reduction, energy efficiency and systemwide resilience initiatives, as they not only align with its strategic objectives but also play a pivotal role in facilitating the realization of ambitious state goals, such as achieving net-zero greenhouse gas emissions by 2050. These efforts connect to other MBTA initiatives, such as systemwide accessibility, workforce development, and capital programs to achieve a state of good repair.

A set of focus areas were identified to enable sustainability and resilience goals for the MBTA with near- to medium-term next steps. Each action step includes the following information:

- Description: Near-term considerations.
- Departments: Key departments that will partner to implement the step. Many initiatives will involve additional stakeholder departments as part of cross-agency implementation.
 - Note: The Engineering and Capital Division (ECD) includes Infrastructure Planning, Asset Management, Infrastructure Engineering, Capital Delivery and Vehicle Engineering.
- Timeline: In progress (underway with completion anticipated within 3 years or recurring activity), near-term (3 to 5 years) to medium term (6-10 years).

Effective implementation of these actions across the MBTA will rely on a clear organizational structure, cross-agency collaboration, workforce development, and consistent funding support.

Key Focus Areas

Planning and
Prioritization



Organizational and
Workforce Needs



Design Enablement
and Integration



Analysis and
Quantification



Communication of
Risks, Priorities and
Needs



Focus Area 1: Planning and Prioritization

The MBTA has established a baseline of assessment and planning in the climate space. To drive action, the MBTA needs a holistic climate planning framework that integrates completed plans and ongoing planning initiatives and informs future and related strategic planning activities.

	ACTION	DESCRIPTION	DEPARTMENT(S)	TIMELINE
1.1	Develop a systemwide resilience plan	Building on completed vulnerability assessments (see Action 4.1) and master plans (see Actions 1.3 and 1.4), a systemwide resilience plan will prioritize initiatives across assets and operations based on operational and capital needs, cost-benefit, and environmental justice criteria.	Climate Policy & Planning (Climate), Environmental, Engineering & Capital Division (ECD), Operations	Near-Term
1.2	Identify geographic resilience needs and coordinate with key municipalities and regional entities	Prioritizing actions in the resilience plan will allow the MBTA to engage with municipalities and regional entities and collaborate on shared priorities and funding opportunities, with an equity-informed engagement strategy.	Climate, Environmental, Strategic Transit Planning, Capital Planning	Near-Term
1.3	Complete decarbonization planning across asset classes	Building on the Bus Electrification Plan and the Rail Modernization initiative, the MBTA will define decarbonization pathways for the remainder of MBTA facilities and fleets, leveraging analyses from Focus Area 4.	Infrastructure Planning, Asset Management, Climate, Operations, Environmental	Medium-Term
1.4	Develop a power master plan	Evaluate current capacity and future needs, assess potential risks and identify steps to achieve a state of good repair, improve resilience, identify opportunities for joint projects across modes, and modernize power assets.	Infrastructure Planning, Asset Management, Power, Climate, Environmental & others	In Progress
1.5	Update emergency response plans and strengthen organizational preparedness	Revise existing plans to reflect latest climate science and develop response plans for any hazards not yet covered (e.g., heat). Support updates to Comprehensive Emergency Management Plan and rider guides. Strengthen internal engagement to ensure workforce readiness to execute plans.	Climate, Security & Emergency Management, Safety, Operations	Medium-Term
1.6	Deepen integration of climate goals into capital planning	Incorporate resilience, energy and emissions priorities and environmental justice considerations into short-term (CIP) and long-term capital planning and grant strategies to ensure the MBTA can equitably fulfill state climate mandates and deliver on plans, including the Bus Electrification Plan, Rail Modernization, and plans developed in Actions 1.1, 1.3 and 1.4.	Capital Planning, Climate, Strategic Transit Planning, Infrastructure Planning	Near-Term

WHAT'S NEXT

Focus Area 2: Organizational and Workforce Needs

The MBTA requires a strong governance framework and capacity to develop and implement climate plans and policies across several key departments. The MBTA will also need to transform its workforce to ensure it can deliver sustainable and resilient capital projects and operate a decarbonized transit system under changing climate conditions.

	ACTION	DESCRIPTION	DEPARTMENT(S)	TIMELINE
2.1	Establish clear governance with designated executive ownership and decision-making authority	Establish a cross-functional team with clear executive and department-level leadership. Define roles and responsibilities by department for resilience, energy and decarbonization goals. Provide regular reports to the MBTA Board.	Climate within Policy and Strategic Planning Division	Near-Term
2.2	Carry out workforce development initiatives to support technology adoption and to build capacity to identify resilience and sustainability challenges and solutions to meet climate goals	Raise internal awareness of the MBTA's role as a climate solution, climate initiatives underway, and how departments are impacted by climate change or contribute to climate initiatives. Execute workforce development initiatives to build capacity in specific departments as needed or to build into operator contracts (e.g., extreme weather preparedness, maintenance for new technologies).	Climate, Environmental, Customer and Employee Experience (CEX), Workforce Management, Quality, Compliance and Oversight (QCO), Safety	Medium-Term
2.3	Review MBTA project management processes to further integrate sustainability and resilience in project planning and delivery	Review Project Development Group (PDG) process and staffing practices to ensure an interdisciplinary approach to delivery that further integrates sustainability and resilience earlier in the project lifecycle and during value engineering (see Actions 3.1, 3.3, 3.5).	Capital Delivery, Infrastructure Engineering, Climate, Environmental	Near-Term
2.4	Review staffing levels needed to implement climate-related initiatives and ensure continuity of service during climate events	Assess staffing needs to integrate climate priorities across capital planning and delivery and operations to achieve goals of Action 2.3, to implement plans underway or to be developed within Focus Area 1, and to ensure worker safety during climate events (e.g., adjusted staff levels during heat events to limit heat stress).	Climate, Workforce Management, QCO, Operations, Maintenance, Safety, Environmental	Medium-Term
2.5	Review procurement strategies	Identify appropriate circumstances for contracting strategies to achieve desired sustainability and resilience outcomes, e.g., for operation and maintenance of specialized energy infrastructure.	Procurement, Capital Planning, Environmental, Climate	Near-Term

WHAT'S NEXT

Focus Area 3: Design Enablement and Integration

To move beyond planning to implementation, the MBTA will need to drive further integration of sustainability and resilience priorities across the organization's process flows, particularly in capital delivery, procurement, asset management, and maintenance.

	ACTION	DESCRIPTION	DEPARTMENT(S)	TIMELINE
3.1	Develop sustainability and resilience design standards for new capital projects	Adopt design standards aligned to the sustainability and resilience objectives for use in the PDG process. Standards should outline minimum performance requirements for different types of projects, including efficiency and electrification targets. Specific standards will need to be developed for operations contracts (e.g., ferry, regional rail).	Infrastructure Engineering, Infrastructure Planning, Capital Delivery, Environmental, Rail Operations/Modernization	In-Progress
3.2	Create energy efficiency protocols for projects outside of the capital planning process	Setting protocols for repairs and maintenance projects or smaller projects. Establish energy use intensity (EUI) and electrification targets for equipment replacement and other minor renovations.	Operations, Infrastructure Engineering, Asset Management, Environmental	Medium-Term
3.3	Further integrate climate risk and sustainability reviews across asset lifecycle management and capital project design	Strengthen integrated use of Trapeze EAM and design review tools such as E-Builder, the environmental checklist, and PDG reviews for all projects and across the project lifecycle by interdisciplinary project teams (see Action 2.3). Build internal capacity to consistently meet sustainability and resilience design standards, including during value engineering (see Action 3.1).	ECD, Climate, Environmental	Near-Term
3.4	Strengthen alignment of the Capital Investment Plan (CIP) with the MBTA's sustainability and resilience goal	Refine the CIP resilience and sustainability project evaluation criteria and scoring and prioritization process to align with the Commonwealth goals as noted in the Climate Chief report, including with an equity and environmental justice lens. Explore adoption of metrics and applying criteria to long-range capital planning.	Climate, Capital Planning, Environmental, Office of Performance Management and Innovation (OPMI), Strategic Transit Planning	Near-Term
3.5	Assess opportunities to integrate Buy Clean purchasing principles into procurement	Explore adoption of Buy Clean, a federal procurement policy to promote purchase of construction materials and products with lower lifecycle emissions. Assess applicability to vehicle, material and equipment purchases.	Procurement, Capital Delivery, Capital Planning, Infrastructure Planning, Environmental	Medium-Term

WHAT'S NEXT

Focus Area 4: Analysis and Quantification

To ensure that the MBTA invests resources wisely, analysis is needed to estimate the scale of potential need and to ensure that we have necessary data to inform prioritization and decision-making in capital planning down to the project level. The MBTA must also continuously evaluate emerging technologies for their potential to accelerate decarbonization and resilience improvements.

	ACTION	DESCRIPTION	DEPARTMENT(S)	TIMELINE
4.1	Complete climate vulnerability assessments	Upcoming assessments include commuter rail assets, Cabot Yard, and additional bus facilities. Future studies should include assessment of heat-specific challenges (e.g., track buckling, power disruption, thermal discomfort). Integrate into enterprise asset management system and other centralized repositories to enable integrated planning across hazards and asset classes. Use findings to inform adaptation plan (see Action 1.1).	Environmental, Asset Management, OPMI	Near-Term
4.2	Conduct comprehensive economic analysis of necessary resilience and net-zero investments through 2050 and identification of funding strategies	Per recommendations from the Climate Chief and Beyond Mobility, in conjunction with A&F, Climate Office, EEA and MassDOT, estimate the costs of implementing energy efficiency, electrification and resilience measures. Compare with the economic benefits, avoided emissions, and other co-benefits to the extent that data is available, to communicate cost of failure to fund and implement sustainability and resilience plans.	Policy and Strategic Planning, OPMI, Capital Planning, Finance	Near-Term
4.3	Evaluate opportunities for renewable energy generation, energy storage and transmission/distribution	Review available and emerging renewable, energy storage and demand management technologies. Assess transmission and distribution needs and opportunities. Evaluate the costs, performance, scalability, and deployment potential, as well as ownership and contracting models.	Climate, Power, ECD, Operations, Maintenance, Legal	In Progress
4.4	Conduct electrification studies for ferry, paratransit and non-revenue service vehicles	Assess electrification pathways, feasibility, infrastructure needs and costs for non-revenue fleet (underway), the RIDE (beginning fall 2024) and ferry to inform facility and power plans (see Actions 1.3 and 1.4).	Operations, Environmental, ECD	In Progress or Near-Term
4.5	Assess and pilot new technologies and reliability advancements	Create a framework to assess, test and document emerging technologies to further the Authority's sustainability goal. Utilize findings to adapt system sustainability and modernization plan as appropriate.	ECD, Operations, Climate, OPMI	Near-Term

WHAT'S NEXT

Focus Area 5: Communication of Risks, Priorities and Needs

To develop equitable plans and ensure successful implement, the MBTA should develop internal and external strategies to raise awareness of climate priorities and barriers and build strong partnerships with stakeholders to ensure implementation in alignment with external mandates.

	ACTION	DESCRIPTION	DEPARTMENT(S)	TIMELINE
5.1	Develop an internal communications and education strategy	Strategy to include a clear processes for disseminating information, communicating risks, accessing and sharing information, support internal and external reporting, and managing key contacts, in connection with Action 2.2.	Climate, QCO, CEX, Environmental	Near-Term
5.2	Participate in regular inter-agency climate coordination meetings	Build on existing coordination between state agencies and establish closer working relationships as needed for coordination on specific for timely climate resilience and/or decarbonization initiatives. Includes coordination with MassDOT Climate PMO, DCR, EEA, MEMA, and other key agencies, as well as participation in state working groups.	Climate, Environmental	In Progress
5.3	Create an external engagement framework for climate priorities	Strategy to engage representatives of key communities, regional working groups and organizations and others as appropriate pursuant to the MBTA's climate priorities (see Action 1.2) and to participate in regional working groups as appropriate (e.g., Resilient Mystic Collaborative). Establish relationship management and internal reporting framework and clear channels of communication for external partners seeking to engage the MBTA on climate-related initiatives.	Climate, Strategic Transit Planning, Environmental, External Affairs	Near-Term
5.4	Develop external communications and public relations strategy around climate impacts and strategic goals	Communications plan that highlights the role of the MBTA as a climate solution by emphasizing the need for mode shift and its benefits such as air quality improvements, educates on MBTA priority climate-related projects, raises awareness of achievements across the agency, and communicates key barriers and needs to policy-makers, decision-makers and external partners (e.g., funding needed to implement legislative mandates, electrification procurement conflicts). Recommendation in alignment with the Climate Chief 180-day report.	Climate, Strategic Transit Planning, Communications, External Affairs, CEX	Near-Term

WHAT'S NEXT

Acknowledgments

MBTA Contributors:

Adam Kamoune, AJ Tanner, Daniel Andres De Riva, Bill Charrette, Bill Wolfgang, Brian Mellen, Bruno Lopes, Charles Dutton, Cheryl Guiod, Chris Brennan, Colby Cunningham, Cosette DeCoste, Deirdre Habershaw, Dennis Varley, Doug Connett, Eric DeLuca, Eric Leguelaff, Erica Anderson, Erik Stoothoff, Fred Olson, Gideon Guilman, Greg Boehner, Greg Thompson, Ivy Payne, Jack Durkin, Jack Martin, Jay Berry, Jennifer Mecca, Joe Callahan, Jonathan Bulman, Joseph Graham, Josh Ostroff, Kat Benesh, Katie Choe, Keith O'Leary, Kelly Chronley, Kelly Jennette, Kevin Scanlon, Landon Acriche, Lee Ann Ross Berry, Megan Chann, Mike McCabe, Nancy Prominski, Pete Robie, Ray Wise, Richard Henderson, Roger Mann, Ronnie Valdivia, Ryan Coholan, Sam Zhou, Sandy Johnston, Scott Hamwey, Seth Haffner, Shannon Greenwell, Steve Hicks, Sydney Peterson, Tess Paganelli, Tim Lasker, Tim Lesniak, Tom Cox, Wes Edwards

Project Team:

Policy and Strategic Planning: Lynsey Heffernan, Kat Eshel, Laura Gilmore, Janet Baker

Environmental Department: Janis Kearney, Hannah Lyons-Galante, Sean Donaghy

Legal Department: Amy Frazier

Consultants: Foley Hoag, ARUP

Photography and Graphics provided by Customer and Employee Experience (CEX) Department

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The MBTA's mission is to serve the public by providing safe, reliable, and accessible transportation.

By working together to make our system sustainable and resilient, we can deliver high-quality service for years to come and achieve our climate goals.

**Track our sustainability and resilience work:
[MBTA.com/Sustainability](https://www.mbta.com/Sustainability)**

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CEX

ORIENT HEIGHTS
BLUE LINE - BOWDOIN