

CHAPTER 1 INTRODUCTION

The Regional Transportation Plan (RTP) is a planning guide that identifies and analyzes transportation infrastructure and service improvement needs in the Northern Middlesex Region through the year 2040. The Plan encompasses nine communities in the northern section of Middlesex County, located in eastern Massachusetts. The communities comprising this area include the Towns of Billerica, Chelmsford, Dracut, Dunstable, Pepperell, Tewksbury, Tyngsborough, and Westford, and the City of Lowell (see Map 1.1 on page 3).

All transportation projects that will be funded under Title 23, U.S.C. or with Federal Transit Act funds must be included in the RTP. In addition, projects requiring FHWA or FTA approval, but not funded under Title 23, U.S.C. or with Federal Transit Act funds, must also be listed in the RTP. Similarly, transportation projects funded with federal funds from other federal agencies, as well as projects funded with local and private monies, should be described in the document for informational purposes and to reflect the integrated and intermodal nature of the metropolitan transportation planning process.

The Plan includes:

1. An overview of transportation infrastructure;
2. An assessment of environmental issues related to transportation;
3. A discussion of transportation policies, goals and objectives, and performance measures;
4. An evaluation of transportation needs for all transportation modes;
5. An overview of anticipated future financial resources;
6. An analysis of the environmental justice and civil rights implications of transportation decisions; and
7. A list of recommended transportation projects and programs, taking into account anticipated financial constraints.

FEDERAL TRANSPORTATION PLANNING REQUIREMENTS

On December 4, 2015, President Obama signed into law the federal transportation funding bill entitled Fixing America's Surface Transportation Act (FAST). The FAST Act funds the nation's surface transportation program – including, but not limited to, Federal Aid highways – at over \$305 billion for fiscal years 2016 through 2020. The Moving Ahead for Progress in the 21st Century Act (MAP-21), enacted in 2012, included provisions to make the Federal surface transportation system more streamlined, performance-based, and multimodal to address the many challenges facing the U.S. transportation system. These challenges include seven national goal areas: improving safety; maintaining infrastructure condition; reducing traffic congestion; improving reliability of the system; freight movement and economic vitality; environmental sustainability; and reducing delays in project delivery. The objective of the performance- and outcome-based program is to invest resources in projects that collectively advance the achievement of the national goals.

FAST did not significantly change the eight Federal planning factors initiated MAP-21 and it continues to address the many challenges facing our transportation system, such as improving safety, reducing congestion, increasing connectivity between modes and protecting the environment, as shown in Table 1.1.

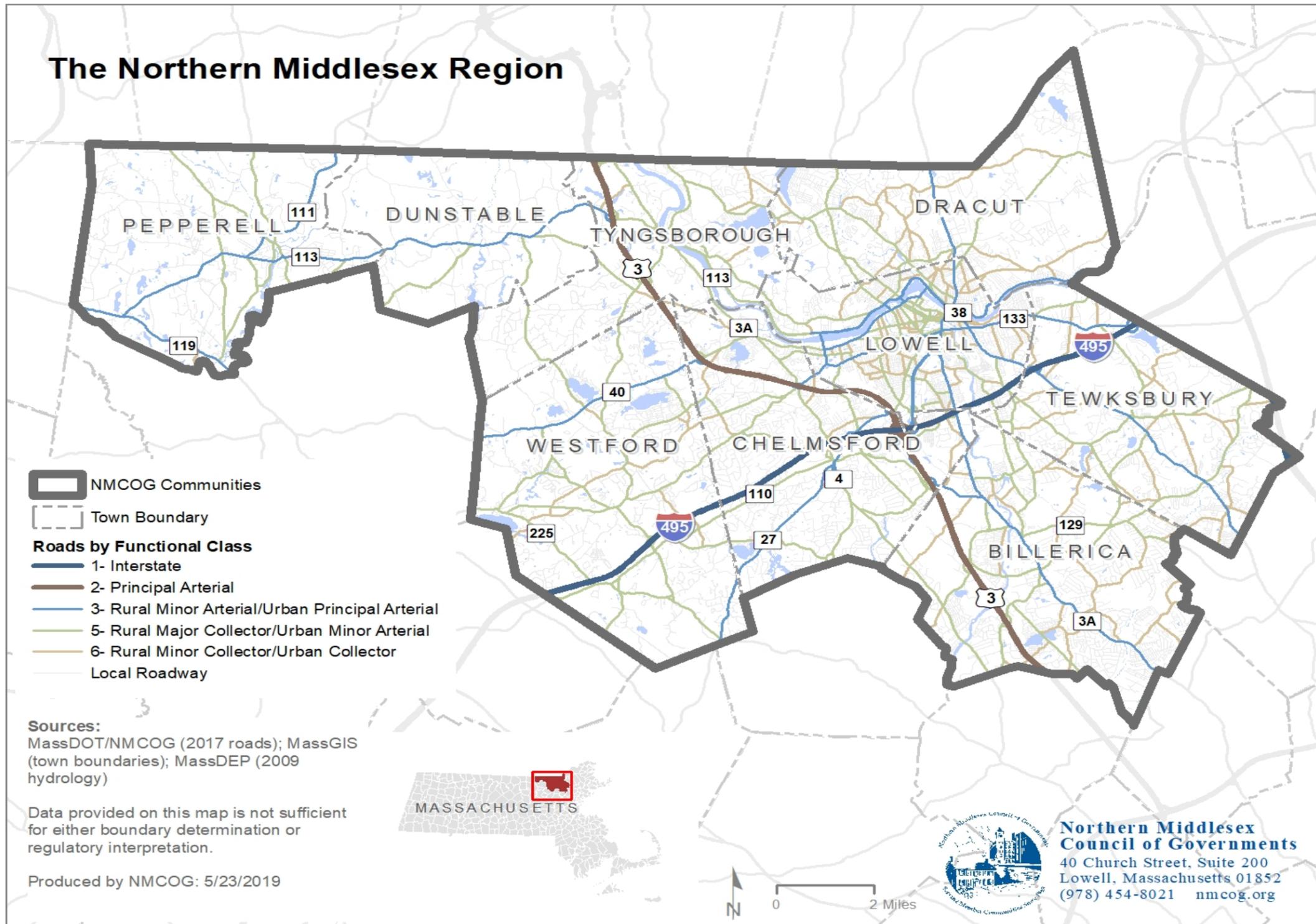
The nation and the region continue to make progress on increasing transportation options, working closely with stakeholders to ensure that local communities are able to build multimodal, sustainable projects. By setting the course for transportation investment in highways, FAST continues to advance the following national goals:

- **Strengthen America’s Highways:** FAST expanded the National Highway System (NHS) to incorporate principal arterials that were not previously included. In addition, more than half of the highway funding in the Act was devoted to preserving and improving the most important highways through the National Highway Performance Program.
- **Establish a Performance-based Program:** Under MAP-21, performance management transformed Federal highway programs and provided for more efficient investment of Federal transportation funds, by focusing on national transportation goals, increasing the accountability and transparency of the Federal highway programs, and improving transportation investment decision-making through performance-based planning and programming. The FAST Act continues the use of performance-based programs.
- **Create jobs and support economic growth:** FAST authorized Federal funding for road, bridge, bicycling, and walking improvements vital to economic sustainability and growth. In addition, FAST enhanced innovative financing and encouraged private sector investment, through a substantial increase in funding for the Transportation Infrastructure Finance and Information Act (TIFIA) program. It also included a number of provisions designed to improve freight movement by establishing a National Freight Highway Network and new freight funding programs.

Table 1.1: FAST Act National Planning Factors

Support the economic vitality of the metropolitan area, especially by enabling global competitiveness, productivity, and efficiency.
Increase the safety of the transportation system for motorized and non-motorized users.
Increase the security of the Transportation system for motorized and non-motorized users.
Increase accessibility and mobility of people and freight.
Protect and enhance the environment, promote energy conservation, improve the quality of life, and promote consistency between transportation improvements and State and local planned growth and economic development patterns.
Enhance the integration and connectivity of the transportation system across and between modes people and freight. Promote efficient system management and operation.
Emphasize the preservation of the existing transportation system.

Map 1.1: The Northern Middlesex Region



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- **Support USDOT’s aggressive safety agenda:** FAST continues the successful Highway Safety Improvement Program (HSIP), funding for infrastructure safety, strengthening the linkage among modal safety programs, and creating a positive agenda for reducing highway fatalities. It also continues to build upon other aggressive safety efforts, including the USDOT’s fight against distracted driving and its push to improve transit and motor carrier safety.
- **Improving Transportation System Resiliency and Reliability:** FAST expands the scope of the metropolitan planning process to focus on overall reliability of the system. By providing accurate and reliable information to users of the system, mobility will be enhanced.
- **Accelerate Project Delivery and Promote Innovation:** FAST continues to ensure the timely delivery of transportation projects by improving innovation and efficiency during the development of projects and throughout the planning and environmental review processes, to project delivery.
- **Mitigation of Stormwater Impacts on Surface Transportation:** FAST looks to prioritize and fund projects aimed at reducing or mitigating the impacts of stormwater runoff on the transportation system and on the environment.
- **Enhancing Travel and Tourism:** FAST focuses on the role of intermodal transportation in facilitating mobility with respect to travel and tourism activities.

MEASURING PLAN EFFECTIVENESS THROUGH PERFORMANCE MANAGEMENT

As discussed above, the FAST Act continues many of the policies of the Moving Ahead for Progress in the 21st Century Act (MAP-21), which created a performance-based and outcome-based program to address the many challenges facing the transportation system. The objective of the performance-based program is to invest resources in projects that collectively advance the achievement of national goals.

The USDOT continues to develop performance goals for each emphasis area. MassDOT and the NMMPO are currently developing performance measures and targets to include in project evaluation and prioritization. The TIP development process considers these performance measures in making transportation investment decisions that address the achievement of performance goals.

FHWA has released Final Rules establishing performance measures relative to safety, pavement condition, bridge condition, the National Highway System, Freight Movement, Congestion, and Congestion Mitigation Air Quality (CMAQ), as shown in Table 1.1. Each rule has an effective date. Once the Final Rules for these measures became effective, MassDOT established performance targets for each national performance measure. The NMMPO then worked with MassDOT and its regional partners to establish regional targets, by either adopting state targets or developing new goals.

Table 1.1: National Performance Management Rules and Performance Measures

National Performance Management Rule	National Performance Measures	Final Rule Effective Date
National Performance Management Measures to Assess Safety (PM1: 23 CFR 490.207)	# of Fatalities	14-Apr-16
	Rate of Fatalities per 100 million VMT	
	# of Serious Injuries	
	Rate of Serious Injuries per 100 million VMT	
	# of Non-motorized Fatalities and Serious Injuries	
National Performance Management Measures to Assess Pavement Condition (PM2: 23 CFR Part 490.307)	Percentage of pavements of the Interstate System in Good Condition	20-May-17
	Percentage of pavements of the Interstate System in Poor Condition	
	Percentage of pavements of the non-Interstate NHS in Good condition	
	Percentage of pavements of the non-Interstate NHS in Poor condition	
National Performance Management Measures to Assess Bridge Condition (PM 2: 23 CFR 490.407)	Percentage of NHS bridges classified as being in Good condition	20-May-17
	Percentage of NHS bridges classified as being in Poor condition	
Performance of the National Highway System (PM 3: 23 CFR 490.507)	Interstate Travel Time Reliability Measure: Percent of person-miles traveled on the Interstate that are reliable	20-May-17
	Non-Interstate Travel Time Reliability Measure: Percent of person-miles traveled on the non-Interstate NHS that are reliable	
	Greenhouse Gas Measure: Percent change in tailpipe CO2 emissions on the NHS compared to the calendar year 2017 level	
Freight Movement on the Interstate System (PM 3: 23 CFR 490.607)	Freight Reliability Measure: Truck Travel Time Reliability (TTTR) Index	20-May-17
Measures to Assess the CMAQ Program - Traffic Congestion (PM 3: 23 CFR 490.707)	Peak Hour Excessive Delay (PHED) Measure: Annual Hours of Peak Hour Excessive Delay (PHED) per Capita	20-May-17
	Non-Single Occupancy Vehicle Travel (SOV) Measure: Percent of Non-Single Occupancy Vehicle (SOV) Travel	

Table 1.1: National Performance Management Rules and Performance Measures

National Performance Management Rule	National Performance Measures	Final Rule Effective Date
Measure to Assess the CMAQ Program - On-Road Mobile Source Emissions (PM 3: 23 CFR 490.807)	Emissions Measure: Total Emission Reductions	20-May-17

Prior to establishment of the final rulemakings, the NMMPO worked with MassDOT on performance management activities. The Unified Planning Work Program (UPWP) includes a task on development and assessment of performance measures. The 2016 Regional Transportation Plan outlined initial performance measures aimed at achieving targets and is further refined in this plan. Other regional activities in performance-based planning are categorized under Safety, Travel Time Reliability and Peak Hour Excessive Delay, Bridge Performance, Pavement Condition, Air Quality, and State of Good Repair.

As displayed in Figure 1.1 on the next page, development of a performance-based transportation plan encompasses all key elements of the transportation planning process. The RTP includes system performance measures to track issues such as congestion, pavement management, safety, and transit operations. These performance measures are used to set clear policies, analyze trend data and guide investments and operational decisions. Performance measurement provides the following benefits, which lead to a more robust and transparent transportation planning and decision-making process:

- Addresses the public’s desire for accountability and transparency;
- Provides more informed decision-making and solutions to increasing challenges;
- Enhances public sector responsiveness to transportation issues and deficiencies;
- Ensures compliance with legislative mandates and regulatory requirements;
- Improves internal management;
- Facilitates refinement of programs and services; and
- Sets benchmarks for comparison of results.

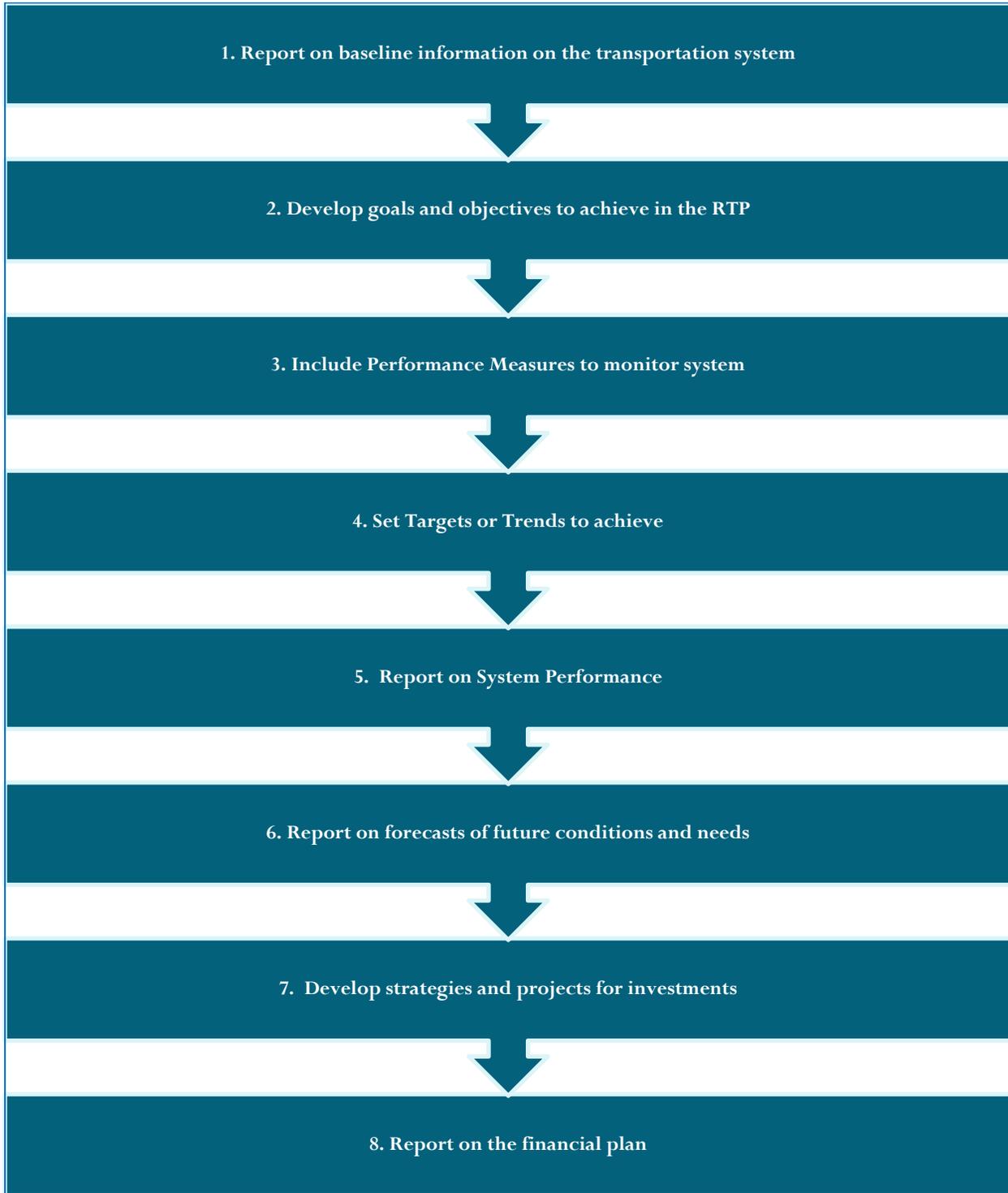


Figure 1.1: Steps involved in a performance-based approach to the Regional Transportation Plan

A performance-based transportation plan not only addresses national goals and performance measures, but is also driven by State and regional priorities. The performance measures and targets outlined throughout the RTP have been adopted by the NMMPO over the past four years.

REGIONAL GOALS, OBJECTIVES, PERFORMANCE MEASURES AND TARGETS

Goals and objectives are extremely useful in the regional planning process as they provide the necessary direction and basic framework upon which future decisions can be made. The overarching objective of the RTP remains the same as in previous plans, with a focus on *“developing a balanced, multi-modal, cost-effective, energy efficient transportation system connecting points inside and outside the Northern Middlesex Region”* by:

- Providing safe, secure and convenient transportation service to all area residents, especially transit dependent groups, such as the elderly, low income and individuals with disabilities;
- Maximizing energy conservation, improving air quality, minimizing traffic congestion, and reducing greenhouse gas (GHG) emissions as a means to address climate change;
- Encouraging development patterns that advance livability, promote a healthy lifestyle and are consistent with local and regional land use policies; and
- Increasing the number of travel choices for people and freight.

The goals outlined in this plan address both national and regional emphasis areas to promote a more balanced transportation system.

GOAL 1: IMPROVE THE SAFETY OF THE TRANSPORTATION SYSTEM FOR ALL USERS

Traffic crashes result in economic loss from damaged vehicles and goods, personal pain and suffering due to injury, and occasionally the catastrophic loss of life. Facility improvements that benefit safety must be highly valued. The RTP strives to reduce and minimize the risk of crashes occurring on the roadway network, and encourages the integrated consideration of roadway, vehicle and driver elements in design of future improvements.

Objectives aimed at achieving goals include supporting projects, program and policies that:

- Advance safe travel;
- Reduce the number and severity of crashes for all modes of transportation; and
- Promote the use of technology for projects aimed at improving safety at high crash locations.

In the post September 11, 2001 era, the Plan also recognizes the need to assess security issues to ensure safe transportation facilities. The RTP calls for coordination with safety and security agencies to ensure safe and secure transport routes throughout the region and connectivity with routes beyond the region.

Table 1.2 outlines the safety performance measures and targets. The NMMPO has adopted statewide performance measures and targets for 2019. The NMMPO has also adopted a long-term target of

achieving a 20% reduction in injuries and fatalities by 2040. The 2016 Northern Middlesex Regional Transportation Plan set a goal of a 20% reduction in fatalities and injuries by 2040 and this plan continues to support that goal. The fatality and incapacitating rates for the region are consistently below state averages. MassDOT does not provide specific targets to 2040, aside from the long-term goal of zero roadway deaths.

Table 1.2: Safety Performance Measures and Targets

Goal Area	Performance Measures	Current Performance - Rolling Five-Year Average 2012-2016	CY 2019 Performance Target - Rolling Five-Year Average 2015-2019*	Regional Rolling Five-Year Average 2012-2016	2040 Regional Target (20% reduction)
Safety	Fatalities	364	353	61	49
	Rate of Fatalities per 100 million VMT	0.61	0.58	0.44	0.35
	Incapacitating Injuries	3,146	2,801	632	506
	Rate of Incapacitating Injuries per 100 million VMT	5.24	4.37	4.57	3.66
	Total Number of Non-Motorized Incapacitating Injuries and Fatalities	541	541	90	72

*Statewide Target adopted by NMMPO 2/27/19

GOAL 2: EFFICIENTLY MANAGE EXISTING TRANSPORTATION ASSETS AND INFRASTRUCTURE

The RTP places an emphasis on maximizing the efficiency of existing facilities, rather than constructing new ones. Maintenance is one of the most cost-effective strategies outlined in the Plan. A relatively small investment is needed to keep the system in good condition, compared to what would be required to completely rebuild it. Deferred maintenance may save money in the short-run, but will be far more costly over the long-term, when compared with regular preventive maintenance. Regular maintenance provides better service, improves safety, extends equipment life and results in fewer breakdowns.

This plan addresses the issue of aging infrastructure and deferred maintenance and the associated impacts on safety, equipment life and the economic health of the region and its communities, by supporting the following projects, programs, and policies:

- Prioritize projects that maintain and modernize existing capital assets;
- Improve the condition of bridge structures;
- Improve the pavement conditions on the region's multimodal travel network;
- Promote the use of technologies for infrastructure improvement projects;
- Promote proper design of infrastructure;

- Maintain and improve service reliability, through regular route and service evaluations, and proper preventative maintenance practices;
- Maintain and upgrade all transit facilities , including Gallagher Intermodal Center, commuter rail parking garages, Kennedy Bus Hub and operation and maintenance centers; and
- Ensure that the LRTA Bus and Paratransit fleets are safe, accessible and in a state of good repair.

Tables 1.3 outlines the Roadway Infrastructure performance measures and targets. The NMMPO has adopted statewide performance measures and targets for pavement condition, bridge condition and Lowell Regional Transit Authority assets. The NMMPO, at its October 24, 2018 meeting, voted to adopt statewide targets for pavement and bridge conditions. This RTP continues the 2016 RTP goal of achieving a 10% reduction in poor pavement and bridge conditions by 2040.

Table 1.3: Pavement and Bridge Performance Measures and Targets

Performance Measures	Current Statewide Condition 2017	2020 Statewide Performance Target	2022 Statewide Performance Target	2040 Regional Target (10% reduction poor)
Interstate Pavement Condition				
% of pavement in Good Condition	74.20%	70%	70%	NA
% of pavement in Poor Condition	0.10%	4%	4%	0.09%
Non-Interstate Pavement Condition				
% of pavement in Good Condition	32.90%	30%	30%	NA
% of pavement in Poor Condition	31.40%	30%	30%	28.3%
Bridges				
% of Bridges in Good Condition	15.22%	15%	16%	NA
% of Bridges in Poor Condition	12.37%	13%	12%	11.1%

The Federal Transit Administration’s (FTA) Final rule (49 CFR Part 625) outlined a requirement for transit providers to implement performance management through Transit Asset Management Plans. LRTA, as a Tier II Provider¹, adopted their respective TAM Plan on August 28, 2018. The NMMPO reviewed and adopted the performance measures outlined in the Plan on February 27, 2019. The TAM Plan covers a horizon period of Federal Fiscal Years 2018-2022. The purpose of the plan is to:

- Provide implementation actions that offer enabling support and direction for management of transit assets; and

¹ Tier II Provider: 100 or fewer vehicles across all fixed routes.

- Provide direction and expectations for asset class owners and department managers regarding lifecycle management planning and processes.

The TAM Plan uses transit asset condition to guide the management of capital assets and prioritizations of funding to improve/maintain a State of Good Repair (SGR). SGR performance measures and targets were set for rolling stock, equipment and facilities. Table 1.4 outlines the NMMPO-adopted TAM performance measures and targets.

Table 1.4: Transit Asset Management Performance Measures and Targets

Asset Category -Performance Measure	Asset Class	2019 Target	2020 Target	2021 Target	2022 Target	2023 Target
REVENUE VEHICLES						
Age -% of revenue vehicles within a particular asset class that have met or exceeded their Useful Life Benchmark	BU -Bus	12%	20%	10%	5%	3%
	CU -Cutaway Bus	11%	24%	35%	13%	4%
EQUIPMENT						
Age -% of vehicles that have met or exceeded their Useful Life Benchmark	Non-Revenue/Service Automobile	50%	0%	0%	0%	0%
	Trucks and other Rubber Tire Vehicles	70%	70%	70%	70%	70%
	Maintenance Equipment*	30%	30%	22%	22%	10%
	Facilities Equipment*	0%	0%	0%	0%	0%
FACILITIES						
Condition -% of facilities with a condition rating below 3.0 on the FTA Transit Economic Requirements Model (TERM) Scale	Administration	0%	0%	0%	0%	0%
	Maintenance	0%	0%	0%	0%	0%
	Parking Structures	0%	0%	0%	0%	0%
	Passenger Facilities	50%	50%	0%	0%	0%

In order to achieve these goals, the NMMPO strives to address infrastructure issues by:

- Monitoring the condition of existing infrastructure and identifying critical needs;
- Prioritizing ongoing maintenance to avoid the added cost of deferred maintenance activities;
- Continued participation in MassDOT programs, plans and policies including the Statewide Bridge Program, the Complete Streets funding program and Chapter 90; and
- Continuing to participate in the State ITS program.

GOAL 3: IMPROVE TRAVEL TIME AND RELIABILITY FOR PEOPLE AND GOODS

Congestion results in increased travel time, poor air quality, increased greenhouse gas emissions, and frustration on the part of the traveling public. Existing facilities can be enhanced by operational improvements and better intermodal connections. Other options, such as reducing travel demand through employer based ridesharing and telecommuting, can play a role in relieving congestion. Expanding existing facilities is often the most direct way to alleviate congestion, although not always the most cost-effective. Improved methods of providing information about congestion trouble spots to commuters may make travelers aware of alternative routes and modes.

In order to achieve this goal, the NMMPO strives to support projects, programs, and policies that:

- Improve the performance of the existing transportation facilities to reduce congestion;
- Eliminate critical highway bottlenecks;
- Increase reliability and on-time performance of the transit system;
- Increase bicycle parking capacity, pedestrian facilities and access to transit stations in order to encourage mode shift; and
- Improve incident management.

As part of the FAST Act's performance-based planning process, FHWA passed a systems performance measure rule aimed at improving the efficiency of the system and freight movement, reducing traffic congestion, and reducing emissions. In May 2018, MassDOT adopted targets for the following measures:

- **Level of Travel Time Reliability (LOTTR):** the consistency or dependability in travel times, as measured from day-to-day and/or across different times of the day. LOTTR is based on the amount of time it takes to drive the length of a road segment and is the percentage of person-miles traveled that are "reliable". LOTTR is calculated by dividing the 80th/50th percentile travel time. If it falls below 1.50, the segment is "reliable". The percentage of road segments that are "reliable" is used as the target.
- **Level of Truck Travel Time Reliability (TTTR):** the consistency or dependability in truck travel times, as measured from day-to-day and/or across different times of the day. TTTR is based on the amount of time it takes trucks to drive the length of a road segment and is an index of 50th/95th percentile travel times. The TTTR index is reported as a weighted average of the largest period for each segment.

The Northern Middlesex MPO planning area includes communities in the Boston Urbanized Area (UZA). As a signatory to the 2018 Boston UZA Memorandum of Understanding (Boston UZA MOU), the NMMPO has adopted two-year (2020) and four-year (2022) Boston UZA-wide congestion performance measure targets. These performance measures are the percentage of non-single occupancy vehicle (SOV) travel and the Peak Hour Excessive Delay (PHED). Targets were developed in coordination with state Departments of Transportation and neighboring MPOs with planning responsibility for portions of the Boston UZA.

- **Percentage of Non-Single Occupancy Vehicle (SOV) Travel:** The metric is based on the percentage of people commuting to work using a mode other than a single occupancy vehicle (e.g. carpool, van, public transit, walking, bicycling, or telecommuting). The targets are determined from available Census journey to work data in the Boston UZA, where the proportion of non-SOV travel has been steadily increasing and is projected to continue increasing at a rate of 0.32% annually.
- **Peak Hour Excessive Delay (PHED):** a measurement of annual hours of excessive delay per capita on the National Highway System (NHS) between 6 am and 10 am, and 3 pm and 7 pm, divided by the total UZA population. At the time when the target was set, there was only one year of data available. Therefore, the performance targets have been set flat until further data is available. The threshold is based on the travel time at 20 miles per hour or 60% of the posted speed limit, whichever is greater.
- **Emissions Reductions:** The on-road mobile source emissions measure is calculated by summing two-and four-year totals of emissions reductions in kilograms per day. Emissions reduction targets are measured as the sum total of all emissions reductions anticipated through CMAQ-funded projects in non-attainment or air quality maintenance areas (currently the cities of Lowell, Springfield, Waltham, and Worcester, and the town of Oak Bluffs) identified in the Statewide Transportation Improvement Program (STIP). This anticipated emissions reduction is calculated using the existing CMAQ processes.

The NMMPO is required to report on performance of vehicle emission reductions for carbon monoxide because of Lowell's maintenance area status and has done so in an October 2018 CMAQ Congestion and Emissions Performance report.

In October 2018, the NMMPO voted to adopt two-year (2020) and four-year (2022) statewide reliability, congestion, and emissions performance measures and targets set by MassDOT. Table 1.5 summarizes each system performance measure and target adopted by the NMMPO. The 2040 regional targets represent a reduction of 20%, continuing the targets set in the 2016 Regional Transportation Plan.

Table 1.5: System Performance Measures and Targets

Performance Measures	2017 Current Conditions (State)	2017 Current Conditions (Region)	2020 Target	2022 Target	2040 Regional Target
Percentage of Travel Time Reliability	68% Interstate	66.9% Interstate	68% Interstate	68% Interstate	80%
	80% Non-Interstate	80.6% Non-Interstate	80% Non-Interstate	80% Non-Interstate	97%
Level of Truck Travel Time Reliability	1.85	2.48	1.85	1.85	1.98
Peak Hour Excessive Delay (annual hours per capita – Boston UZA)	18.31	18.31	18.31	18.31	14.65
Non-SOV Travel (Boston UZA)	33.60% (2016)	33.60%	34.50%	35.10%	40.3%
CO Benefit (kg/day)	24.452 kg/day (State baseline condition)	11.76 kg/day (FFY14-17 regional baseline);	0.00 (FFY 18-19 regional target) 1,596.514 (State target)	0.00 (FFY 2018-2022 regional target) 1,596.514 (State target)	FFY 2036-2040 Regional TIP
NOx Emissions Reduction (kg/day)	0.742 (FFY 14-17 Obligated STIP Projects using CMAQ Funding)		0.5	1.6	
VOC Emissions Reduction (kg/day)	1.667 (FFY 14-17 Obligated STIP Projects using CMAQ Funding)		0.6	0.9	
Ozone (kg/day)	FFY 14-17 baseline condition		497.9	1.1	

GOAL 4: ENSURE THAT THE TRANSPORTATION NETWORK SUPPORTS ECONOMIC DEVELOPMENT NEEDS AND ACCOMMODATES FUTURE ECONOMIC GROWTH

An efficient, safe, and reliable transportation system is critical to the economic vitality of the region. Sufficient road, rail, and transit connections allow businesses to transport goods and services to markets and allow workers to get to job centers. The RTP strives to reduce the time and cost of commuting, goods movement, and other travel activities. Transportation supports economic development by improving access to priority development areas, and increasing transportation options in economically disadvantaged communities.

In order to achieve the economic vitality goal, the NMMPO support projects, programs, and policies that:

- Advance corridor and community development and redevelopment opportunities to improve the region's economy and enhance quality of life;
- Prioritize transportation investments that serve targeted development sites;
- Advance strategies to support connections between key employment origins and destinations;
- Expand transit service to regional employment markets that are either underserved or not currently served;
- Improve bicycle and pedestrian access to employment, educational, health, and recreational opportunities; and
- Connect multi-family and affordable housing with employment and educational opportunities.

This 2020 Regional Transportation Plan continues to support the goals outlined in the 2016 version, by monitoring the following performance measures:

- *Number of new businesses formed;*
- *Number of Affordable Housing facilities served by transit;*
- *New jobs created;*
- *Number of new or expanded transit routes to serve employment centers, health care facilities, and educational facilities; and*
- *Percentage of population and places of employment within ¼ mile of a transit station or route.*

Targets aimed at achieving this goal include the following:

- *Increase percentage of population and places of employment within ¼ mile of transit station or route by 5% as compared to 2016; and*
- *Increase percentage of population and places of employment within ½ mile of bicycle facilities by 15% as compared to 2016.*

The NMMPO strives to continue its work coordinating economic development projects and transportation infrastructure, as well as working to connect employment sites, educational institutions, and health facilities with the region's neighborhoods.

GOAL 5: MINIMIZE AND MITIGATE THE IMPACTS OF THE TRANSPORTATION SYSTEM ON THE ENVIRONMENT, INCLUDING AIR QUALITY, WATER QUALITY, WILDLIFE HABITAT, AND CLIMATE CHANGE

Transportation affects the environment by producing air pollution (including greenhouse gases), creating runoff that affects soils and drinking water, consuming land, and by generating noise and visual impacts. Air quality can be improved by encouraging the use of modes that reduce the amount of emissions per passenger per mile. Ridesharing, transit, bicycling and walking are beneficial in this regard,

compared to using the single occupant automobile. Alternative fuels, electric vehicles and new engine technologies also offer hope for the future.

Design and construction of facilities should assure that materials used in operations and maintenance, such as road salt, will not have negative impacts on drinking water. In planning new facilities, sensitivity to design issues can also minimize adverse impacts on communities through appropriate treatments, such as landscaping and noise barriers. Future transportation improvements should be designed and constructed in a way that minimizes the disruption of existing neighborhoods, and preserves prime farmland, natural resources and open spaces.

Transportation system management measures enhance mobility and strengthen corridor efficiency by reducing overall travel time delay. Deploying and adapting Intelligent Transportation Systems (ITS), such as vehicle flow treatments, real-time system information programs, transit monitoring systems and real time automated incident detection technologies, can also improve the reliability and efficiency of the transportation system.

The most efficient modes of transportation save energy by using fewer vehicles to carry a given number of people. As vehicle occupancy rates increase, the amount of energy used per passenger mile decreases. The use of the most energy efficient modes, such as transit, ridesharing, bicycling and walking, should be encouraged wherever practical. Minimizing the use of energy resources will also help to lower greenhouse gas emissions. This plan supports MassDOT's Healthy Transportation Compact, which outlines the State's mode shift goal, and the Global Warming Solutions Act, which focuses on reduction of greenhouse gas emissions, by prioritizing projects aimed to achieve their goals. The Commission on the Future of Transportation, established under Executive Order 579, recommends electrification of the Commonwealth's transportation system. Electric vehicles produce far fewer emissions than conventional vehicles, and their use is supported by the NMMPO.

Transportation and land use policies have a symbiotic relationship –each is dependent upon the other. Transportation facilities should be constructed to serve areas with existing demand, and the land should be developed most intensively, where there are adequate transportation facilities. Transportation planning decisions should incorporate sound local and regional land use planning objectives. Compact, mixed-use development brings jobs, housing and shopping closer together, and, thereby, improves livability.

Future transportation facilities and services should be consistent with adopted community land use plans, water quality management plans, housing plans, economic development plans and open space and recreation plans. Communities should consider the impacts of future development projects on the transportation network.

To achieve the environmental sustainability and livability goal, the NMMPO supports projects, programs, and policies that:

- Encourage mode shift and reduce VMT;

- Provide multimodal, active transportation options that improve public health and reduce air pollution;
- Maintain national ambient air quality standards;
- Create a connected network of bicycle and pedestrian facilities by expanding existing facilities and closing gaps;
- Promote the use of alternative fuel vehicles, such as compressed natural gas (CNG), electric and hybrid electric;
- Provide additional electric vehicle charging facilities;
- Protect critical transportation infrastructure from the effects of climate change;
- Promote sustainable design principles that minimize the region’s carbon footprint;
- Consider sensitive environmental resources, such as wetlands and wildlife habitat, in planning and designing transportation improvements; and
- Address stormwater runoff and flooding concerns.

Table 1.6 below outlines Environmental Sustainability and Livability performance measures and targets.

Table 1.6: Environmental Sustainability and Livability Performance Measures and Targets

Goal 5: Environmental Sustainability and Livability	
Performance Measures	Roadways
	On-road mobile source emissions (carbon dioxide, nitrogen oxides, volatile organic compounds, greenhouse gases).
	Number of projects implemented that benefit air quality
	Number of stormwater improvement projects implemented by local communities and MassDOT
	Transit
	Transit fleet mix (alternative fueling technologies)
	Number of electric vehicle charging stations added
	Active Transportation
	Bicycle and Pedestrian mode share
Miles of bike lanes, sidewalks and off road multi use trails	
Targets	By 2040:
	Reduce transportation-related carbon dioxide emissions below 1990 levels by 25% as compared to 2010
	Increase electric or compressed natural gas (CNG) transit fleet by 15% as compared to 2016
	Double bicycling and walking mode share as compared to 2016.
	Increase miles of bike lanes and sharrows by 25% as compared to 2016.
	Increase miles of sidewalks and trails by 15% as compared to 2016.
Increase the number of electric vehicle charging stations by 20% as compared to 2016	

In order to achieve these targets, the NMMPO will continue to work with local, regional, state and Federal partners to:

- Ensure that transportation construction projects respect the environment and are adequately mitigated;
- Promote alternative modes of transportation;
- Work with local communities to address pollution from stormwater runoff, limit deicing chemicals, and protect wildlife habitat; and
- Work to protect critical infrastructure from impacts of climate change.

GOAL 6: PROVIDE FAIR AND EQUAL TRANSPORTATION ACCESS AND SERVICE QUALITY TO ALL COMMUNITIES AND NEIGHBORHOODS, REGARDLESS OF INCOME, RACE OR LEP STATUS.

An equitable transportation system can produce many benefits including economic equity, social justice and equality. The RTP strives to provide mobility and accessibility to the transportation system for all people, particularly those who are transportation disadvantaged, and to minimize transportation barriers for mobility-limited people. Transit and paratransit services and systems must be accessible to persons with physical or other disabilities, in accordance with the Americans with Disabilities Act.

Transportation decision-making should be made through an open and accessible public participatory process that includes broad representation of interested individuals and groups, including minority and low-income populations. Environmental justice should be fostered through the maintenance of a planning process that does not unfairly affect any one segment of our community. Early and continuing opportunities for public engagement in transportation plans, projects and programs should be provided, particularly for those in the communities traditionally underserved by the transportation planning process.

To provide fair and equal transportation access and service quality to all communities and neighborhoods regardless of income, race or LEP status, the NMMPO supports projects, programs and policies that:

- Maximize benefits and minimize burdens of transportation investments for low-income and minority neighborhoods;
- Meet non-traditional transportation and transit-dependent needs of the region's population, including those of the elderly and persons with disabilities; and
- Ensure that low-income, minority and Non-English speaking persons have ample opportunities to participate in the transportation planning process and share in the decision-making process.

Table 1.7 presents performance measures and targets for Transportation Equity and Accessibility.

Table 1.7: Transportation Equity and Accessibility Performance Measures and Targets

Goal 6: Transportation Equity and Accessibility	
Performance Measures	Monitor transportation projects and investments (number of projects and dollars of investment) to ensure that low-income and minority neighborhoods share equally in the benefits and burdens
	Monitor transit improvement projects to ensure that low-income and minority neighborhoods receive equitable service levels and equipment
Targets	By 2040:
	Provide long-term documentation demonstrating that low income, minority and Non-English speaking persons share equally the benefits and burdens of transportation improvements and investments

To achieve the long-range target, the NMMPO will continue the following efforts:

- Actively engaging minority and low income neighborhoods;
- Review and expand the regional public participation process;
- Monitor changes in demographics; and
- Routinely evaluate transportation projects and programs to assess impacts on low-income and minority populations through the Transportation Improvement Program and the Unified Planning Work Program.

RELATIONSHIP BETWEEN REGIONAL AND NATIONAL GOALS

In developing the RTP, the NMMPO has considered how the regional goals address each of the national planning factors. Table 1.8 lists the national planning factors set out in FAST and the regional goals associated with each factor. Some planning factors include multiple regional goals, which will be discussed throughout the Plan.

Table 1.8: National Planning Factors and Regional Goals

Federal Planning Factors	Regional Goals supporting National Planning Factors
Support the economic vitality of the metropolitan area, especially by enabling global competitiveness, productivity, and efficiency.	Improve the safety of the transportation system for all users
	Efficiently manage existing transportation assets and infrastructure
	Improve travel time and reliability for people and goods
	Ensure that the transportation network supports economic development needs and accommodates future economic growth
Increase the safety of the transportation system for motorized and non-motorized users.	Improve the safety of the transportation system for all users

Table 1.8: National Planning Factors and Regional Goals

Federal Planning Factors	Regional Goals supporting National Planning Factors
Increase the security of the Transportation system for motorized and non-motorized users.	<p>Improve travel time and reliability for people and goods</p> <p>Improve the safety of the transportation system for all users</p>
<p>Increase accessibility and mobility of people and freight</p> <p>Protect and enhance the environment, promote energy conservation, improve the quality of life, and promote consistency between transportation improvements and State and local planned growth and economic development patterns.</p>	<p>Ensure that the transportation network supports economic development needs and accommodates future economic growth</p> <p>Improve travel time and reliability for people and goods</p> <p>Minimize and mitigate the impacts of the transportation system on the environment, including air quality, water quality, wildlife habitat, and climate change</p> <p>Ensure that the transportation network supports economic development needs and accommodates future economic growth</p>
Enhance the integration and connectivity of the transportation system across and between modes people and freight.	<p>Efficiently manage existing transportation assets and infrastructure</p> <p>Improve travel time and reliability for people and goods</p>
Promote efficient system management and operation.	Efficiently manage existing transportation assets and infrastructure
Emphasize the preservation of the existing transportation system.	<p>Improve travel time and reliability for people and good</p> <p>Efficiently manage existing transportation assets and infrastructure</p>

OVERVIEW OF THE RTP DOCUMENT

The Regional Transportation Plan serves as the guide for moving the region's transportation system forward in a way that provides enhanced mobility while respecting the sustainability challenges that confront our region and the nation. The document contains fifteen chapters, including this introductory section, which comprises **Chapter 1**.

Chapter 2 provides an overview of the Public Participation process that was utilized for the RTP planning process. This section includes a summary of the input received through: the RTP website and social media; the regional public input sessions; meetings with stakeholders and special interest groups; and input collected through an online survey for residents and stakeholders.

Chapter 3 outlines the transportation planning process. It describes the federal and state requirements, the composition of the Northern Middlesex Metropolitan Planning Organization (NMMPO), the role of the municipalities and other stakeholders, and outlines the transportation decision-making process. It

also outlines how local and regional planning, policies and programs are integrated into the RTP document.

Chapter 4 provides an overview of the region's development and land use trends. A demographic profile of the region is also provided, including data on income, population, and housing. Demographic projections through the year 2040 are contained within this chapter, along with information on commuting patterns and mode choice.

Chapter 5 describes the region's roadway network and bridge infrastructure and identifies the condition of these transportation assets. It also provides an overview of some of the large infrastructure and transportation system deficiencies that will need to be addressed over the life of the plan, such as the replacement of the temporary Rourke Bridge, improvements along I-495 and I-93, and the completion of Exit 36 on Route 3.

Chapter 6 provides an overview of transit services available to the region, including services operated by LRTA, MBTA, and non-profit and private transit service providers. This section outlines the transit needs of the region and provides an overview of transit improvements that have been put in place since completion of the previous RTP.

Chapter 7 provides an overview of the Active Transportation network in the region. This chapter describes the region's bicycle and pedestrian facilities, outlines state initiatives to promote bicycling and walking, such as Complete Streets and Safe Routes to School, and details the challenges and opportunities for expanding active transportation in the region.

Chapter 8 provides information on emerging technologies at the federal, state and local level. Such initiatives impact all modes of transportation, with a focus on improving efficiency, travel times and safety. The Regional ITS architecture is also summarized in this section.

Chapter 9 outlines the safety and security issues impacting the region's transportation infrastructure and services. This chapter outlines the roles and responsibilities of the state and federal agencies charged with protecting our transportation system, describes recent safety and security initiatives impacting the region and the state, as well as steps taken by the LRTA to enhance the safety of its customers.

Chapter 10 evaluates transportation system reliability and congestion. The region's Congestion Management Process is reviewed, summarizing the levels of congestion found on the roadway system, transit network and at park and ride lots. Travel demand management and transportation system management strategies are discussed.

Chapter 11 discusses national freight policy and state initiatives. This section also provides an overview of the region's freight facilities and network, and describes current freight movement. Opportunities and challenges related to improving freight transportation are also discussed.

Chapter 12 describes the interaction between the growth of the region’s economy and the transportation network needed to support and sustain the region’s economic health. An overview of regionally significant development projects and related transportation infrastructure needs is presented.

Chapter 13 focuses on environmental sustainability and livability. Air quality, water quality, stormwater and climate change are addressed in this section. A preliminary analysis of the potential environmental impacts associated with the projects contained in the RTP is also provided in this chapter.

Chapter 14 addresses the issues of accessibility, social equity and environmental justice. An assessment of the region’s environmental justice population is provided, along with an analysis of the environmental justice impacts of the projects outlined in the RTP.

Chapter 15 outlines the project recommendations and financial analysis of the plan. This section also summarizes the projects that have been implemented since the 2016 RTP was completed. The demonstration of financial constraint is presented in this chapter to ensure that costs of the recommendations do not exceed the anticipated resources available.