NYMTC
NEW YORK METROPOLITAN TRANSPORTATION COUNCIL

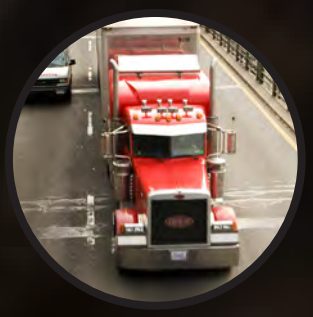
New York Metropolitan Transportation Council

Plan 2040

Regional Transportation Plan

A Shared Vision for a Sustainable Region



ADOPTED ON SEPTEMBER 4, 2013

Disclaimer

This document was funded in part through funds from the Federal Highway Administration, the Federal Transit Administration and the U.S. Department of Transportation. The views expressed in this document are those of the New York Metropolitan Transportation Council and do not necessarily state or reflect the those of the U. S. Department of Transportation.

The New York Metropolitan Transportation Council assures that no person shall, on the grounds of race, color, national origin, or gender, as provided in Title VI of the Civil Rights Act of 1964 and related statutes, be excluded from participation in, or be denied the benefits of, or be otherwise subjected to discrimination under any program or activity for which NYMTC received Federal financial assistance.

Further, NYMTC incorporates the principles of environmental justice into its policies, planning and project development activities to ensure that there are no inequitable impacts on minority groups and low-income groups throughout the region.

Joel P. Ettinger
Executive Director

NEW YORK METROPOLITAN TRANSPORTATION COUNCIL

RESOLUTION #2013-5
COUNCIL ADOPTION OF THE FEDERAL FISCAL YEARS 2014-2040 REGIONAL TRANSPORTATION PLAN (*PLAN 2040*) AND RELATED 2013 CONGESTION MANAGEMENT PROCESS STATUS REPORT

WHEREAS, the New York Metropolitan Transportation Council (NYMTC) is a regional council of governments which is the metropolitan planning organization for New York City, Long Island and the lower Hudson Valley; and

WHEREAS, pursuant to 23 CFR 450.322, NYMTC is responsible for the development of a Regional Transportation Plan (Plan) for the downstate New York region; and

WHEREAS, NYMTC's current 2010-2035 Plan was adopted by the Council on September 24, 2009, having addressed all federal planning requirements set forth in 23 CFR 450.322, and, per Federal regulations, expires on September 30, 2013; and

WHEREAS, NYMTC has prepared a draft 2014-2040 Plan (*Plan 2040*) to address the federal planning requirements set forth in 23 CFR 450.322 beginning on October 1, 2013; and

WHEREAS, in conjunction with the *Plan 2040* draft, NYMTC has also prepared a draft 2013 Status Report for the Congestion Management Process (CMP) to address regulations set forth in 23 CFR 450.320 and 23 CFR 500.109; and

WHEREAS, these draft products have undergone public review per Federal regulations and NYMTC's Operating Procedures; and

WHEREAS, at its August 29, 2013 meeting, NYMTC'S Program, Finance and Administrative Committee recommended that the *Plan 2040* draft and the 2013 CMP Status Report draft be adopted by the Council.

NOW, THEREFORE BE IT RESOLVED, the New York Metropolitan Transportation Council members adopts *Plan 2040,* the 2014-2040 Regional Transportation Plan, and the 2013 CMP Status Report.

This resolution shall take effect on the fourth day of September, two thousand and thirteen.

ADOPTED: September 4, 2013

"I hereby certify that the above is a true copy of Resolution #2013-5, Council Adoption of the Federal Fiscal Years 2014-2040 Regional Transportation Plan (Plan 2040) and Related 2013 Congestion Management Process Status Report, and was motioned by Nuria Fernandez, representing Chairman & CEO Thomas Prendergast, Metropolitan Transportation Authority, and seconded by Jack Schmidt, representing Director Amanda Burden, NYC Department of City Planning. This Resolution was adopted and passed unanimously by the New York Metropolitan Transportation Council."

Ron Epstein, Secretary to the Council

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CHAPTER 1:
THE SHARED VISION

PLAN 2040
Chapter 1: The Shared Vision

MTA Metro-North Railroad's new M8 single rail cars.


A family outing along the Bronx River Parkway during Bicycle Sundays in Westchester County.


LIRR East Side Access, Manhattan

1. Introduction

The key to understanding, developing, and implementing the regional transportation plan is sustainability. It is the crucial element in how we plan for the future and where we invest. *Plan 2040: A Shared Vision for Sustainable Growth*, the New York Metropolitan Transportation Council (NYMTC)'s Regional Transportation Plan, is the 25-year, long-term plan for investing and building sustainable growth in our region and transportation network.

All indicators suggest that the region will continue to grow in population by 1.7 million, from 12.6 million in 2015 to 14.3 million in 2040, including a senior population (aged 65 and above) that increased by 7.4 percent between 2000 to 2010, from 1.48 to 1.59 million. On a daily basis, the region's transportation network currently supports approximately 3.2 million bus riders, 6.3 million rail rapid transit passengers, 110,000 ferry riders, 143,000 airline passengers, and over 200 million vehicle miles driven each day on the region's roads. With the anticipated population growth, the existing transportation network must be improved, integrated, and properly maintained. The financial security of the transportation system is critical to the economic health and future growth of the region.

Plan 2040 was developed by member agencies and communities across the 10-county region. The plan highlights the need for developing sustainable transportation and land use projects, supporting the equitable development of regional growth, and creating strategic policy guidelines and transportation investments. The plan also discusses how NYMTC member agencies will help sustain and encourage the region's economic growth through state-of-good-repair programs and expansions of the transportation network. *Plan 2040* outlines how NYMTC intends to accomplish regional transportation planning goals guided by a Shared Vision of the region's future without compromising future generations to meet their needs.

The NYMTC planning area, like the rest of the nation, has suffered from the recent economic downturn. However, the region's unique characteristics contribute to a positive quality of life while moving more people and goods than any other region in the nation. For example, about one in every five mass transit riders and one-third of all rail riders in the U.S. reside in the NYMTC planning area. Also, the region's transportation agencies show a strong dedication to walking, bicycling, and reducing transportation emissions. Economic conditions are closely related to transportation service. The transportation network is the means by which workers access jobs and businesses access resources on a daily basis. Its quality and reliability directly impacts worker productivity, business efficiency, and quality of life. On a typical business day, the region's roads and transit systems handle approximately 33 million passenger trips and thousands of tons of freight. By 2040, the number of passenger trips is expected to rise to almost 38 million. Regional mobility and the quality of the transportation network are therefore critical factors in supporting sustainable economic development. Investing in the region's transportation system has an immediate impact on job growth and eco-

nomic activity. Accordingly, *Plan 2040* describes investments in the future of the region.

To stay economically competitive, it is vital for the New York metropolitan region to continue to maintain and improve its transportation network, increasing capacity, and improving efficiency. Susan Martinovich, President of the American Association of State Highway and Transportation Officials (AASHTO), told a U.S. Senate committee in 2011, "The overall benefits of transportation investments to the broader economy are estimated to be five times the $240 billion spent by governments each year on highway, transit and other transportation infrastructure." According to Jean-Paul Rodrigue, Claude Comtois, and Brian Slack, the many significant impacts that transportation investment can have on the economy can be broken down according to three types. First, "direct impacts" result from the positive effects of increased accessibility on employment, market expansion, saved time and cost, and added value. Second, "indirect impacts" are caused by the multiplier effects of lower prices and the greater variety of goods and services, which spur greater economic activity in the region. Third, "related impacts" result from the ability of firms to move passengers and freight at reduced cost.

These economic impacts tend to boost productivity. Transportation improvements decrease the cost of doing business for industry and for the economy in general. Increased productivity then increases output across the economy. The connection between transportation investments and economic growth has been demonstrated historically, from the building of the national railroad network in the 19th century to the construction of the interstate highway system during the 1950s and 1960s. In the latter case, investment in the interstate system led to productivity gains largely in vehicle-related industries.

Transportation projects can also yield employment gains, an economic effect which is much needed during periods of recession. The Federal Highway Administration predicts that an expenditure of $1 billion of federal-aid towards transportation will support up to 30,000 jobs with a total employee income of $1.5 billion. Construction and manufacturing workers were among those most affected by the economic downturn: 21 percent of those who lost their jobs during the period of December 2007 to December 2009 were in the construction industry. Infrastructure spending would allow many of those who lost their jobs to return to work: 61 percent of infrastructure jobs are in construction, 12 percent are in manufacturing, and 7 percent are in retail trade. Although many of these positions are short-term, increased hiring would lead to increased demand and further hiring to satisfy that demand. *Plan 2040* focuses on a portfolio of strategic transportation investments and projects that will make a substantial contribution to economic productivity and employment growth.

In order to reliably support the region's economy and quality of life, the transportation system must not only grow to meet future demands but also be safeguarded against emerging stresses of climate change.

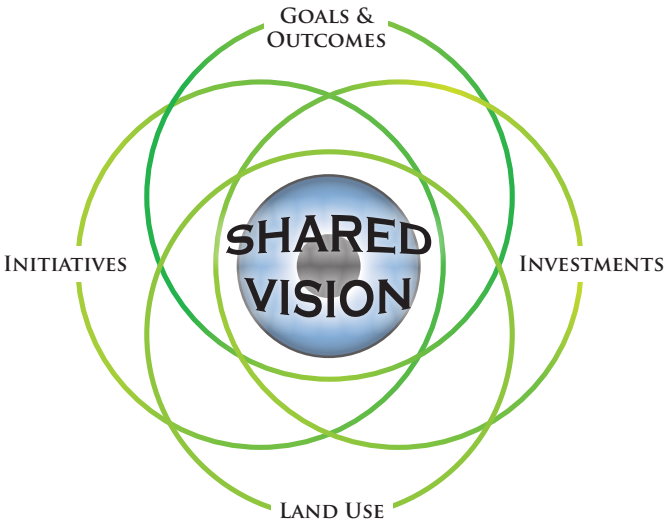
In order to reliably support the region's economy and quality of life, the transportation system must not only grow to meet future demands but also be safeguarded against the emerging stresses of climate change. Planning for climate change employs two types of strategies, mitigation and adaptation, both of which are incorporated into *Plan 2040*. Climate change mitigation measures aim to stop the causes of global warming, most commonly by reducing greenhouse gas emissions which are produced primarily by burning fossil fuels. Climate change adaptation measures aim to increase our resilience to the effects of climate change and global warming which include sea level rise, heat waves and more frequent and severe storms.

In the United States, the transportation sector is the second largest emitter of greenhouse gasses, following electrical power generation, and in 2011 was responsible for 27 percent of all U.S. greenhouse gas emissions. Even small improvements in efficiency of moving people and goods can result in substantial reductions in overall greenhouse gas emissions, and *Plan 2040* discusses a

Suffolk County Bus Rapid Transit.


Hurricane Sandy flooding, World Trade Center.

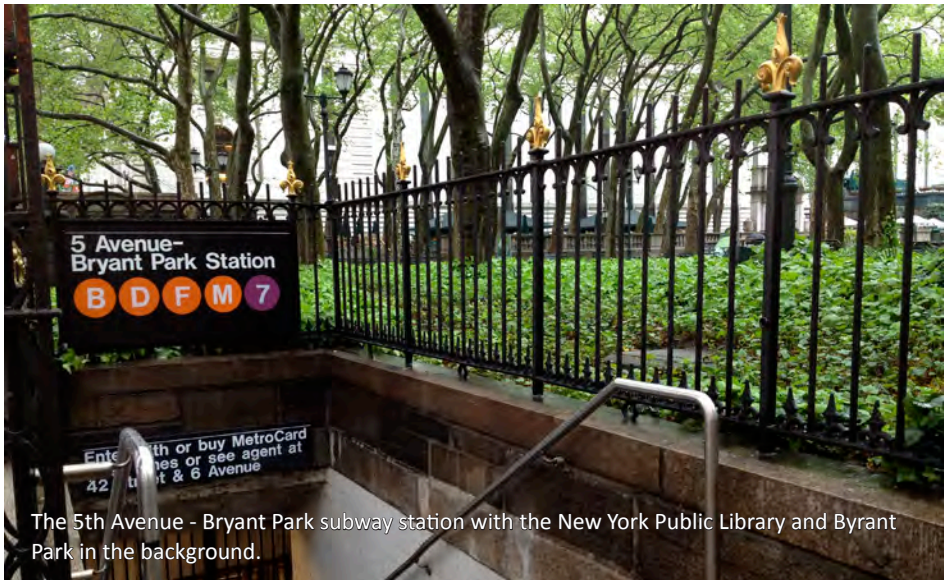
wide variety of strategies and goals aimed at doing so. These strategies range from modernizing transit infrastructure to making walking, bicycling and carpooling more attractive to residents. The benefits of greener transportation are not limited to lessening environmental impacts, but will also reduce the cost of operating and maintaining roads and transit networks, thereby making the region more competitive.



While mitigating climate change for long-term security is essential, our transportation system is already vulnerable to current climate risks which are projected to intensify in the near future. Following the many severe weather events in the past three years alone, chiefly Hurricane Sandy, there is an urgent need to strengthen the ability of our roads and transit systems to better withstand flooding, heat waves and severe storms. Improving resiliency to these threats is accomplished at all levels of the system, relying on coordination between operations, management, infrastructure, and policy. *Plan 2040* looks at different strategies for climate change adaptation throughout the entire transportation system and stresses the importance of collaboration between all member agencies in planning for future severe weather events.

This Shared Vision consists of four sections that were developed by NYMTC members as a blueprint to guide the short-, medium- and long-term regional transportation investments and developments: Shared Goals, Shared Land Use Development areas, and Strategic Transportation Investments and Initiatives. The elements of the Shared Vision are interconnected, influencing and complementing each other throughout the planning process.

It is important to note that although *Plan 2040* focuses on the New York metropolitan area, transportation planning must also be done in the context of the larger, megaregion. NYMTC and other MPOs in the Northeast megaregion must increase collaboration and megaregional considerations as urbanized and suburbanized areas continue to grow together, economies and transportation networks become more regional, and issues of air quality and climate change demand large-scale consideration. The implications and efforts to plan at this level are discussed in the NYMTC Overview section at the end of this chapter.



The 5th Avenue - Bryant Park subway station with the New York Public Library and Byrant Park in the background.

Brooklyn Bridge Park along the waterfront in Brooklyn, New York City.

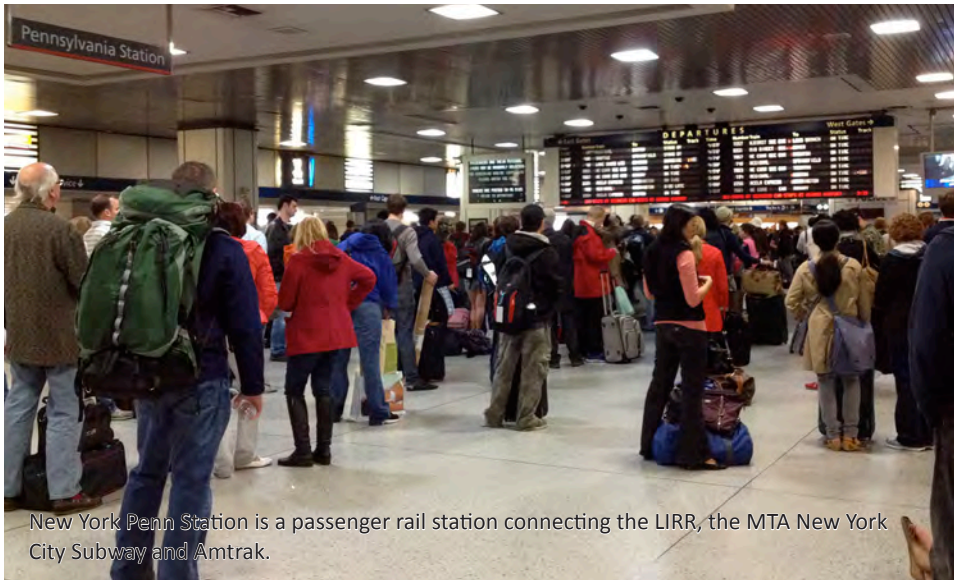
2. Shared Goals

The seven shared goals and their outcomes are the first part of the Shared Vision. These goals were consensually developed by NYMTC members and represent their commitment to sustainable growth and economic development through directing resources to transportation investments that will produce the desired outcomes.

These goals, which are equally important and not listed in a particular order, are defined on the following pages and include a series of of long-term desired outcomes and a list of near-term actions for each goal. The near-term actions are advanced in the first ten years of *Plan 2040* and through the Transportation Improvement Plan (TIP) and United Planning Work Program (UPWP).

The Shared Goals

Enhance the regional environment
Improve the regional economy
Improve the regional quality of life
Provide a convenient and flexible transportation system within the region
Enhance the safety and security of the transportation system for all users
Build the case for obtaining resources to implement regional investments
Improve the resiliency of the regional transportation system

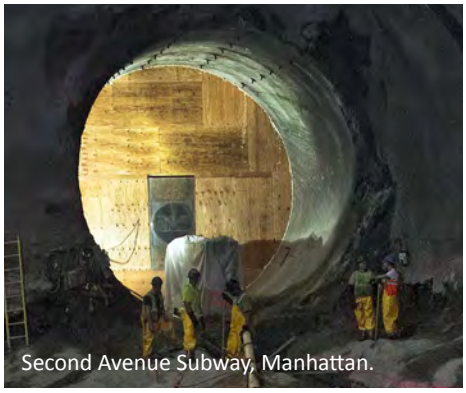


New York Penn Station is a passenger rail station connecting the LIRR, the MTA New York City Subway and Amtrak.

GOAL: ENHANCE THE REGIONAL ENVIRONMENT

NYMTC members are committed to selecting transportation projects and programs and encouraging land use policies that, in the aggregate, enhance the natural environment and human health.


East Side Access, Manhattan.


Second Avenue Subway, Manhattan.

Desired Outcomes

NYMTC will continue to work in a collaborative fashion to achieve these outcomes:

- Reduced traffic congestion and improved air quality;
- Reduced greenhouse gas emissions;
- Improved water quality; and
- Preservation of open space, especially wetlands.

Near-Term Actions

- Evaluate and enhance demand management programs;
- Evaluate and enhance mobile source emissions reduction programs;
- Inventory greenhouse gas emissions;
- Plan for expanded road pricing;
- Implement transit improvements, enhancements in the 2014-2018 TIP;
- Implement mobility, traffic improvement projects in the 2014-2018 TIP;
- Implement programmed strategic regional transportation investments:
  - MTA NYCT Second Avenue Subway
  - MTA LIRR East Side Access
  - MTA LIRR Ronkonkoma Branch Second Track
  - Eight NYC Select Bus Service routes

GOAL: IMPROVE THE REGIONAL ECONOMY

NYMTC's members must continue to maintain and develop the regional transportation infrastructure to support the vitality, competitiveness, and sustainable growth of the entire regional economy that will create employment opportunities and support the local tax base.

Desired Outcomes

The goal of sustainable economic growth will produce, and be supported by, these outcomes:

- A strengthened position of the region as a global and national gateway;
- Strategic distribution of growth throughout the region; and
- Improved regional mobility for people and goods.

Near-Term Actions

- Advance Bus Rapid Transit and managed-use lane projects as part of a regional system;
- Implement Central Avenue transit signal priority, Westchester County
- Implement programmed strategic regional transportation investments:
  - Bayonne Bridge clearance project
  - Moynihan Station Phase I
  - PATH system modernization
- Complete planning and/or environmental assessments for the following vision projects:
  - Cross Harbor goods movement improvements
  - America's Marine Highway System recommendations
  - CSX River Line second track
  - Amtrak Gateway project
  - North-East Corridor and Empire Corridor inter-city passenger and freight rail improvements
  - Moynihan Station Phase II
- Continue planning for multi-modal access to ports and airports;
- Continue planning for multi-modal goods movement and distribution improvements.

GOAL: IMPROVE THE REGIONAL QUALITY OF LIFE

NYMTC's members must work together to coordinate regional transportation with locally-controlled land use and zoning, to the extent practical, so that the negative externalities of individual public and private decisions in any of those arenas are recognized and mitigated in the planning process.

Desired Outcomes

By considering quality of life issues, NYMTC members hope to achieve the following outcomes:

- Increased intra-regional mobility and accessibility for commuting, recreation and tourism;
- Mitigation of negative impacts of transportation in the design, construction, and operation of the system;
- Increased ability to safely enjoy walking, bicycling and use of public space;
- Vibrant communities.

Near-Term Actions

- Complete planning and/or environmental assessments for the following transit-oriented development and transportation improvement vision projects linked to land use plans:
  - Nassau Hub Preliminary Regional Study Area transportation improvements;
  - Wyandach Rising and Ronkonkoma Hub transit-oriented development;
  - NY 347 corridor reconstruction;
  - Sagtikos Parkway truck bypass;
  - MTA LIRR Main Line Corridor Planning;
  - No. 7 Subway Tenth Avenue Station;
  - Staten Island North Shore transit improvements;
  - Bruckner-Sheridan interchange;
  - I-684 capacity improvements:
    - Southeast MTA MNR Station parking and pedestrian improvements
  - I-287 corridor transit enhancements:
    - Tarrytown-Port Chester local transit improvements
  - Southern Westchester East-West Corridor transit improvements
- Advance the recommendations of the New York-Connecticut Sustainable Communities Initiative;
- Advance the Plan 2040 Pedestrian and Bicycle and implement pedestrian and bicycle projects in the 2014-2018 TIP;
- Complete planning and/or environmental assessments for the following pedestrian and bicycle projects:
  - Brooklyn and East River waterfront greenways
  - Hudson River Valley Greenway link
- Continue implementation of Complete Streets policies;
- Continue local capacity-building through community planning workshops;
- Continue planning for transportation sector clean fuels expansion.

Artwork at the new Jay Street transfer station in Downtown Brooklyn.

GOAL: PROVIDE A CONVENIENT AND FLEXIBLE TRANSPORTATION SYSTEM WITHIN THE REGION

NYMTC's members provide mobility and transportation options so that everyone can participate in society regardless of income level, residence, access to transit, age, or ability. NYMTC's members also must provide for the efficient movement of freight to, from and through the region.

Desired Outcomes

NYMTC hopes to achieve the following outcomes by working towards this goal:

- A sufficient array of transportation choices;
- Expanded connections, particularly across modes and between communities;
- Increased reliability for passenger and freight trips; and
- Increased transit ridership.

Near-Term Actions

- Advance the congestion management process and complete planning and/or environmental assessments for the following vision projects:
  - East River crossing and Hudson River crossing bus/HOV capacity
  - Cross Bronx Expressway improvements
  - Additional NYC Select Bus Service routes
  - Long Island Expressway HOV/Active Transportation Demand Management
  - Suffolk County Bus Rapid Transit Feasibility Study: Route 110, Sagtikos Parkway, CR97 transit improvement
  - Central Avenue Bus Rapid Transit, Westchester County
  - Continue planning for ferry service enhancements and station access improvements
- Implement congestion-related improvements and enhancements in the 2014-2018 TIP;
- Implement programmed strategic regional transportation investments related to system preservation:
  - Tappan Zee Hudson River Crossing project
  - Kosciuszko Bridge replacement
  - Goethals Bridge replacement
  - East 153rd Street Bridge replacement
  - City Island Bridge and Riker's Island Bridge replacement
  - Shore Road Bridge replacement
  - Bronx River Parkway bridge replacement
  - Cross Bronx Expressway-Grand Central Parkway interchange
  - Rehabilitation of Belt Parkway bridges
  - Major Deegan Expressway desk replacement
  - Van Wyck Expressway bridges
- Implement preservation-related projects in the 2014-2018 TIP;
- Complete planning and/or environmental assessments for the following projects:
  - Staten Island Ferry vessels
  - Kew Gardens interchange
  - Cross County Parkway-Saw Mill River Parkway interchange
  - MTA NYCT Queens Communications-Based Train Control
  - MTA NYCT vehicle fleet, depot and station expansion, and sustainability investments
  - Port Jervis Line improvements
  - MTA MNR Penn Station Access


Rendering of Tappan Zee Bridge from Losee Park, Tarrytown, NY.

GOAL: ENHANCE THE SAFETY AND SECURITY OF THE TRANPORTATION SYSTEM FOR BOTH MOTORIZED AND NON-MOTORIZED USERS

NYMTC's members will work to reduce the rate and severity of transportation-related crashes in the region and make the transportation system safe for all users. Members will also strive to increase the security of the transportation system.

Desired Outcomes

The following outcomes will be the goal of all NYMTC members:

- Reduced rate of annual injuries and fatalities on the region's transportation systems;
- Promulgation of advanced safety and security measures throughout the region;
- Enhanced coordination, data, and information sharing among members and other stakeholders; and
- Promotion of safety and security improvements in all aspects of transportation planning and implementation.

Near-Term Actions

- Develop comprehensive access to safety-related data;
- Develop a regional approach to safety-related data analysis;
- Develop operating procedures for safety and security considerations;
- Implement safety improvements and enhancements in the 2014-2018 TIP
- Implement programmed strategic regional transportation improvements:
    - East River Bridges
    - Manhattan Bridge cables and suspenders, and seismic retrofit
    - Ed Koch Queensboro Bridge seismic retrofit

GOAL: BUILD THE CASE FOR OBTAINING RESOURCES TO IMPLEMENT REGIONAL INVESTMENTS

NYMTC's members and its region's other elected officials must think regionally about transportation needs, solutions, strategies, and investment priorities. In developing a shared regional vision, NYMTC's members hope to make the case that these investments are a shared priority and are of strategic importance to this region and to the entire nation.

Desired Outcomes

NYMTC will continue to work in a collaborative fashion to achieve these outcomes:

- Coordinated long-term planning;
- A list of prioritized projects supporting the region's shared vision;
- An increase in the use of alternative methods of financing transportation investments to supplement existing Federal and State funding sources;
- Obtain a fair share of Federal funds available for transportation, proportional to its transportation needs and economic share relative to the nation; and
- Elimination of unfunded mandates.

Near-Term Actions

- Advance near-term actions, immediate strategic regional investments and improvement projects through the TIP;
- Pursue agreed upon alternative funding sources;
- Reach consensus on other alternative funding sources to be used individually or cooperatively.

GOAL: IMPROVE THE RESILIENCY OF THE REGIONAL TRANSPORTATION SYSTEM

NYMTC's members will continue to plan for improving the resiliency of the transportation system so that the system can better resist disruptions to services and facilities and recover from them when they occur. Greater resiliency will mitigate the adverse impacts of disruptions on the movement of people and goods due to weather, climate, or other acts of nature.

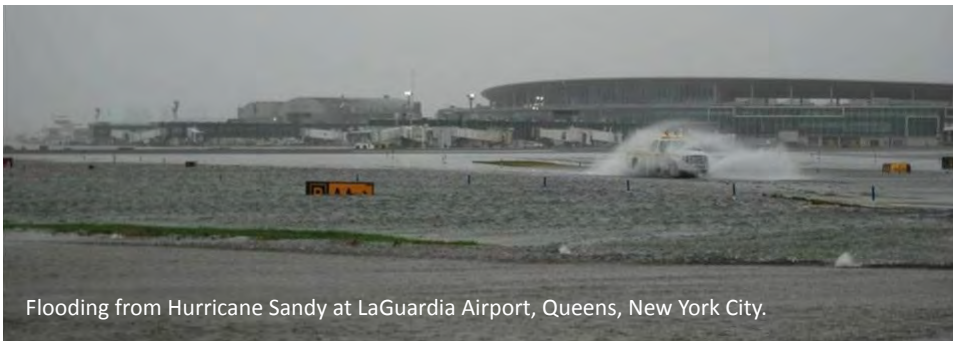
Desired Outcomes

NYMTC hopes to achieve the following outcomes by working towards this goal:

- Member-defined adaptation measures for critical components of the transportation system to accommodate variable and unexpected conditions without catastrophic failure;
- Greater resiliency of the regional supply chain by identifying options for goods movement during and after events;
- Cooperative partnerships with federal, state, local agencies, and other stakeholders to adapt the transportation system and improve recovery from disruptions.

Near-Term Actions

- Planning and implementation to improve the resiliency of the existing system, including:
  - Hurricane Sandy recovery projects
  - New York-New Jersey-Connecticut Transportation Vulnerability Assessment and Adaptation Analysis
  - Nassau County Coastal Evacuation Routes project
- Create new cooperative partnerships with multiple government agencies when responding to disasters;
- Pursue new partnerships through the Federal Disaster Recovery Framework for recovery from disasters.



Flooding from Hurricane Sandy at LaGuardia Airport, Queens, New York City.

Damage from Hurricane Sandy, Scarsdale.

New transfer station in Lower Manhattan.

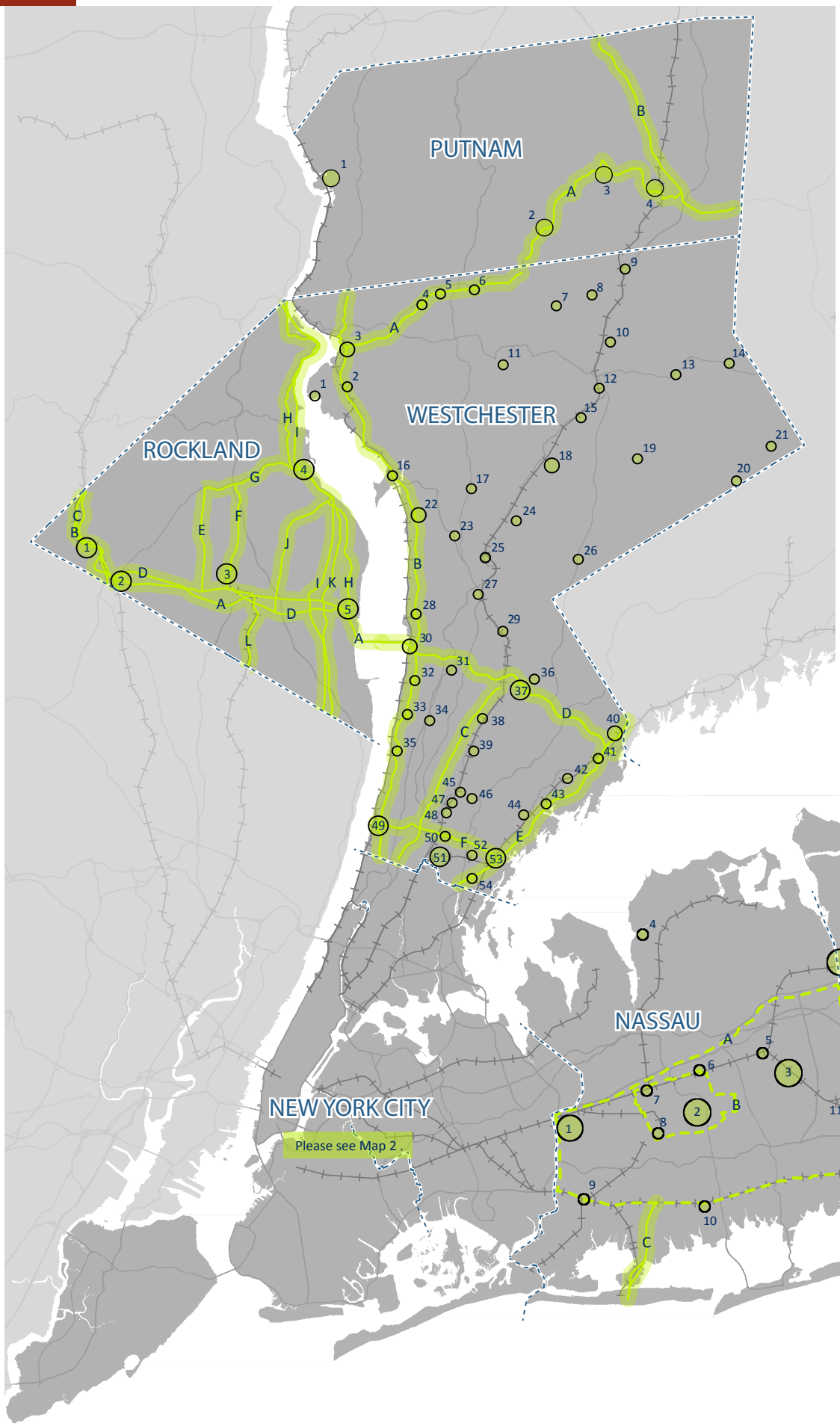
3. Shared Land Use Designations

The second component of the Shared Vision is the Shared Land Use Designation area. These locations are where transportation resources can attract residents and businesses while providing efficient, sustainable and cost effective mobility.

Land use and development, particularly if they are in areas with higher density, generate transportation demand for public investment in transit and roadway infrastructure. Likewise, changes to the transportation system often stimulate development activity by creating more capacity or providing access to new land for development. Transit-oriented development promotes long-term, sustainable growth of business and residential populations around existing or planned transportation infrastructure investments. While land use decisions are typically made at the local level, major transportation decisions involving Federal funds are made at the regional level and these two elements must be strategically linked.

Within the NYMTC planning area, this link between land use and transportation services is not planning theory, but rather an everyday reality with examples such as the Manhattan business districts supported by a dense transit network and the scores of village centers built around commuter rail stations. The concept of sustainable development in long-range planning is built on focusing growth around maximized mobility. The current national emphasis on sustainable development and livability emphasizes the coordination of transportation and land use. This has encouraged NYMTC to plan and invest in the region accordingly and strive to leverage the efforts of major local and regional players to work collaboratively towards complementary, sustainable development.

The two maps (Map1 and Map 2) on the following pages show the Shared Land Use Designations in the NYMTC planning area. Each county, borough, city or region has created these areas and designated them as areas for development and/or transportation investments. These development locations can be centers or corridors in the region. New York City's land use designations are listed on Map 2 because they could not fit on the regional map due to the intensity of land use.



PUTNAM

Sustainable Development Centers

1- Vil. of Cold Spring
2- Mahopac Hamlet
3- Carmel Hamlet
4- Vil. of Brewster

Sustainable Development Corridors

A- Route 6
B- Interstate 84

MAP 1: SHARED LAND USE DESIGNATIONS IN THE NYMTC PLANNING AREA

ROCKLAND

Sustainable Development Centers

1- Western Ramapo
2- Suffern
3- Spring Valley
4- Haverstraw
5- Nyack

Sustainable Development Corridors

A- I-287/I-87: Sloatsburg to TZB
B- Rte 17 & I-287: Mahwah to Sloatsburg
C- Port Jervis/Main Bergen Rail Line: Sloatsburg to Suffern
D- Rte 59: Suffern to Nyack
E- Rte 306: Rte 59 to Rte 202
F- Rte 45: Rte 59 to Rte 202
G- Rte 202: Rte 306 to Rte 9W
H- Rte 9W: Rte 59 to Bear Mtn Bridge
I- CSX RR River Line: NJ to Bear Mtn Bridge
J- Rte 304: Rte 59 to Rte 9W
K- Rte 303: NJ to Rte 9W
L- Pascack Valley Rail Line: Spring Valley to Pearl River

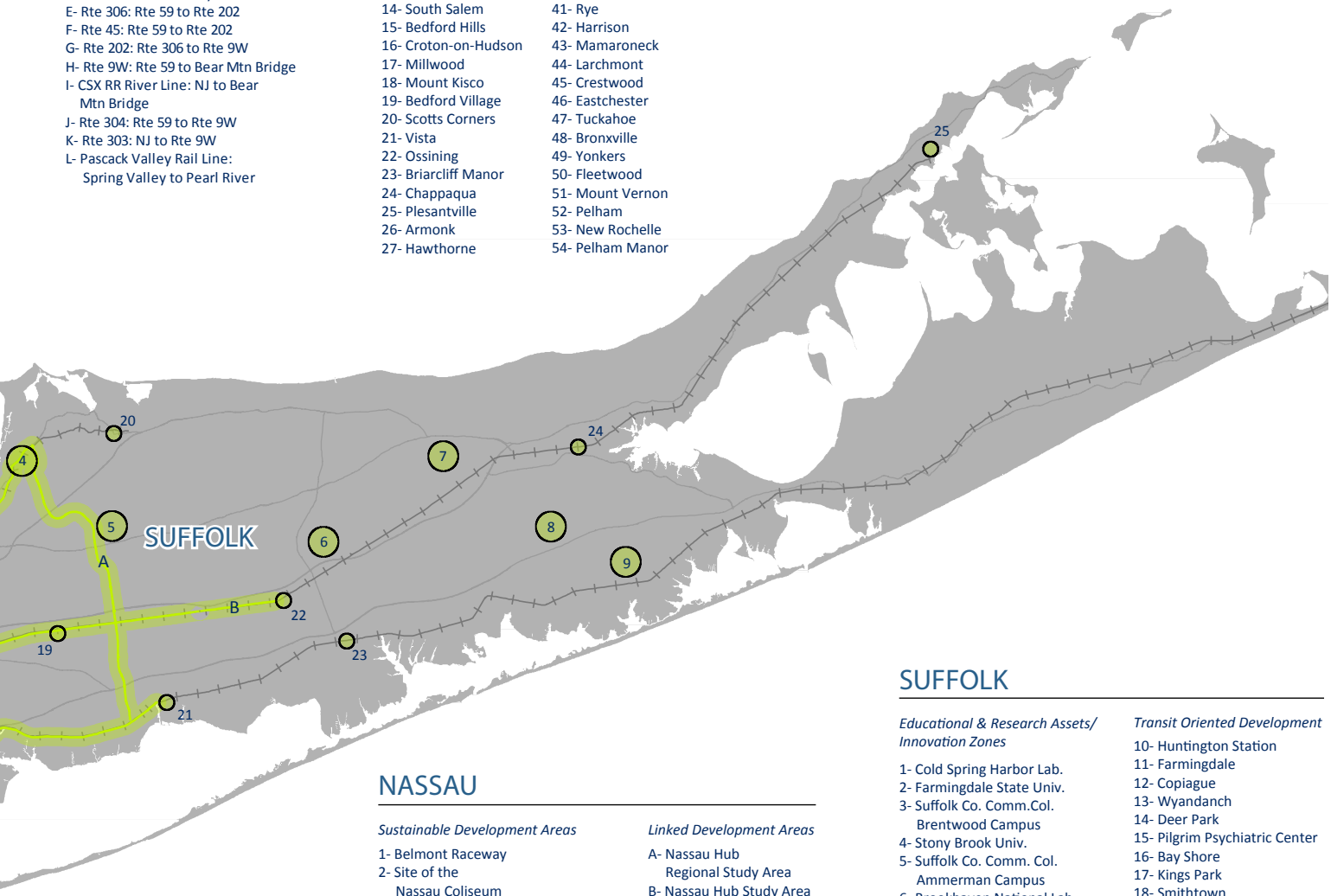
WESTCHESTER

Sustainable Development Centers

1- Verplanck
2- Buchanan
3- Peekskill
4- Lake Mohegan
5- Shrub Oak
6- Jefferson Valley
7- Lincolndale
8- Somers
9- Croton Falls
10- Goldens Bridge
11- Yorktown Heights
12- Katonah
13- Cross River
14- South Salem
15- Bedford Hills
16- Croton-on-Hudson
17- Millwood
18- Mount Kisco
19- Bedford Village
20- Scotts Corners
21- Vista
22- Ossining
23- Briarcliff Manor
24- Chappaqua
25- Plesantville
26- Armonk
27- Hawthorne
28- Sleepy Hollow
29- Valhalla
30- Tarrytown
31- Elmsford
32- Irvington
33- Dobbs Ferry
34- Ardsley
35- Hastings
36- Silver Lake
37- White Plains
38- Hartsdale
39- Scarsdale
40- Port Chester
41- Rye
42- Harrison
43- Mamaroneck
44- Larchmont
45- Crestwood
46- Eastchester
47- Tuckahoe
48- Bronxville
49- Yonkers
50- Fleetwood
51- Mount Vernon
52- Pelham
53- New Rochelle
54- Pelham Manor

Sustainable Development Corridors

A- Route 6
B- Route 9/9A
C- Central Park Avenue
D- Interstate 287
E- Route 1
F- Southern Westchester East-West Corridor



NASSAU

Sustainable Development Areas

1- Belmont Raceway
2- Site of the Nassau Coliseum
3- Grumman

Transit Oriented Development Areas

4- City of Glan Cove
5- Hicksville Hamlet (Town of Oyster Bay)
6- Vil. of Westbury
7- Vil. of Mineola
8- Vil. of Hempstead
9- Vil. of Valley Stream
10- Vil. of Freeport
11-Vil. of Farmingdale

Linked Development Areas

A- Nassau Hub Regional Study Area
B- Nassau Hub Study Area

Linked Corridors

C- Long Beach Rd Corridor

SUFFOLK

Educational & Research Assets/ Innovation Zones

1- Cold Spring Harbor Lab.
2- Farmingdale State Univ.
3- Suffolk Co. Comm.Col. Brentwood Campus
4- Stony Brook Univ.
5- Suffolk Co. Comm. Col. Ammerman Campus
6- Brookhaven National Lab.
7- EPCAL
8- Suffolk Co. Comm. Col. Riverhead Campus
9- Hamptons Business Dist. @ Gabreski Airport

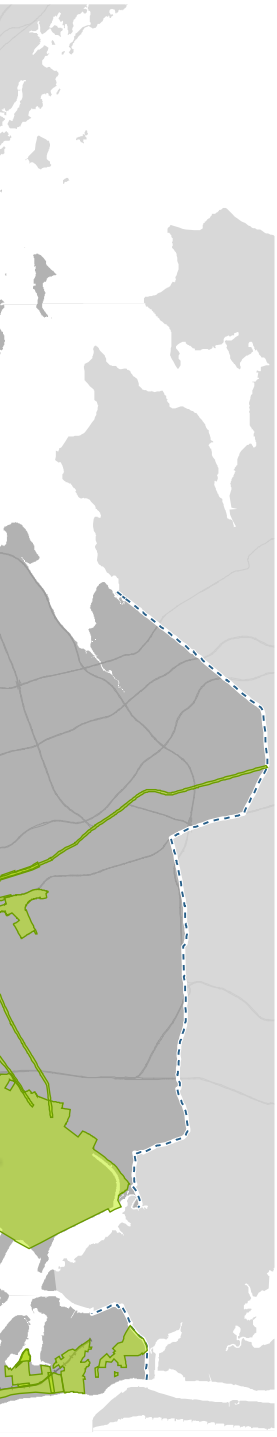
Transit Oriented Development

10- Huntington Station
11- Farmingdale
12- Copiague
13- Wyandanch
14- Deer Park
15- Pilgrim Psychiatric Center
16- Bay Shore
17- Kings Park
18- Smithtown
19- Ronkonkoma
20- Port Jefferson
21- Patchogue
22- Yaphank
23- Mastic-Shirley
24- Riverhead
25- Greenport

Transit Corridors

A- Bus Rapid Transit Line
B- Recommended Expansion of LIRR Electrification
C- LIRR Double Track

MAP 2: SHARED LAND USE DESIGNATIONS IN NEW YORK CITY



MANHATTAN

Adopted or Potential Rezonings

125th Street Corridor
Broadway Upzoning
East 125th Street (w/EDC)
East Harlem
East Midtown
East River Realty Co.
East Village/Lower East Side
Frederick Douglass Blvd (Central/ South Harlem)
Garment Center
Ginsberg
Goldwater Hospital
Hudson Square
Hudson Square North
Hudson Yards
Javits Area
Ladies Mile (w/ private applicant)
M1-6D Zoning District
Manhattanville
Moynihan Station East
Northern Tribeca
River Place II
Riverside Center
Seward Park
Site 5B/5C
South Midtown Manufacturing Districts
The Clinton Park
Upper Park Avenue Corridor
Upper West Side
West 44th Street & 11th Avenue (w/HPD)
West Chelsea
West Clinton/11th Ave
West Harlem
Western Rail Yards

Other Projects

11th Avenue Corridor
57th Street Corridor
Brooklyn Bridge Ped/Bike Capacity
BRT: 125th Street Crosstown Corridor
BRT: 14th Street Crosstown Corridor
BRT: Manhattan West Side Corridor
BRT: Upper West/Upper East Side Crosstown Corridor
CBD: 125th Street
CBD: Manhattan South of 60th Street
Cornell
Durst Building
Governors Island
Greenwich Street Corridor
GW Bridge Transit Hub
Hospital Corridor
Hudson River Park
Hunter College Brookdale Campus
Miller Highway
NY Daily News- 4 NY Plaza
NY Presbyterian Hospital
NYU
Pathmark
Quadriad
Roosevelt Is. Tram to Queens
Rudin / St. Vincent's
Sherman Creek
South Street Seaport / Tin Building
St. John's Terminal Area
Two Bridges
United Nations
World Trade Center

BRONX

Adopted or Potential Rezonings

161st Street/River Avenue
Bartow Avenue
Boricua Village
Bronx Center/Hub
Bronx River
Crossroads Plaza
Crotona Park East
Crotona Terrace
East Fordham Road
Jerome Avenue North
Kingsbridge
Lower Concourse
Melrose Crescent
Morrisania
Park Avenue/Morrisania
Parkchester/Van Nest
Port Morris/Bruckner Blvd
St. Ann's Ave Dev.
Third Avenue/Tremont Avenue
Via Verde/ The Green Way
Wakefield/Eastchester
Webster Ave/Bedford Park/Norwood
Webster Commons
West Farms
Williamsbridge/Baychester

Other Projects

BRT: South Bronx East-West Corridor
BRT: Webster Ave/Third Ave Corridor
CBD: Bronx Hub
CBD: Fordham
Cromwell - Jerome Study Area
Harding Park / Classon Point
Highbridge Subway-Bus Ped. Access
Hunts Point Market
IBZ: Bathgate
IBZ: Eastchester
IBZ: Hunts Point
IBZ: Port Morris
IBZ: Zerega
Loral
Metro-North Station: Fordham
Metro-North Station: Melrose
Metro-North Station: Morris Heights
Metro-North Station: Tremont
Metro-North Station: University Heights
Metro-North Station: Williams Bridge
Oak Point Interchange
Proposed MetroNorth Morris Park Station
Proposed MetroNorth Parkchester Station
Sheridan Local Transportation Issues
South Bronx Greenway
Southern Boulevard
Subway Station Improvement: 138th St.
Subway Station Improvement: 149th St.
Thruway / Hutch Corridor

BROOKLYN

Adopted or Potential Rezonings

363-365 Bond St
470 Vanderbilt Avenue
Atlantic Terrace
Atlantic Yards
BAM Cultural District
Baptist Medical Center
Bay Ridge Mixed Use Dev.
Bedford-Stuyvesant North
Bedford-Stuyvesant South
Boerum Hill
Bridge Plaza
Brighton Beach
Broadway Junction
Broadway Triangle (w/HPD)
Brownsville
Clarkson Ave
Columbia Hicks
Coney Island
Coney Island Commons (w/HPD)
Coney Island Mixed Use District
Cook Street Muni Lot
Crown Heights
Crown Heights II
Culver El (w/HPD)
Dahill Road
Dock Street DUMBO
Downtown Brooklyn
DUMBO
East Flatbush
East Williamsburg/ Bushwick
Flatbush
Fort Greene/Clinton Hill
Gateway Estates II (w/HPD)
Gowanus
Greenpoint Hospital
Greenpoint/Williamsburg
Greenpoint/Williamsburg Contextual Rezoning
Kedem Winery
Midwood
Navy Green/The Brig (w/HPD)
Park Slope
Public Place (w/HPD)
Red Hook
Rose Plaza on the River
South Park Slope
Sunset Park
The New Domino

Other Projects

86th Street
8th Ave
Atlantic Ave (Crown Heights)
Atlantic Ave (East New York)
Atlantic LIRR Corridor
Brighton Muni Lot
Broadway (Bushwick)
Brooklyn Tech Triangle
Brooklyn Terminal Market
BRT: Bushwick to Downtown Brooklyn Corridor
BRT: Flatbush Ave Corridor
BRT: Southern Bklyn East-West Corridor
BRT: Utica Ave Corridor
Bushwick Inlet Park
Canarsie El Relocation
CBD: Northwest Brooklyn
Columbia Street
Coney Island Avenue
Coney Island Yards Climate Adaptation
East New York Sustainable Communities
Empire Blvd (East Flatbush)
Fourth Avenue MID
Fulton Street (East New York)
Gateway Connection
IBZ: Brooklyn Navy Yard
IBZ: East New York
IBZ: Flatlands/Fairview
IBZ: Greenpoint/Williamsburg
IBZ: North Brooklyn
IBZ: Southwest Brooklyn
Kings Highway (East Flatbush)
Linden Blvd (East Flatbush)
Livonia Avenue
Loew's/Sears
Macdonald avenue
Myrtle Ave (Bushwick)
New Utrecht Ave
Nostrand Ave (East Flatbush)
Pfizer Vacant Sites
Pitkin Ave (East New York)
Rheingold
Utica Ave (East Flatbush)
Wyckoff Ave (Bushwick)

QUEENS

Adopted or Potential Rezonings

Astoria
Astoria Blvd/East Elmhurst
Averne URA
Dutch Kills
Edgemere URA
Flushing Commons/Macedonia Plaza (w/EDC)
Flushing Waterfront BOA
Forest Hills Special District
Halletts Point/Pot Cove
Hunters Point
Hunters Point South (w/EDC & HPD)
Kew Gardens/Richmond Hill
Maspeth/Woodside
North Corona I
Northern Blvd (Jackson Heights)
Queens Plaza/LIC Core
Rockaway Residential Neighborhoods
Silvercup West
Sunnyside/Woodside
Willets Point Redevelopment (w/EDC)
Woodhaven/Richmond Hill

Other Projects

Arch Street Yard
Atlantic Ave LIRR Service
BRT: Flushing-Jamaica Corridor
BRT: Hillside Ave Corridor
BRT: LaGuardia/East Elmhurst Corridor
BRT: Manhattan-Northern Blvd-Flushing Corridor
BRT: Southeast Queens Corridor
BRT: Woodhaven Blvd Corridor
CBD: Flushing
CBD: Jamaica
CBD: Long Island City
E Terminal Train Capacity
Elmhurst LIRR Access
Flushing Transit Coordination
IBZ: Jamaica
IBZ: JKF
IBZ: Long Island City
IBZ: Maspeth
IBZ: Steinway
Queens Center Mall Ped/Transit Circulation
Ravenswood/Applied Sciences Allied Dev.
Rearrangements to JFK Airport
Rearrangements to La Guardia Airport
Rockaway Branch Dev. Opportunity
Sunnyside Yards
Transit to Support Growth
Willets Point West/Roosevelt Ave lots

Container ship navigating Kill Van Kull and the Bayonne Bridge.

4. Strategic Transportation Initiatives and Investments

The final element of the Shared Vision is the Strategic Transportation Initiatives and Investments. A growing and dynamic region is envisioned over the next two decades and the preservation, enhancement, and the strategic improvement of the extensive transportation system is necessary to support the region. The initiatives and investments listed on the following pages, and further described in Chapter 5: System Improvements and Actions, are transportation investments that are critical to support the sustainable growth outlined in *Plan 2040*. These projects focus on actions planned to preserve, enhance, and grow the transportation system.

The charts on the following pages list the near-term actions that are or will be undertaken predominantly in the 2014-2018 timeframe. These actions are divided into four categories:

Category A - Planning Initiatives

Category B - Project Planning and/or Environmental Assessments for Vision Projects

Category C - Programmed Improvement Projects Over the Next Five Years

Category D - Programmed Improvement Projects Beyond the Next Five Years

The initiatives and investments are shown on Map 3 on pages 1-23 and 1-24.

NEAR TERM ACTIONS CATEGORY A: PLANNING INITIATIVES

#	Area	Activity or Project	Related Goal	Timeframe
A1	All	Evaluate and enhance demand management programs	Enhance the regional environment	2014-2018
A2	All	Evaluate and enhance mobile source emissions reduction programs	Enhance the regional environment	2014-2018
A3	All	Inventory greenhouse gas emissions	Enhance the regional environment	2014-2018
A4	All	Plan for expanded road pricing	Enhance the regional environment	2014-2018
A5	All	Continue planning for multi-modal access to ports and airports	Improve the regional economy	2014-2018
A6	All	Continue planning for multi-modal goods movement and distribution improvements	Improve the regional economy	2014-2018
A7	All	Advance the recommendations of the New York-Connecticut Sustainable Communities Initiative	Improve the regional quality of life	through 2023
A8	All	Continue local capacity-building through community planning workshops	Improve the regional quality of life	annually
A9	All	Continue planning for transportation sector clean fuels expansion	Improve the regional quality of life	2014-2018
A10	All	Planning for ferry service enhancements and station access improvements	Provide a convenient, flexible, and resilient transportation system within the region	through 2023
A11	All	New York-New Jersey-Connecticut Transportation Vulnerability Assessment and Adaptation Analysis	Provide a convenient, flexible, and resilient transportation system within the region	2014-2018
A12	All	New cooperative partnerships with multiple government agencies when responding to disasters	Provide a convenient, flexible, and resilient transportation system within the region	2014-2018
A13	All	New partnerships through the Federal Disaster Recovery Framework for recovery for disasters	Provide a convenient, flexible, and resilient transportation system within the region	2014-2018
A14	All	Develop comprehensive access to safety-related data	Enhance the safety and security of the transportation system	2014-2018
A15	All	Develop a regional approach to safety-related data analysis	Enhance the safety and security of the transportation system	2014-2018
A16	All	Develop operating procedures for safety and security considerations	Enhance the safety and security of the transportation system	2014-2018
A17	All	Enhance Safe Routes to School and Safe Streets for Seniors programs	Enhance the safety and security of the transportation system	2014-2018
A18	All	Reach consensus on other alternative funding sources to be used individually and corporately	Build the case for obtaining resources to implement regional investments	2014-2018
A19*	LI	Suffolk County Connect LI Bus Rapid Transit Feasibility Study	Provide a convenient, flexible, and resilient transportation system within the region	2014-2018

LI = Long Island; LHV = Lower Hudson Valley; NYC = New York City; All = NYMTC Planning Area

* = only one Category A project (A19) is shown on Map 3 on pages 1-23 and 1-24

NEAR TERM ACTIONS CATEGORY B: PROJECT PLANNING OR ENVIRONMENTAL ASSESSMENTS FOR VISION PROJECTS

#	Area	Activity or Project	Related Goal	Timeframe
B1*	All	Cross Harbor goods movement improvements; America's Marine Highway System recommendations	Enhance the regional economy	2014-2018
B2	LI	Long Island Motor Parkway Trail	Improve the regional quality of life	2014-2018
B3	LI	Nassau Hub Preliminary Regional Study Area transportation improvements	Improve the regional quality of life	2014-2018
B4	LI	Suffolk County Connect LI - Wyandanch Rising, Heartland, Ronkonkoma Hub transit-oriented development	Improve the regional quality of life	2014-2018
B5	LI	NY 347 corridor reconstruction	Improve the regional quality of life	2014-2018
B6	LI	Sagtikos Parkway truck bypass	Improve the regional quality of life	2014-2018
B7	LI	MTA LIRR Mainline Corridor Planning	Improve the regional quality of life	post-2018
B8	LI	Suffolk County Connect LI: Route 110, Sagtikos / Sunken Meadow Parkways, and CR 97 transit improvements	Provide a convenient, flexible, and resilient transportation system within the region	2014-2018
B9	LHV	I-684 capacity improvements	Improve the regional quality of life	2014-2018
B10	LHV	Southeast MTA MNR Station - parking and pedestrian improvements	Improve the regional quality of life	2014-2018
B11	LHV	I-287 Corridor transit enhancements	Improve the regional quality of life	2014-2018
B12	LHV	Tarrytown-Port Chester local transit improvements	Improve the regional quality of life	2014-2018
B13	LHV	Southern Westchester East-West Corridor transit improvements	Improve the regional quality of life	2014-2018
B14	LHV	Central Avenue Bus Rapid Transit	Provide a convenient, flexible, and resilient transportation system within the region	2014-2018
B15	LHV	Cross County Parkway - Saw Mill River Parkway interchange	Provide a convenient, flexible, and resilient transportation system within the region	2014-2018
B16	LHV	Port Jervis Line improvements	Provide a convenient, flexible, and resilient transportation system within the region	2014-2018
B17	NYC	Moynihan Station Phase II	Improve the regional economy	2014-2018
B18	NYC	Brooklyn and East River waterfront greenways	Improve the regional quality of life	2014-2018
B19	NYC	No. 7 Subway Tenth Avenue Station	Improve the regional quality of life	post-2018
B20	NYC	Staten Island North Shore transit improvements	Improve the regional quality of life	2014-2018

B21	NYC	Bruckner-Sheridan Interchange	Improve the regional quality of life	2014-2018
B22	NYC	East River crossings and Hudson River crossings bus / HOV capacity	Provide a convenient, flexible, and resilient transportation system within the region	2014-2018
B23	NYC	Cross Bronx Expressway improvements	Provide a convenient, flexible, and resilient transportation system within the region	2014-2018
B24*	NYC	Additional New York City Select Bus Service routes	Provide a convenient, flexible, and resilient transportation system within the region	2014-2018
B25	NYC	Long Island Expressway (Queens) HOV / Active Transportation Demand Management	Provide a convenient, flexible, and resilient transportation system within the region	2014-2018
B26	NYC	Staten Island Ferry terminals and vessels	Provide a convenient, flexible, and resilient transportation system within the region	2014-2018
B27	NYC	Kew Gardens (Queens) interchange	Provide a convenient, flexible, and resilient transportation system within the region	2014-2018
B28	NYC	Trans-Hudson Bus System Improvements	Provide a convenient, flexible, and resilient transportation system within the region	2014-2018
B29*	NYC	MTA NYCT Queens Commmunications-Based Train Control	Provide a convenient, flexible, and resilient transportation system within the region	2014-2018
B30*	NYC	MTA NYCT vehicle fleet, depot and station expansion; sustainability investments	Provide a convenient, flexible, and resilient transportation system within the region	2014-2018
B31	NYC & LHV	CSX River Line second track and Amtrak Gateway project	Improve the regional economy	2014-2018
B32	NYC & LHV	North-East Corridor and Empire Corridor inter-city passenger and freight rail improvements	Improve the regional economy	2014-2018
B33	NYC & LHV	Hudson River Valley Greenway Link	Improve the regional quality of life	2014-2018
B34	NYC & LHV	MTA Metro-North Railroad Penn Station Access	Provide a convenient, flexible, and resilient transportation system within the region	2014-2018

LI = Long Island; LHV = Lower Hudson Valley; NYC = New York City; All = NYMTC Planning Area

* = Category B projects that are not shown on Map 3 on pages 1-23 and 1-24

NEAR TERM ACTIONS CATEGORY C: PROGRAMMED IMPROVEMENT PROJECTS OVER THE NEXT FIVE YEARS

#	Area	Activity or Project	Related Goal	Timeframe
C1*	All	Advance programmed transit improvements and enhancements in the 2014-2018 TIP	Enhance the regional environment; Improve the regional economy	2014-2018
C2*	All	Advance programmed mobility and traffic improvement projects in the 2014-2018 TIP	Enhance the regional environment; Improve the regional economy	2014-2018
C3*	All	Advance programmed pedestrian-bicycle projects in the 2014-2018 TIP	Improve the regional quality of life	2014-2018
C4*	All	Advance congestion-related improvements and enhancements in the 2014-2018 TIP	Provide a convenient, flexible, and resilient transportation system within the region	2014-2018
C5*	All	Advance preservation-related and SOGR-related projects in the 2014-2018 TIP	Provide a convenient, flexible, and resilient transportation system within the region	2014-2018
C6*	All	Advance resiliency-related improvements to the existing system in the 2014-2018 TIP, including Hurricane Sandy recovery projects as appropriate	Provide a convenient, flexible, and resilient transportation system within the region	2014-2018
C7*	All	Advance safety improvements and enhancements in the 2014-2018 TIP	Enhance the safety and security of the transportation system	2014-2018
C8	LI	MTA LIRR Ronkonkoma Branch second track	Enhance the regional environment	2014-2018
C9*	LI	Nassau County Coastal Evacuation Routes project	Provide a convenient, flexible, and resilient transportation system within the region	2014-2018
C10	LHV	Tappan Zee Hudson River Crossing project	Provide a convenient, flexible, and resilient transportation system within the region	2014-2017
C11	LHV	CSX West Shore River Line Safety and Quiet Zone	Improve the regional quality of life	2014-2018
C12	LHV	Central Avenue transit signal priority	Provide a convenient, flexible, and resilient transportation system within the region	2014-2018
C13	LI & NYC	MTA LIRR East Side Access	Enhance the regional environment	2014-2018
C14	NYC	St. George's Terminal ramp reconstruction	Enhance the regional environment	2014-2018
C15	NYC	East River Bridges Hazard Mitigation project	Enhance the safety and security of the transportation system	2014-2018
C16	NYC	Manhattan Bridge cables and suspenders; and seismic retrofit	Enhance the safety and security of the transportation system	2014-2018
C17	NYC	Ed Koch Queensboro Bridge seismic retrofit	Enhance the safety and security of the transportation system	2014-2018
C18	NYC	Bayonne Bridge clearance project	Improve the regional economy	2014-2018
C19	NYC	Goethals Bridge replacement	Provide a convenient, flexible, and resilient transportation system within the region	2014-2018

LI = Long Island; LHV = Lower Hudson Valley; NYC = New York City; All = NYMTC Planning Area

* = Category C projects that are not shown on Map 3 on pages 1-23 and 1-24

NEAR TERM ACTIONS CATEGORY D: PROGRAMMED IMPROVEMENT PROJECTS BEYOND THE NEXT FIVE YEARS

#	Area	Activity or Project	Related Goal	Timeframe
D1*	All	Advance Bus Rapid Transit and managed-use lane projects as part of a regional system	Enhance the regional economy	through 2023
D2*	All	Advance the Plan 2040 Pedestrian-Bicycle Element	Improve the regional quality of life	through 2023
D3*	All	Continue application of Complete Streets policies	Improve the regional quality of life	through 2023
D4*	All	Pursue agreed upon funding sources	Build the case for obtaining resources to implement regional investments	through 2023
D5	NYC	Select Bus Service routes	Enhance the regional environment	through 2023
D6	NYC	MTA NYCT Second Avenue Subway phases 2-4	Enhance the regional environment	post 2018
D7*	NYC	Expand Park Smart, Commercial Paid Parking, Delivery Windows and other approaches to address congestion	Enhance the regional environment; Improve the regional economy	through 2023
D8	NYC	Moynihan Station Phase I and PATH system modernization	Enhance the regional economy	through 2023
D9	NYC	Complete reconstruction of Belt Parkway Bridges	Improve the regional economy	through 2023
D10*	NYC	Promote and expand DeliverEase	Improve the regional quality of life	through 2023
D11	NYC	Kosciuszko Bridge replacement	Provide a convenient, flexible, and resilient transportation system within the region	through 2023
D12	NYC	East 153rd Street Bridge replacement	Provide a convenient, flexible, and resilient transportation system within the region	through 2023
D13	NYC	City Island Bridge replacement	Provide a convenient, flexible, and resilient transportation system within the region	through 2023
D14	NYC	Shore Road Bridge rehabilitation	Provide a convenient, flexible, and resilient transportation system within the region	through 2023
D15	NYC	Riker's Island Bridge reconstruction	Provide a convenient, flexible, and resilient transportation system within the region	through 2023
D16	NYC	Bronx River Parkway Bridge replacement	Provide a convenient, flexible, and resilient transportation system within the region	through 2023
D17	NYC	Cross Bronx Expressway Bridge rehabilitation	Provide a convenient, flexible, and resilient transportation system within the region	through 2023
D18	NYC	Brooklyn Queens Expressway - Grand Central Parkway interchange	Provide a convenient, flexible, and resilient transportation system within the region	through 2023
D19	NYC	Rehabilitation of Belt Parkway bridges	Provide a convenient, flexible, and resilient transportation system within the region	through 2023
D20	NYC	Major Deegan Expressway deck replacement	Provide a convenient, flexible, and resilient transportation system within the region	through 2023
D21	NYC	Van Wyck Expressway bridges	Provide a convenient, flexible, and resilient transportation system within the region	through 2023

LI = Long Island; LHV = Lower Hudson Valley; NYC = New York City; All = NYMTC Planning Area

* = Category D projects that are not shown on Map 3 on pages 1-23 and 1-24

MAP 3: STRATEGIC TRANSPORTATION INITIATIVES AND INVESTMENTS

Near Term Actions

- Category A: Planning initiatives
- Category B: Project planning or environmental assessments for vision projects
- Category C: Programmed improvement projects over the next five years
- Category D: Programmed improvement projects beyond the next five years

Labels for each project correspond their number as listed in the preceding Strategic Transportation Initiatives and Investments tables.

REGIONAL ECONOMIC DEVELOPMENT COUNCIL DEVELOPMENT AREAS AND PROJECTS

In 2011 New York's Governor created 10 Regional Councils, including one each in Mid-Hudson, Long Island and New York City, to develop long-term strategic plans for economic growth for their regions. These councils are public-private partnerships made up of local experts and stakeholders from business, academia, local government, and non-governmental organizations. In order to pursue their defined economic development objectives the Councils identified a number of projects, many of which have implications for transportation planning and growth in the NYMTC planning area.

Projects identified for the NYMTC planning area include the following:

Lower Hudson Valley:

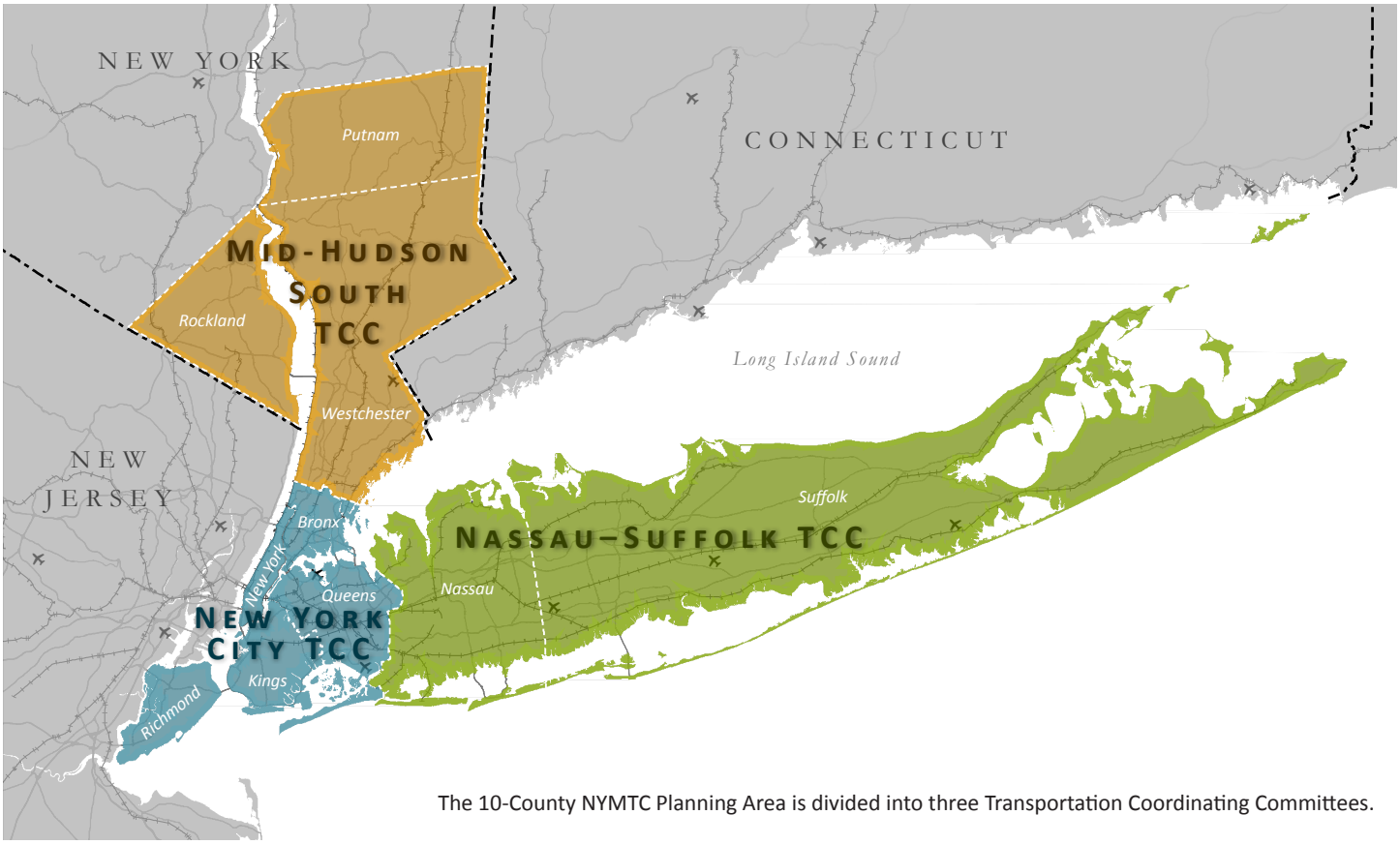
- Installation of a biotechnology incubator at New York Medical College in Westchester County
- Construction of a new Tappan Zee Bridge in Westchester County
- Development of a law enforcement training center in Putnam County
- Improvements to the West Point Foundry Preserve trail in Westchester and Putnam County providing access to Metro-North, downtown Cold Spring, and the Hudson River
- Construction of Harbor Square Promenade Park along the Hudson River in Ossining, Westchester County, a new mixed-use waterfront development
- Redevelopment of the central business district in the village of Spring Valley, Rockland County
- Renovation of the Nanuet Mall into a Main Street-type pedestrian mall in Rockland County
- Redevelopment of excess capacity at the Pfizer R&D and Manufacturing site in Pearl River, Rockland County

New York City:

- Modernization of the Hunts Point Produce Market in the Bronx which will include a 20 percent increase in capacity and improved environmental conditions
- The construction of five new green streets and a large green roof at St. Mary's Recreation Center in the Bronx using new green techniques and materials
- Revitalization of waterfront parkland in the densely populated neighborhoods of the South Bronx, Lower Manhattan, and Coney Island in Brooklyn
- Implementation of four vital aspects of New York City's waterfront plan: improved government oversight, economic development on the waterfront, restoration of the natural waterfront, and increased climate resilience
- Expansion of the Brooklyn Waterfront Greenway and park space
- Restoration of Sherman Creek for waterfront access which will include improving health and quality of life in this area of Northern Manhattan
- Construction of the East Park section of Fresh Kills Park in Staten Island which will include pedestrian and bicycle trails and a kayak and canoe launch

Long Island

- Rehabilitation and revitalization of several buildings and streets in Downtown Historic Oyster Bay in Nassau County
- Revitalization and sewer upgrade of downtown Hempstead, Nassau County for transit oriented development
- Road improvements as part of the Heartland Town Square mixed-use development project in Islip, Suffolk County
- Construction of the Ronkonkoma Hub transit-oriented development in Islip, Suffolk County
- Transformation of Wyandanch Rising in Babylon, Suffolk County into a mixed-use, mixed income green community that provides jobs and housing for inhabitants
- Purchase of the Pipes Cove Complex in the Town of Southold in Suffolk County in order to complete the Bay to Sound Trail
- Completion of the Harborwalk component of Harbor Waterfront Park which will provide pedestrian access to the waterfront in Port Jefferson, Suffolk County



The 10-County NYMTC Planning Area is divided into three Transportation Coordinating Committees.

5. NYMTC Overview

MPOs AND THE ROLE OF NYMTC IN REGIONAL PLANNING

Metropolitan Planning Organizations (MPOs) are the force behind transportation development in urbanized regions. These organizations bring together the public with stakeholders and local and regional governments to start a dialogue on transportation opportunities and issues. These discussions are then turned into projects that are partially funded by Federal transportation dollars, and shape the transportation network and infrastructure in the region.

NYMTC is the MPO for the New York City Region. NYMTC organizes the transportation concerns of the five boroughs of New York City and the counties of Nassau, Suffolk, Westchester, Putnam, and Rockland. Together they create a transportation plan that distributes funding and prioritizes projects in a manner that is suitable for the entire metropolitan area. As shown in the map above, this region is divided into three subregions called Transportation Coordinating Committees (TCCs): New York City, Mid-Hudson South, and Nassau-Suffolk. The area that encompasses the Mid-Hudson South TCC is often referred to in *Plan 2040* as the Lower Hudson Valley

To assess the goals of MPOs, the Federal Government requires a long-range and a short-range regional transportation plan. For NYMTC, these plans are the 25-year Regional Transportation Plan (RTP), the five-year Transportation Improvement Plan (TIP), and the one-year Unified Planning Work Program (UPWP). *Plan 2040* is the 2015-2040 Regional Transportation Plan for the region. NYMTC studies potential transportation improvements, forecasts future conditions and needs, and pools the concerns of the public with the planning resources and expertise of its member agencies to facilitate the development of a shared strategic vision for transportation and development in the region. In doing so, NYMTC fulfills Federal planning requirements and maintains the eligibility of its region for Federal funding for transportation planning and improvements.

The NYMTC planning area has developed around a world-class urban center – New York City. This metropolis is the economic engine for the region as well as for the United States. The city features

a significant business agglomeration: in 2012, the NYMTC planning area was home to the headquarters of 49 Fortune 500 companies and the broader tri-state metropolitan area, which includes northern New Jersey and southwestern Connecticut, is home to many more. The high concentration of internationally competitive firms in the region, coupled with an entrepreneurial business climate are incentives for global companies to operate in the regional market; their presence in turn spurs greater economic activity. According to the U.S. Census Bureau, the knowledge-based industry sectors (e.g., finance and insurance; professional, scientific, & technical services; and health care and social assistance) accounted for about 37 percent of total jobs in the NYMTC planning area in 2010. In terms of aggregate personal income in 2010, these sectors represented roughly 53 percent of the annual income generated in the NYMTC planning area, or approximately $323 billion. In addition to being a hub of the knowledge economy, the NYMTC planning area is one of the world's leaders in arts and culture. The role played by transportation in facilitating the movement of people and goods, thus reinforcing economic development, cannot be underestimated. Despite moving enormous numbers of people each day, the regional transportation network is increasingly congested. Traffic congestion costs the New York region more than $13 billion per year in delay costs and revenue losses. Identifying and implementing improvements to the regional transportation network is a crucial to assuring sustainable economic growth in the region.

People living in the region are the movers of the economy: their innovation drives growth and fuels development. Therefore, NYMTC seeks to place public input at the center of regional transportation planning in order to improve the economic conditions and quality of life of the region at large. If the public is inconvenienced by delays and overcrowded transportation, or if the system is not sufficiently maintained and expanded, growth in the region will decline, the economy will suffer, and the entire NYMTC planning area will be at a loss. To keep people and ideas flowing, transportation networks must continue to improve and become more efficient. For this to happen, the concerns and needs of the public must be incorporated into every step of the planning process.

THE MISSION

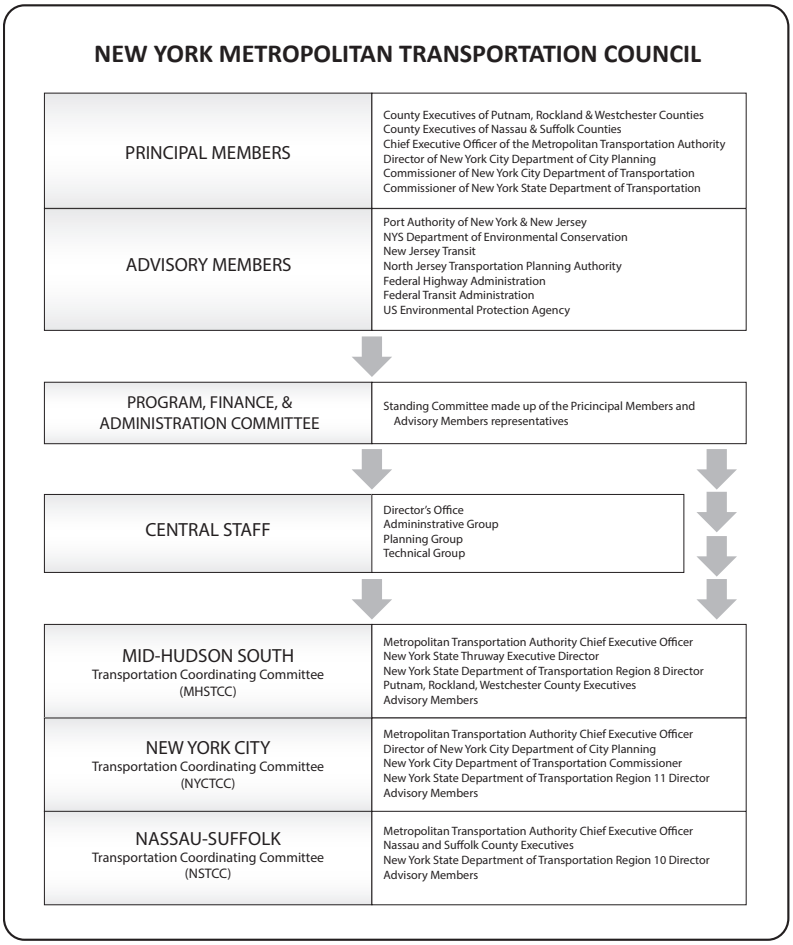
NYMTC acts as a platform for collaborative discussion on transportation-related issues from a regional perspective. It facilitates informed decision-making within the Council by providing sound technical analysis of projects, concerns, and developments. NYMTC ensures that the region is prepared to obtain the maximum federal funds available to achieve the goals of the Regional Transportation Plan, the Transportation Improvement Program, and the Unified Planning Work Program. All of this is in an attempt to focus the collective planning activities of all Council members to achieve a shared regional vision.

PANYNY's George Washington Bridge Bus Station, Upper Manhattan, New York City.

MEMBERS

NYMTC is comprised of the NYMTC Council which is made up of the chief elected and appointed officials of the member agencies; the Program, Finance and Administration Committee (PFAC), which oversees the day-to-day operations of the organization; the three subregional Transportation Coordination Committees (TCCs), which provide sub-regional planning forums; and a professional staff, responsible for conducting the daily business of the organization. The NYMTC Council is divided into two groups: a group of nine voting members and another group of seven non-voting advisory members (see Figure 1).

Figure 1



THE METROPOLITAN PLANNING PROCESS

The metropolitan planning process facilitates a cooperative, continuous, and comprehensive regional framework for multi-modal transportation planning, as required by Federal regulation. As part of this process, NYMTC produces the following (see Figure 2):

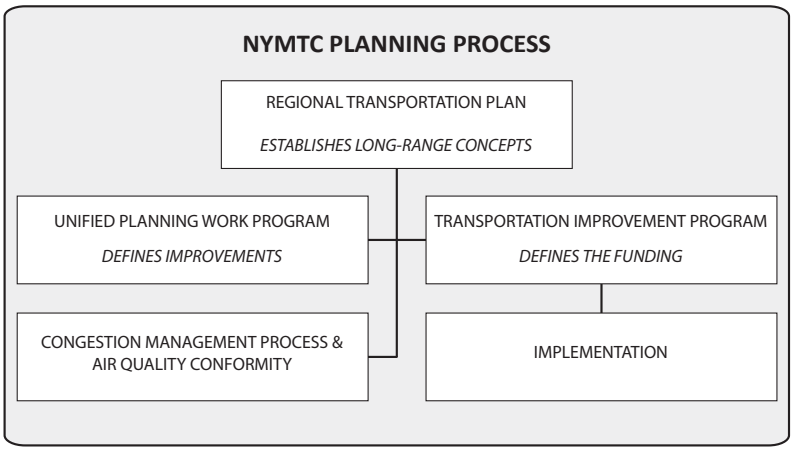
Three Planning Products

- The Regional Transportation Plan (RTP), which describes long-range goals, objectives, and strategies, typically over a 25-year horizon for the NYMTC planning area;
- The Transportation Improvement Program (TIP), which defines funding for specific investments and actions over a five-year horizon;
- The Unified Planning Work Program (UPWP), which determines how funding for planning activities will be spent over the course of a program year.

Two Planning Processes

- The Congestion Management Process (CMP) is a systematic approach, collaboratively developed and implemented throughout the region, which provides for the safe and effective management and operation of new and existing transportation facilities through the use of demand reduction and operational management strategies.
- The Air Quality Conformity Process provides a flexible funding source to State and local governments for transportation projects and programs to help meet the requirements of the Clean Air Act. Funding is available for areas that do not meet the National Ambient Air Quality Standards (nonattainment areas) as well as former nonattainment areas that are now in compliance (maintenance areas).

Figure 2



THE FEDERAL CONTEXT

NYMTC is required by federal legislation to prepare the Regional Transportation Plan every four years to serve as a blueprint for transportation planning and implementation over at least a 20-year period. The most recent legislation Moving Ahead for Progress in the 21st Century (MAP-21) was signed into law by the President of the United State on July 6, 2012. In addition to requirements spelling out the development of a long range transportation plan, the legislation also includes eight planning factors that need to be considered in metropolitan transportation planning process. These factors are:

- 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 for 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, for people and freight;
- Promote efficient system management and operation;
- Emphasize the preservation of the existing transportation system.

The authority for NYMTC's Regional Transportation Plan is also found in other Federal legislation and guidance such as 23 United State Code (U.S.C) 134 (h) and (i); 49 U.S.C. 5303 (f); 42 U.S.C. 2000d et. seq. (Title VI of the Civil Rights Act of 1964 as amended); the Environmental Justice Executive Order of 1997; and the National Environmental policy Act of 1969 (NEPA).

MEGAREGIONAL PLANNING WITH AREA MPOs

Inter-organization communication is essential for sustaining the integrity of overlapping transportation networks, ecosystems, economies, and environments. To address these geographically expansive issues, NYMTC must plan at the 'megaregional' scale. NYMTC recognizes the importance of megaregional planning in the global context and among cities. Council members understand that the economy of the NYMTC planning area relies heavily on seamless connections in transportation. There are also environmental impacts and sustainability issues related to how each region addresses congestion, air quality, and water quality.

NYMTC is part of a coordinated transportation planning Memorandum of Understanding (MOU) between the North Jersey Transportation Authority (NJTPA), the South Western Region Metropolitan Planning Organization (SWRMPO), the Greater Bridgeport / Valley Metropolitan Planning Organization (GBVMPO), and the Housatonic Valley Council of Elected Officials (HVCEO). The MOU recognizes that these metropolitan regions are interdependent of each other and share ecosystems, environments, transportation systems, and are socio-economically related. The implementation of this MOU is partially facilitated by the Metropolitan Area Planning (MAP) forum which is working on issues such as data exchange, information sharing on regional projects, and other transportation planning issues common to the MPOs.

One major megaregional project is the New York-Connecticut Sustainable Communities Consortium which is was formed in 2011 to launch a bi-state sustainability initiative for coordinated regional and local planning. The Consortium consists of:

- Mayors from nine New York and Connecticut cities (Bridgeport, Mount Vernon, New Haven, New Rochelle, New York, Norwalk, Stamford, White Plains, Yonkers);
- The New York City Department of City Planning Commissioner;
- Four Metropolitan Planning Organizations (GBVMPO, NYMTC, SWRMPO, and the South Central Regional Council of Governments or SCRCOG);
- The Nassau County Executive and Suffolk County Executive;
- Heads of two regional planning entities (Long Island Regional Planning Council; Regional Plan Association).

The Consortium continues to work together to develop livable communities and growth centers around the region's commuter rail network that will expand economic opportunity by creating and connecting residents to jobs, foster new affordable, energy-efficient housing, provide more transportation choices, strengthen existing communities and make the region more globally competitive. The initiative will work to reduce congestion, improve the environment and create a strategy to build resilience to the effects of climate change.

URBAN AREA BOUNDARY (UAB) AND THE METROPOLITAN PLANNING AREA (MPA) BOUNDARY ADJUSTMENTS

The MPO is required to examine their Urbanized Area growth patterns following each decennial census. The US Census determines which areas are considered urbanized based on an area's concentration of residential density. The urbanized area designations established in Census 2010 are used to establish FHWA and Metropolitan Planning Area (MPA) boundaries. Adjusting the Census urban area boundaries is a necessary first step in the roadway functional classification review.

While there is no requirement in law or regulation to adjust the 2010 Census urban area boundaries, adjusted or "smoothed" FHWA boundaries can facilitate transportation planning and programming activities and are to be drawn to include the areas expected to become urbanized within a 20-year horizon. Adjusted urban area boundaries are subject to approval by USDOT and need to be forwarded to FHWA and FTA with an approval letter from NYSDOT. The 2010 Urban Area Boundary map (see Figure 3) contains a minor adjustment that has been made to NYMTC's UAB following the smoothing process. A few census blocks at Conkling Point in Suffolk County were changed from Rural to Urban in order to make the Urban Area Boundary smooth. Conkling Point is located at the north-west side of Shelter Island in Suffolk County.

Since existing, the NYMTC MPA boundary encompasses the entire 2010 Census urbanized area as well as the area expected to become urbanized within the next 20-year period, there has been no revision made to the MPA boundary. Figure 4 shows the NYMTC MPA boundary.

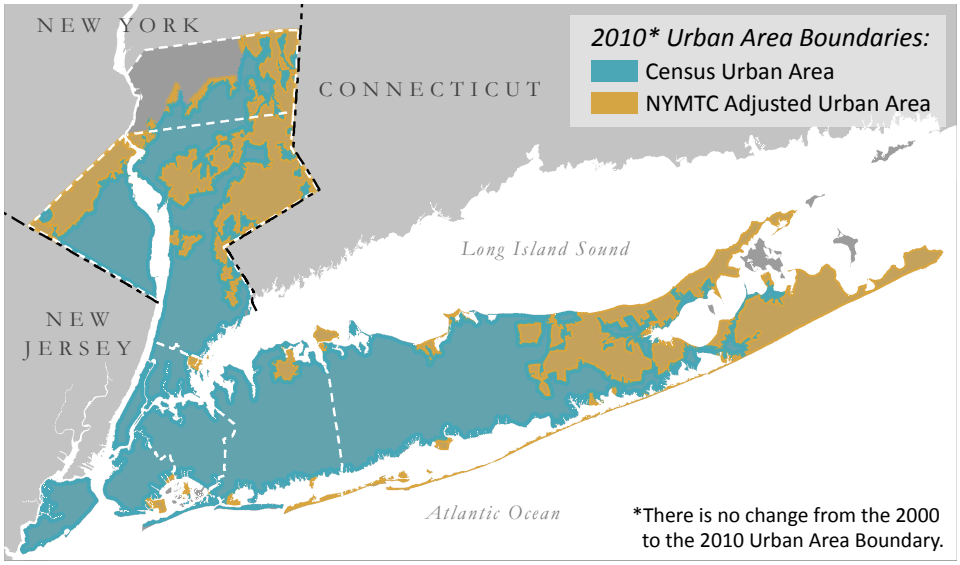


Figure 3: Urban Area Boundary

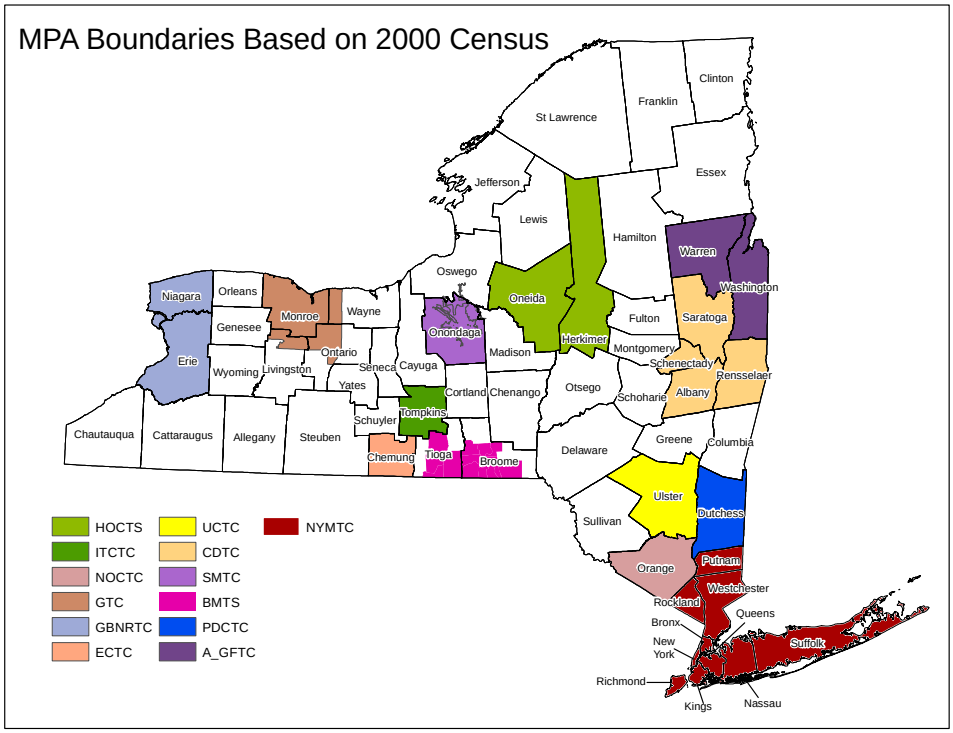


Figure 4: AGFTC - Adirondack-Glens Falls Transportation Council; BMTS - Binghamton Metropolitan Transportation Study; CDTC - Capital District Transportation Committee; ECTC - Elmira-Chemung Transportation Council; GTC - Genesee Transportation Council; GBNRTC - Greater Buffalo-Niagara Regional Transportation Council; HOCTS - Herkimer-Oneida Counties Transportation Study; ITCTC - Ithaca-Tompkins County Transportation Council; OCTC - Orange County Transportation Council; PDCTC - Poughkeepsie-Dutchess County Transportation Council; SMTC - Syracuse Metropolitan Transportation Council; UCTC - Ulster County Transportation Council.

GETTING INVOLVED

NYMTC strives to engage the public in all planning efforts, from beginning to end. For a detailed discussion, including all of the public's comments on *Plan 2040,* go to Appendix 7: Public Outreach and Participation. Involving a diverse set of communities in a planning process across a large geographic area is key to developing and implementing transportation investments that will be the most beneficial to, and accepted by, the very people relying on those resources. Every day, people in this region are acutely aware of how the transportation system is working, with valuable knowledge and insight into their needs and the needs of their communities. NYMTC's public involvement program aims to be proactive, gathering input and ideas at early stages of the planning process for consideration as the process moves forward. The public is openly involved at the regional, subregional, and local level of the RTP and Figure 4 further illustrates the various points where the public is engaged with NYMTC in the planning process. Members of the public can get involved in any of the following ways:

• Visiting www.NYMTC.org where there is a resource on nearly every aspect of the regional transportation planning process, including major studies in your community, links to local web sites, calendars of meetings and study contacts. The site includes maps, charts and data online in an easy-to-navigate format, as well as a collective library of data on transportation issues and related topics.

• Subscribing to NYMTC Notes by sending an email to nymtc-notes@dot.ny.gov, or via www.NYMTC.org. This electronic newsletter provides an e-mail report on what's new at NYMTC, with news and contacts for studies, recent survey results and new models for analysis, along with a calendar of upcoming meetings.

• Joining NYMTC's mailing, emailing and fax lists to receive regular updates, information and notices of activities and public comment periods, including notification about the Regional Transportation Plan, Transportation Improvement Program and Unified Planning Work Program updates and amendments. Send requests to be added to nymtc-web@dot.ny.gov.

• Participating in the planning process for the development of the Regional Transportation Plan, Transportation Improvement Program and Unified Planning Work Program by attending meetings, submitting written comments, joining community visioning sessions and open houses. Notices of meetings are sent via mail, fax and email, and electronic notices are posted on the NYMTC website www.NYMTC.org and NYMTC's Facebook page at www.Facebook.com/NYMTC.

• Participating in Advisory Working Groups, which strengthen the collaboration with the public on specific related issues, such as freight transportation, pedestrian and bicycle safety, and transportation demand management. A list of the working groups and contact information is available on www.NYMTC.org in the About NYMTC section.

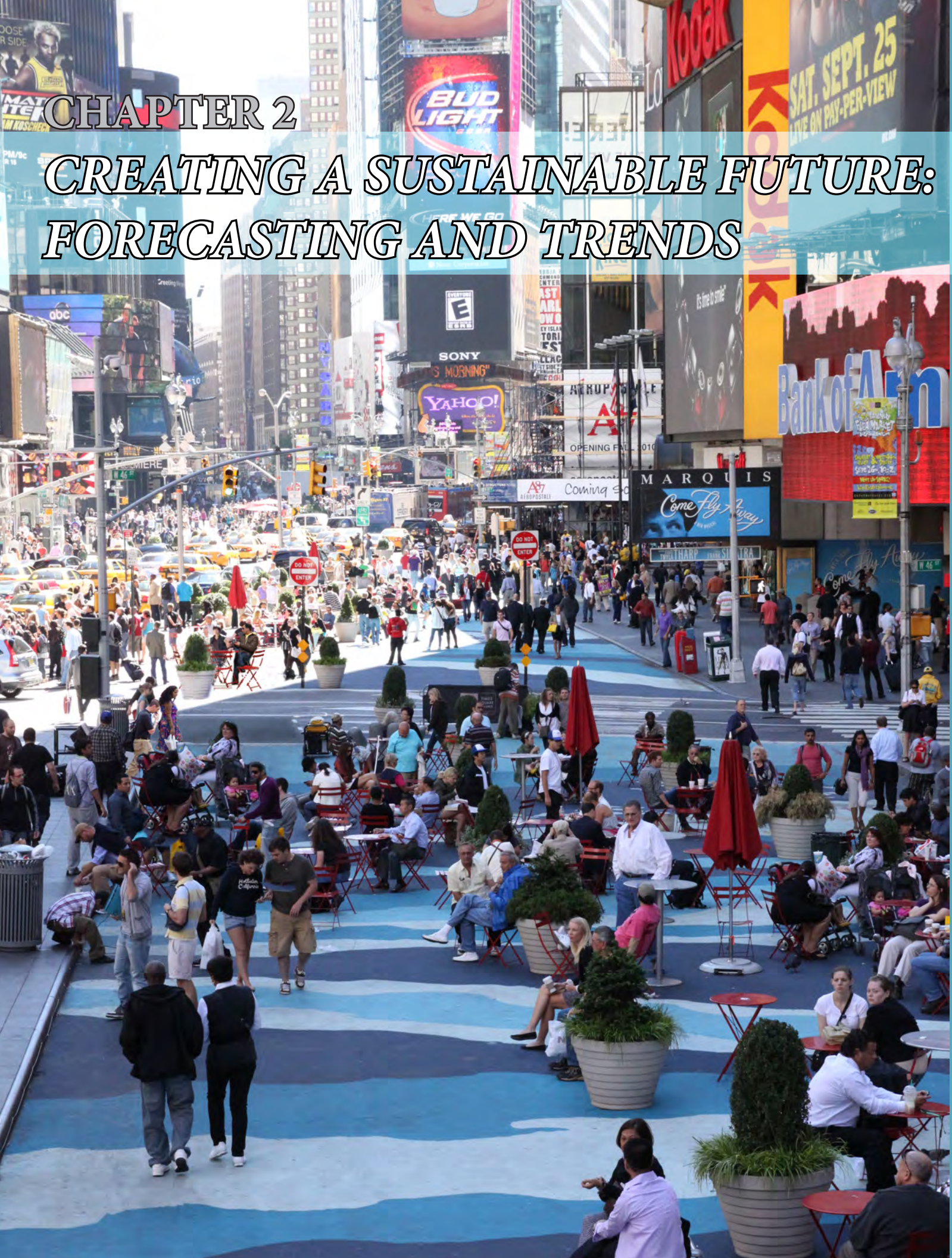
• Providing comments on NYMTC's products during public reviews. Notices of review are provided on www.NYMTC.org, on NYMTC's Facebook page, and via mail, fax and email.

• Attending Metropolitan Area Planning Forums and Public Information Sessions, where the public and NYMTC staff discuss regional transportation topics and specific related issues, assuring that a wide range of opinions are considered and all voices are heard. The MAP Forum meetings are held annually, and meeting notices are posted on www.NYMTC.org, on NYMTC's Facebook page, and via mail, fax and email

• Join Town Hall Forums, such as those for the Sustainable Communities Consortium HUD grant, that involve the public in discourse about local transportation issues.

• Visiting the NYMTC Library at NYMTC's Manhattan headquarters at 199 Water Street, 22nd floor, NYC, where studies, diagrams, data, models and more can be found.

• "Like" our Facebook page, www.Facebook.com/NYMTCH to receive notifications of upcoming events and comment periods.



CHAPTER 2

CREATING A SUSTAINABLE FUTURE: FORECASTING AND TRENDS

PLAN 2040

Chapter 2: Creating a Sustainable Future: Forecasting and Trends

Public Plaza in Times Square, New York City

Ferry Service in Lower Manhattan.

1. Introduction

Over the next twenty-six years, the New York Metropolitan Transportation Council (NYMTC) planning area is expected to undergo major changes. According to recent research conducted by planners, economists, and demographers, the NYMTC planning area is likely to experience significant growth in population, economic activity, travel, jobs, and housing needs as well as congestion and vehicular emissions.

The prospect of such a dynamic and vital future presents a challenge to our current infrastructure and transportation services, which must have the capacity to accommodate this growth while simultaneously safeguarding the quality of life and health of residents, visitors, and businesses. Meeting these growth challenges in a sustainable fashion has become a primary focus of NYMTC members.

This chapter presents data on a broad range of recent trends and forecasts how they are expected to unfold over the course of the *Plan 2040*. It also discusses the underlying technological, economic, and environmental developments that continue to have an impact on the region's transportation infrastructure.

FORECASTING METHODS

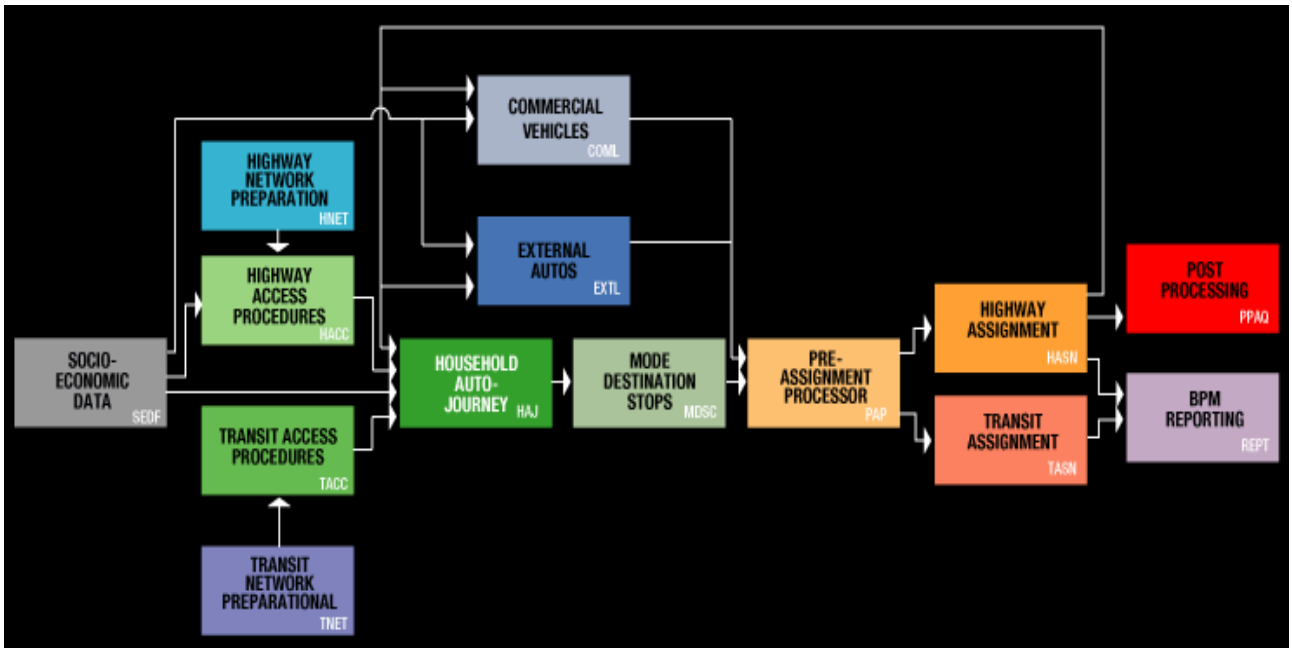
Forecasts were made with the use of models to predict how the NYMTC 10-county planning area will change over the course of the RTP. These forecasts will assist in decision making regarding potential transportation investments that can improve the mobility of the region's population.

There are two stages in NYMTC's modeling process. For *Plan 2040*, the first step was to produce regional demographic forecasts for the years 2014 and 2040. In the second step, these forecasts were used as inputs to the New York Best Practice Model, or NYBPM, which forecasts key measures of transportation in the region (see "What is the Best Practice Model?" below). The full details of these forecasting models, including methodologies and assumptions, can be found in Appendix 3. The first stage of forecasting calculated the following four key socio-economic and demographic measures:

- **Population**, which refers to the number of people living in the region and each of its sub-regions. In addition to being a key indicator of growth, this variable allows planners and decision makers to infer where many commute trips originate.

- **Employment**, which refers to the number of jobs in the region and each of its sub-regions. Employment trends influence both the end points of commute trips and the demand for the movement of various types of goods in the region. The employment figures help decision makers understand whether the region is generating or shedding jobs. Employment trends influence the number of people utilizing transpor-

Figure 2.1: NYMTC Best Practice Model Flowchart



What Is the Best Practice Model?

The New York Best Practice Model (NYBPM) is NYMTC's in-house methodology for forecasting travel patterns. It responds to projected changes in socio-economic conditions and to planned changes in the region's transportation system. It helps simulate and visualize future travel patterns including where people travel, how they travel (car, subway, bus, or commuter rail), preferred routes (highways or local roads), and their trip times. It provides decision makers and planners in the NYMTC planning area with a valuable tool for the long-term planning of regional transportation improvements. The NYBPM process requires significant human and technological resources and the model is reconfigured and updated every six months to incorporate the latest information and trends. The results are reviewed and approved by NYMTC's Program, Finance and Administration Committee.

Some of the salient features of the BPM include the following:

- The model uses the concept of "journeys" (multiple trip segments) rather than conventional "trips" to identify travel patterns in the region.
- The model simulates travel patterns rather than relying on average rates of travel associated with various types of development.
- The model is available for local planners to use on a variety of transportation software. The transit and highway components are based on a geographic information system (GIS) which provides a realistic and accurate representation of the highway and transit network.
- The model's highway and transit networks are very complex, using data from various transportation agencies and operators such as New York State Department of Transportation (NYSDOT), New York City Department of Transportation (NYCDOT), Metropolitan Transportation Authority (MTA), Port Authority of NY & NJ (PANYNJ) and New Jersey Transit (NJT).
- The two primary model types used to forecast journeys and destinations are a "household, auto ownership and journey-frequency model" and a "mode destination stop choice model."

Additional details about the Best Practice Model can be found in Appendix 3.

tation networks in the region.

- **Labor force**, which refers to the number of eligible workers living in the region and each of its sub-regions. This figure affects how and when workers commute between home and work.

- **Households**, which refers to the average household size of people living in the region and each of its sub-regions. This figure can be used to predict travel patterns (e.g., how many cars a household owns and which modes of transportation household members are likely to take).

These results, along with NYMTC's household travel survey and the regional road network, were then used as inputs to the NYBPM. When it is run, the model uses these inputs to forecast travel patterns for the broader twenty-eight county region, which includes counties in Connecticut and New Jersey. The results of the BPM that are discussed in the *Plan 2040* are the following:

- **Daily Auto Trips**, which refers to the origins and destinations of all automobile trips in the broader region. These trips are broken down by specific automobile type.

- **Daily Transit Trips**, which refers to the origins and destinations of all transit trips in the broader region. These trips are broken down by specific transit type.

- **Daily Vehicle Miles of Travel (VMT)**, which refers to the total miles traveled by all vehicles. This number is broken down by county.

- **Daily Vehicle Hours of Travel (VHT)**, which refers to the total amount of hours spent traveling by all vehicles. This number is broken down by county.

Forecasts for all eight of these metrics were produced for 2014 and 2040 as a basis for showing how the NYMTC planning area will change over the course of *Plan 2040*. The results are explained in more detail in the sections that follow.

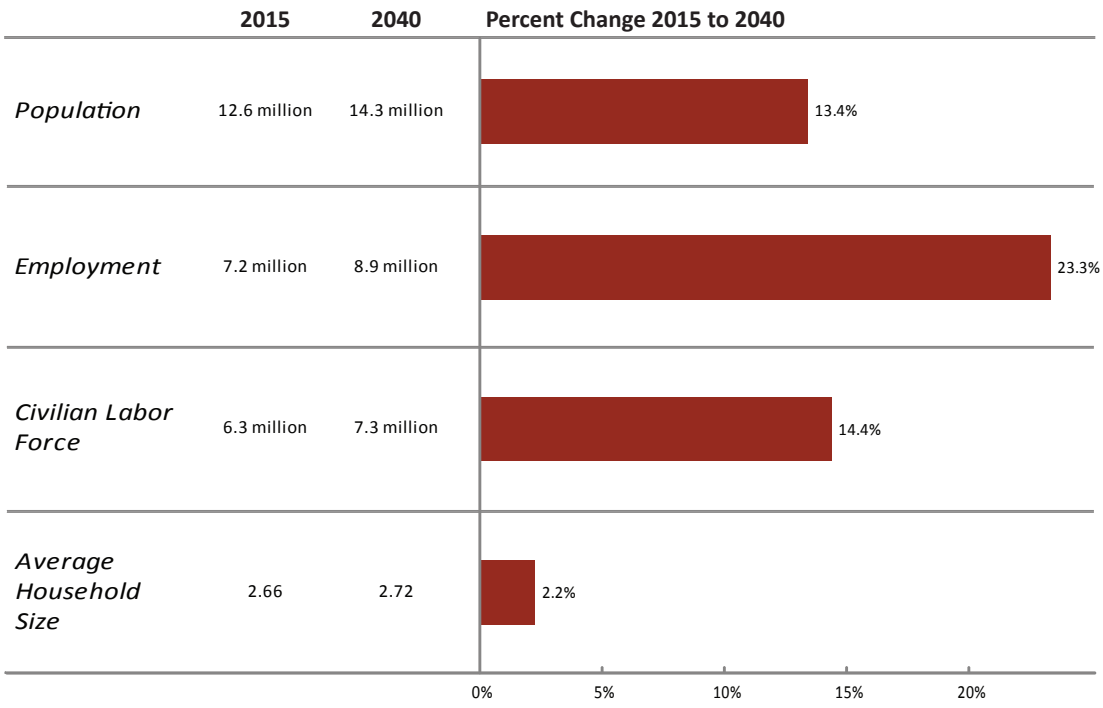

Busy streets and sidewalks.

REGIONAL TRENDS AND SHARED GOALS

As with other sections of *Plan 2040*, Chapter 2 focuses on advancing the Shared Goals and Desired Outcomes laid out in Chapter 1. Regarding the first goal of **enhancing the regional environment**, this chapter discusses the challenges posed by climate change which include rising sea levels, heat waves, and more frequent and intense storms. This chapter identifies strategies and initiatives such as New York's State Climate Action Council that will protect transportation assets from extreme weather events and help reduce the region's contribution to greenhouse gas emissions. The challenges that must be confronted to achieve the second goal of **improving the regional economy** are also laid out in this chapter. They include the forecasts of significant increases in population, employment, auto and transit trips, and vehicle miles traveled. These forecasts as well as the increased volume of freight that will travel through the NYMTC planning area point to the need to strengthen transportation infrastructure and ensure that the region remains a globally competitive center. All of these topics also relate to the goal of **improving the regional quality of life**: an improved environment and an expanding transportation network that accommodates an increasing population will improve quality of life. This chapter also identifies increased gridlock and travel times as a regional challenge and one that *Plan 2040* seeks to address with the goal of providing **flexible and convenient transportation** in the region. This challenge will necessitate strengthening existing infrastructure and expanding transportation options with a range of projects discussed in Plan 2040. In this sense, Chapter 2 builds a strong case for **implementing regional transportation investments**. New York City, which is the economic engine in the NYMTC planning area, attracts investment from all over the world. Many workers in the region commute to Manhattan's central business district, so the region's transportation infrastructure is vital to sustaining the region's growth. Finally, the forecasted increase in the volume of traffic on the region's roads as well as the increasing number of bicyclists that commute to and from work necessitate a focus on the goal of **improving safety and security** in transportation.

2. Socio-Economic and Demographic Trends and Forecasts

Figure 2.2a: Socio-economic Indicators for the NYMTC Region, 2015 to 2040



Source: NYMTC

Socio-economic and demographic forecasts underlie NYMTC's entire planning process involving future travel demand. These forecasts typically use as a base U.S. Census Bureau data from the broader 28-county tri-state metropolitan region, but the RTP itself focuses on the ten-county NYMTC planning area. Studying trends in the 28-county region helps planners better understand the potential for growth in the region's population and economy in the future. The data is broken down according to either NYMTC subregions or individual counties. The subregions, or Transportation Coordinating Committees (TCCs), are organized in the following manner:

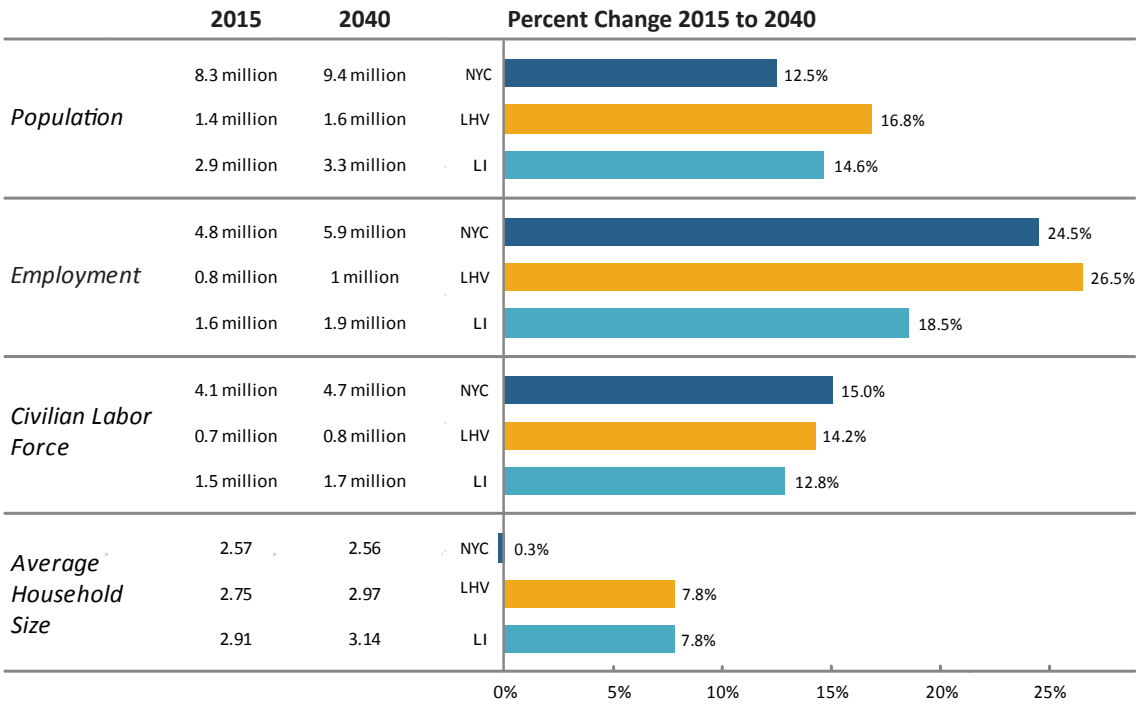
- The **Lower Hudson Valley**, consisting of Putnam, Rockland, and Westchester counties;
- **New York City**, consisting of Bronx, Queens, New York (Manhattan), Kings (Brooklyn), and Richmond (Staten Island) counties; and
- **Long Island**, consisting of Nassau and Suffolk counties.

This section briefly presents the forecast results for the four socio-economic and demographic metrics described above. It then provides additional background and delves into past and future trends in these metrics. All statistics on the "NYMTC planning area" refer to the ten-county region identified above.

Figures 2.2(a) and (b) break down the four metrics and display NYMTC's forecasts for 2015 and 2040. Growth is expected to occur in the NYMTC planning area in all four metrics over the course of the RTP. In particular, employment is expected to grow significantly at 23.3 percent. Average household size, a less volatile statistic, is expected to grow very little.

As shown below in Figure 2.2(b), when these figures are broken down by TCC, the Lower Hudson Valley stands out for its significant growth over the next three decades. In particular this TCC is expected to see an increase in employment of 26.5 percent. As for average household size, all TCCs will see small increases, but this metric is actually expected to decrease in New York City over the next three decades.

Figure 2.2b: Socio-economic Indicators for the NYMTC Region by TCC, 2015 to 2040
Note: Some TCC figures, when added together, do not equal total NYMTC figures due to rounding.



Source: NYMTC

Economy and Industry Impacts in the NYMTC Planning Area

These socio-economic and demographic changes will occur in one of the world's most dynamic regional economies. The importance of the NYMTC planning area's transportation system in maintaining this economy and ensuring its continued success cannot be overlooked. Gross domestic product (GDP), the total output of goods and services of an area, can provide a useful economic overview of the New York-Northern New Jersey-Long Island metropolitan area. In 2010 this area's GDP was $1.28 trillion, roughly 9 percent of the GDP of the United States.[1] If it were an independent nation, the New York metro area would rank as the 13th largest economy in the world.[2] By comparison, the next largest economic center in the United States, the Los Angeles-Long Beach-Santa Ana metro area, had a GDP of approximately $0.74 trillion (GDP figures are advance statistics). With its relatively high GDP, the NYMTC planning area offers opportunities for further investments and entrepreneurial activities, which are needed to spur economic innovation.

In addition to the strength of its economy, the NYMTC planning area has developed around a world-class urban center: New York City. This metropolis is an economic engine for the region as well as for the United States, and features a very significant business agglomeration. In 2012, it was home to 18 Fortune Global 500 company headquarters (Figure 2.3). Westchester County was also home to three Fortune Global 500 company headquarters. The high concentration of internationally competitive firms within New York City, together with the city's strong entrepreneurial setting, confers additional economic opportunities through synergies that cannot be obtained in isolated locations. Thus, many global companies find incentives to operate in markets in the New York City area, and in turn they spur further economic activities. Only four other cities in the world had more Fortune Global 500 company headquarters than New York City in 2011. Houston, Texas, the only other U.S. city that made the top-ten list, had six headquarters.[4]

New York City has enjoyed dramatic growth in economic output over the past 45 years, largely by way of its significant concentration of knowledge-based industries. While jobs in many industries have been lost to other countries, industries that are relatively intensive in their use of technology and/or human capital inputs tend to concentrate in large cities, such as New York, and are less affected by the offshoring of jobs.[5]

These industries account for a large por-

tion of the regional economy. Of the 18 Fortune Global 500 companies based in New York City, 16 of them are knowledge-based companies specializing in finance, insurance, information and communication technology, and research and development (e.g., consulting and pharmaceutical companies). Together, they produced total revenues of nearly $1 trillion in 2011.[6] The 2010 County Business Patterns dataset of the U.S. Census Bureau shows that the knowledge-based industry sectors (i.e. finance and insurance; professional, scientific, and technical services; and health care and social assistance) account for about 37 percent of total jobs in the NYMTC planning area.[7] In terms of aggregate personal income in 2010, these sectors represented roughly 56 percent ($139 billion) of the total income of individuals generated in New York City ($246 billion) and 53 percent of the income generated in the NYMTC planning area ($323 billion).[8]

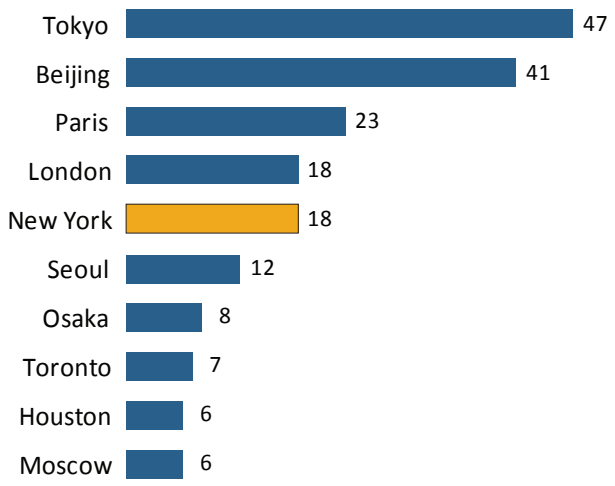
There are challenges, however, to the continued success of this industry in the region. The role played by transportation in facilitating the movement of people and goods, and thus in reinforcing economic development, cannot be underestimated and it is especially critical in knowledge-based economies. The regional transportation network (roadways, transit, rail, and air) is increasingly congested; for example, gridlock has been estimated to cost New York City up to $13 billion per year in annual costs and revenue losses,[9] which can undermine the region's continuous economic success.

The following sections will explore each of the four socio-economic and demographic metrics in depth, analyzing past trends and exploring the future development of these trends.

POPULATION

In 2000, the population of the 10-county NYMTC planning area was roughly 12.1 million, up 8.2 percent since 1990 (an annualized growth rate of 0.8 percent). Overall growth in the region was lower than the national average (13.2 percent) for the same decade. Growth within the counties varied significantly, ranging from Manhattan, with an increase of only 3.3 percent, to Staten Island, which saw an increase of 17.1 percent (Figure 2.4). Queens added the most residents in terms of actual numbers (nearly 278,000), resulting in a growth rate of 14.2 percent during this decade.[10]

Figure 2.3: Number of Fortune Global 500 Companies By City, 2011



Source: *CNN Money*, 2011

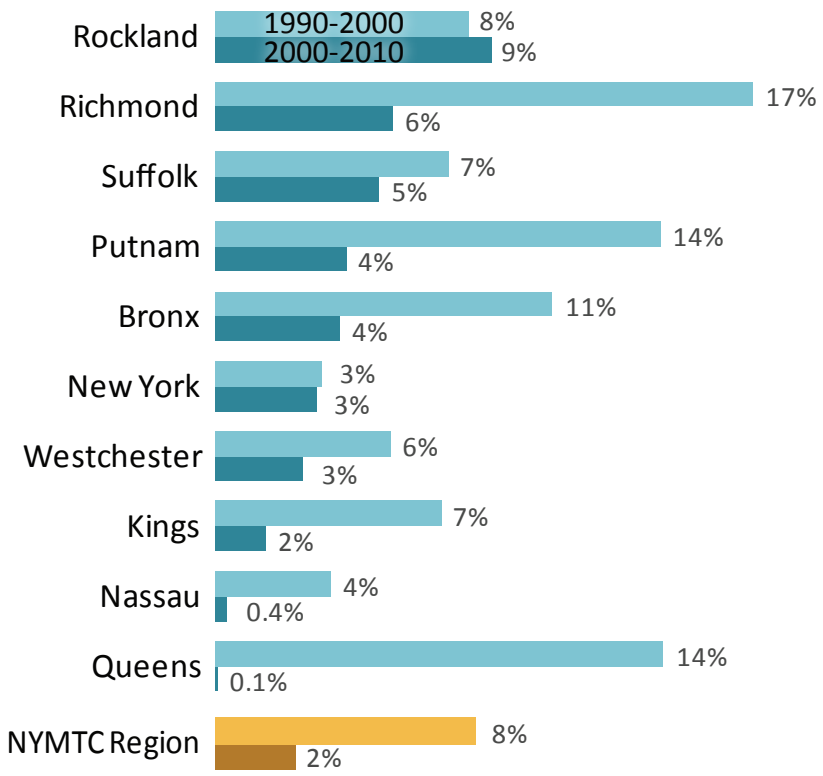
Of note, population growth rates seem to have slowed since the 2000 Census, declining nationally from 13.2 percent between 1990 and 2000 (an annualized growth rate of 1.2 percent), to approximately 9.7 percent between 2000 and 2010 (an annualized growth rate of 0.9 percent).[11] This is due to a combination of factors: lower economic growth, less immigration, and the aging of the baby boomer generation out of prime childbearing years.[12] The NYMTC planning area appears to be following a similar pattern, with the current growth rate between 2000 and 2010 at only 2.5 percent, or an annualized growth rate of 0.25 percent (Figure 2.4).[13] This is consistent with recent national patterns of growth, which have shown strong growth in the Southern and Western regions of the country and less growth in the Northeast and Midwest.

Perhaps of even greater interest is the fact that while some counties in the region are experiencing significant population growth, others have remained nearly flat. Between 2000 and 2010, Rockland County grew at an 8.7 percent rate. However, the rapid growth of Queens, Staten Island, and Putnam County came down significantly between 2000 and 2010. Queens and Nassau counties both grew less than 1 percent during this period. In fact, Rockland was the only county that saw an increase in the rate of its population growth between 2000 and 2010.

Population in the ten-county NYMTC planning area is expected to increase by 13 percent from 12.6 million people in 2015 to about 14.3 million by 2040, a growth rate of approximately 0.5 percent annually.

The New York City subregion is forecast to grow by approximately 12 percent, from 8.3 million to 9.4 million between 2015 and 2040. The population of Nassau and Suffolk counties on Long Island is expected to grow by 15 percent through 2040, while the Lower Hudson Valley subregion is expected to grow by 17 percent through 2040.

Figure 2.4: Population Growth Rates By County, 1990 to 2010



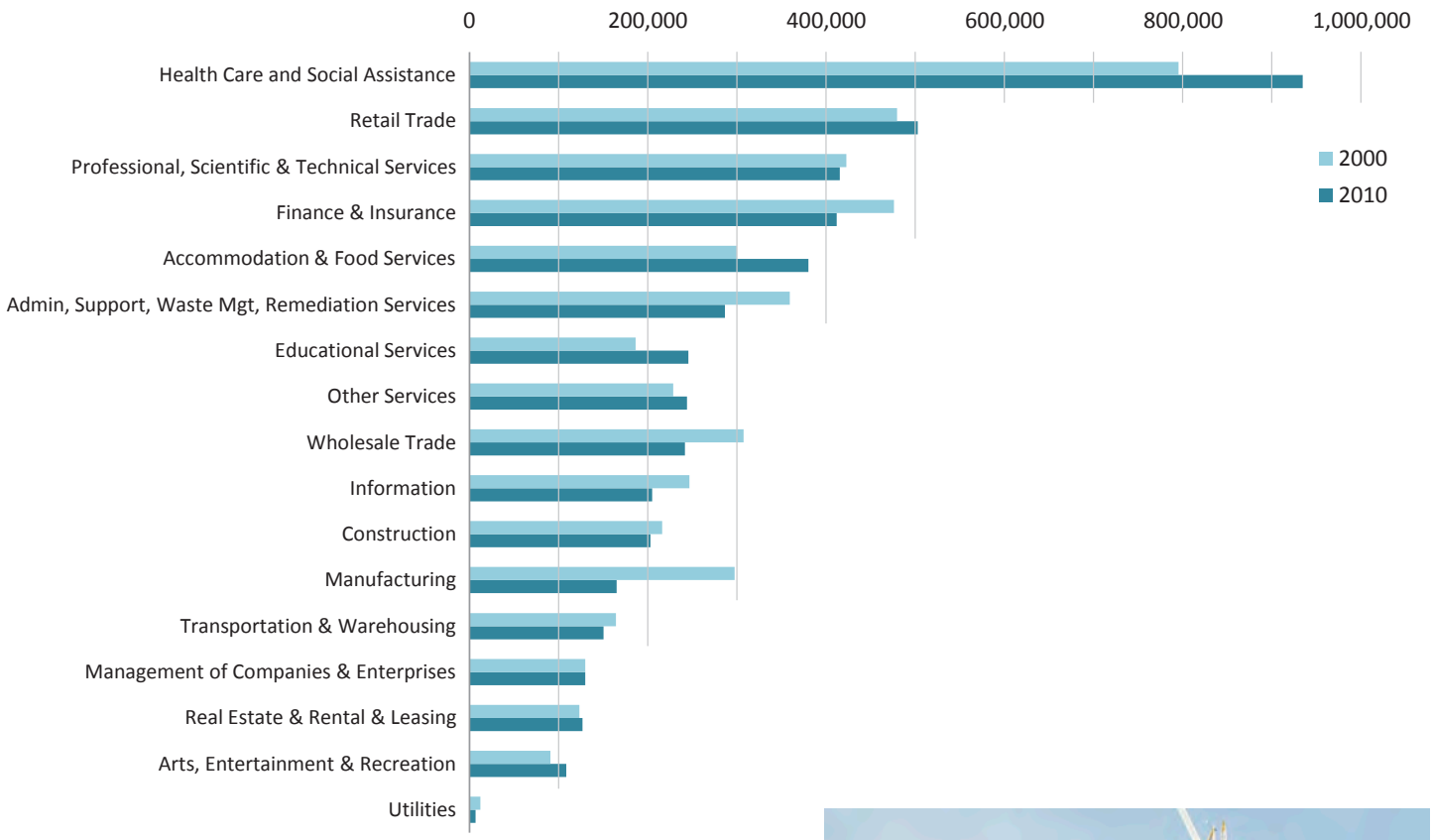
Source: U.S. Census Bureau, 1990, 2000, 2010

Table 2.1: Population Trends and Forecasts By County and Subregion (in 1000s)

AREANAME	1970	1980	1990	2000	2010	2015	2020	2025	2030	2035	2040
NYC	**7,894.9**	**7,071.6**	**7,322.6**	**8,008.3**	**8,175.4**	**8,315.6**	**8,469.8**	**8,684.7**	**8,954.7**	**9,228.6**	**9,351.5**
Bronx	1,471.7	1,169.0	1,203.8	1,332.7	1,385.4	1,396.8	1,403.5	1,423.3	1,454.9	1,485.1	1,505.1
Brooklyn	2,602.0	2,231.0	2,300.7	2,465.3	2,504.7	2,529.6	2,570.2	2,624.0	2,705.4	2,781.3	2,800.9
Manhattan	1,539.2	1,428.3	1,487.5	1,537.2	1,585.9	1,620.7	1,654.2	1,699.8	1,760.7	1,824.4	1,848.5
Queens	1,986.5	1,891.3	1,951.6	2,229.4	2,230.7	2,287.5	2,350.2	2,430.6	2,508.1	2,593.6	2,643.8
Staten Island	295.5	352.0	379.0	443.7	468.7	481.0	491.7	507.0	525.6	544.2	553.1
LI	**2,553.0**	**2,605.8**	**2,609.2**	**2,753.9**	**2,832.9**	**2,891.5**	**2,929.7**	**3,009.5**	**3,115.1**	**3,221.6**	**3,313.2**
Nassau	1,428.1	1,321.6	1,287.4	1,334.5	1,339.5	1,353.3	1,362.5	1,397.6	1,444.3	1,487.3	1,525.0
Suffolk	1,124.9	1,284.2	1,321.8	1,419.4	1,493.4	1,538.2	1,567.1	1,612.0	1,670.8	1,734.3	1,788.2
LHV	**1,180.7**	**1,203.3**	**1,224.3**	**1,306.0**	**1,360.5**	**1,394.9**	**1,421.9**	**1,464.5**	**1,512.0**	**1,567.5**	**1,629.3**
Putnam	56.7	77.2	83.9	95.7	99.7	104.2	107.2	112.1	117.7	124.2	131.9
Rockland	229.9	259.5	265.5	286.8	311.7	319.8	324.3	332.0	339.3	352.2	363.6
Westchester	894.1	866.6	874.9	923.5	949.1	970.9	990.4	1,020.3	1,055.1	1,091.1	1,133.7
REGION	**11,628.6**	**10,880.7**	**11,156.1**	**12,068.1**	**12,368.8**	**12,601.9**	**12,821.4**	**13,158.7**	**13,581.8**	**14,017.8**	**14,293.9**

Source: NYMTC

Figure 2.5: Job Growth By Major Industry in the NYMTC Region, 2000 and 2010



Source: U.S. Census Bureau, County Business Patterns

EMPLOYMENT

Over 2.7 million jobs in the NYMTC planning area are located in Manhattan, more than the rest of New York City combined. The region experienced continued job growth between 2000 and 2010, with employment increasing by 7.5 percent despite the continuing economic challenges faced by the nation.[14]

As with population, there are significant differences at the county level. While all counties in the region have added jobs, the New York City boroughs of the Bronx, Staten Island, and Brooklyn stand out, having increased employment by 26, 25 and 20 percent respectively. Putnam County also grew significantly, increasing its employment by 25 percent. While Manhattan has the largest share of jobs in the NYMTC planning area, its employment grew very little at 1.2 percent (see Table 2.2). As individuals increasingly must travel to and from new and/or different destinations, diverse demands will be placed on different parts of the transportation network and investments may be needed in new and different areas.[15]

Several employment trends are expected to influence the region during the next few decades. First, manufacturing continues to decline

World Trade Center work site.

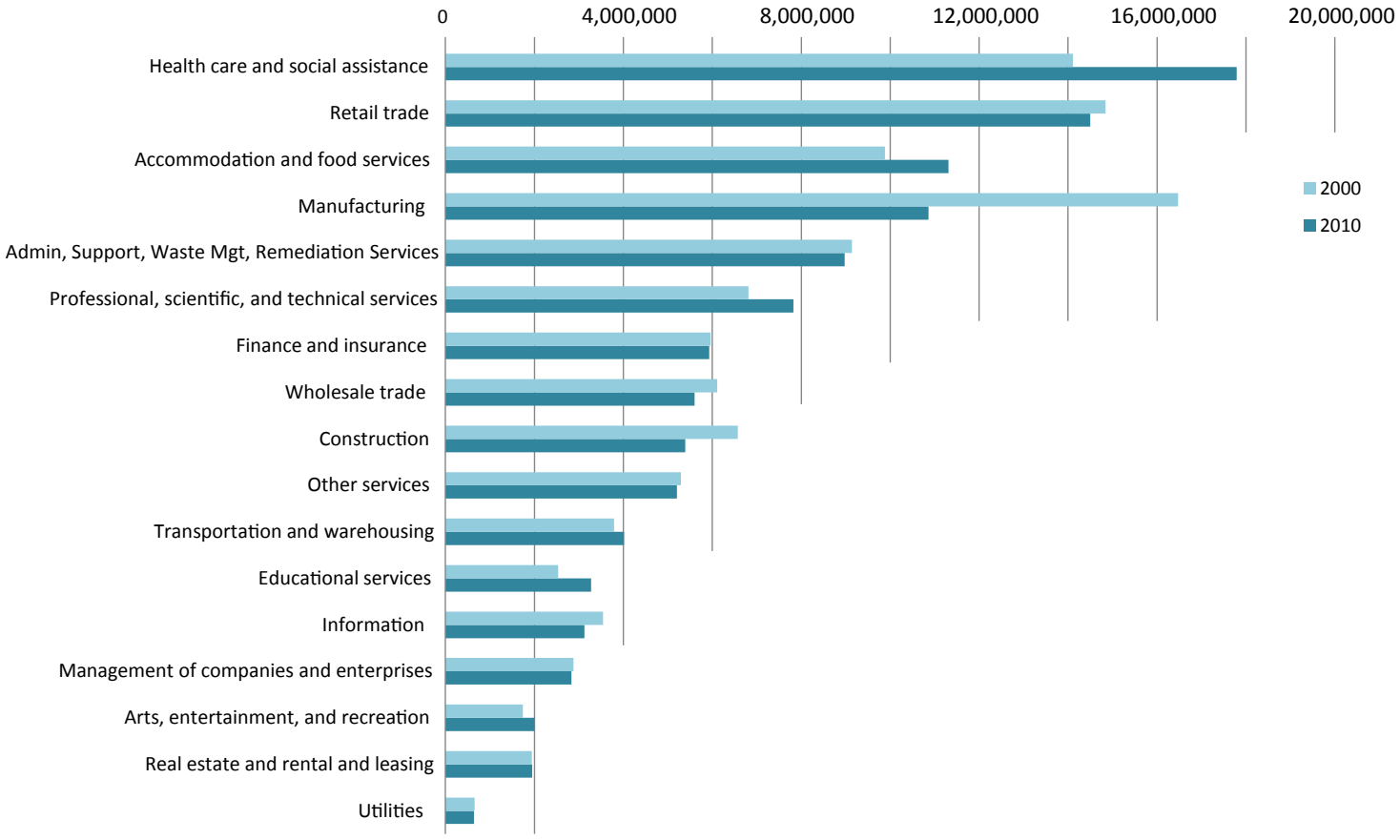
both in the nation and the region. Historically the engine of economic development in industrialized countries, manufacturing industries are increasingly moving away from the region as the costs of doing business (including but not limited to labor costs) rise.[16] Although some of these industries may have relocated within the region, many have moved to other parts of the United States or abroad. Indeed, while manufacturing jobs in the United States as a whole plummeted by 34 percent between 2000 and 2010, the NYMTC planning area lost close to 44 percent of its manufacturing base, with a decline from more than 297,000 to just over 165,000 jobs (see Figures 2.5 and 2.6).[17]

Second, the availability of state-of-the-art information and communications technology and ever-increasing globalization has increased the "offshoring" of highly standardized information technology-enabled back-office jobs (e.g., telephone or online-based customer service) to other countries, especially to India, where many people speak English fluently.[18] Thus, jobs in the information industry in the United States have declined by 17 percent between 2000 and 2010.[19] There are indications that countervailing forces are working against this trend such as recent increases in labor costs in China, which have led some companies to move jobs to the U.S.[20] However, most evidence points to a continuation of the offshoring trend in the near term. According to a study by Atkinson and Wial, the New York Metropolitan Area (including Northern New Jersey) is expected to lose between 2.1 and 2.5 percent of back office information technology jobs to foreign competition by 2015.[21]

Third, high-skill and knowledge-based jobs have also been decreasing in the NYMTC planning area. Roughly 13 percent of the jobs in the Finance and Insurance sector, a significant source of growth in the region, were lost between 2000 and 2010. The nation as a whole felt this less with finance and insurance jobs declining by 6 percent (Figures 2.5 and 2.6). The decrease was steepest in Manhattan where 18 percent of the Finance and Insurance jobs were lost during this period.[22] Some of these jobs moved to other counties in the region (notably Brooklyn and the Bronx), but the recent economic downturn has likely been a significant factor in this trend.

Despite the recent shrinkage of employment in these key sectors, employment in the region as a whole has increased. This increase has been led by sectors such

Figure 2.6: Job Growth By Major Industry in the U.S., 2000 and 2010



Source: U.S. Census Bureau, County Business Patterns

Table 2.2: Employment Trends and Forecasts By County and Subregion (in 1000s)

AREANAME	1970	1980	1990	2000	2005	2010	2015	2020	2025	2030	2035	2040
NYC	**4,066.5**	**3,614.0**	**3,966.2**	**4,277.3**	**4,369.1**	**4,611.1**	**4,776.8**	**5,017.3**	**5,239.9**	**5,456.5**	**5,671.9**	**5,946.2**
Bronx	251.3	216.9	237.8	269.4	308.0	339.3	364.5	387.2	406.9	424.3	440.8	458.4
Brooklyn	631.9	516.4	504.5	584.6	613.4	702.2	754.3	805.8	851.3	893.1	933.6	976.8
Manhattan	2,550.3	2,277.5	2,565.1	2,682.2	2,675.9	2,714.2	2,762.9	2,880.6	2,995.0	3,112.1	3,230.2	3,396.6
Queens	586.0	536.7	567.3	624.1	647.2	708.9	733.9	767.5	796.5	823.4	850.2	883.0
Staten Island	47.1	66.4	91.6	116.9	124.6	146.5	161.2	176.2	190.2	203.6	217.0	231.3
LI	**862.6**	**1,093.2**	**1,329.8**	**1,457.5**	**1,550.4**	**1,544.2**	**1,632.0**	**1,703.9**	**1,756.1**	**1,815.5**	**1,872.0**	**1,933.7**
Nassau	575.2	661.0	716.8	743.2	768.5	751.0	783.6	810.6	821.4	839.9	856.7	876.3
Suffolk	287.4	432.2	613.0	714.1	781.9	793.2	848.4	893.2	934.6	975.6	1,015.3	1,057.4
LHV	**448.0**	**534.6**	**632.6**	**686.4**	**739.8**	**747.2**	**799.5**	**845.8**	**892.6**	**931.2**	**968.1**	**1,011.0**
Putnam	11.7	17.0	26.3	31.5	34.7	39.5	42.2	44.5	46.5	48.1	49.6	51.2
Rockland	73.1	98.1	122.7	134.5	145.0	152.0	162.6	172.5	181.7	189.6	197.0	205.3
Westchester	363.2	419.5	483.6	520.4	560.1	555.7	594.6	628.8	664.4	693.4	721.6	754.6
REGION	**5,377.2**	**5,241.8**	**5,928.5**	**6,421.3**	**6,659.3**	**6,902.6**	**7,208.2**	**7,567.0**	**7,888.6**	**8,203.2**	**8,512.0**	**8,890.9**

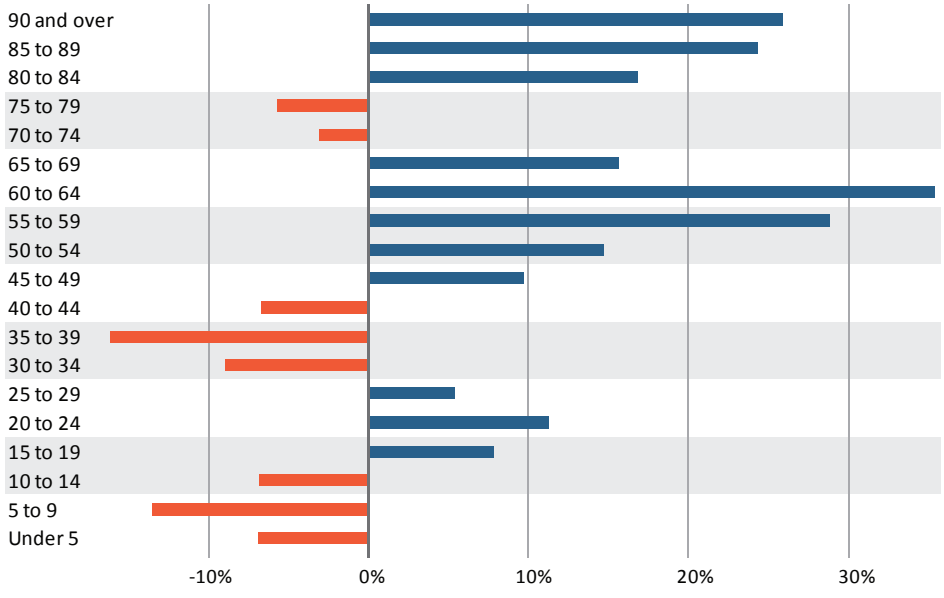
Source: NYMTC

as educational services, health care and social assistance, and accommodation and food services. The number of jobs in the ten-county NYMTC planning area is expected to increase by 23 percent, or about 1.7 million, from 2015 to 2040, compared to a historical increase of 1.3 million jobs over the 25-year period from 1980 to 2005. Higher proportional employment gains are projected to occur in Staten Island, Brooklyn, the Bronx, Rockland, Westchester, and Suffolk. Overall, the Lower Hudson Valley subregion is forecast to have the greatest proportional employment growth, 26 percent through 2040.[23] Table 2.2 summarizes employment growth forecasts for each subregion.

LABOR FORCE

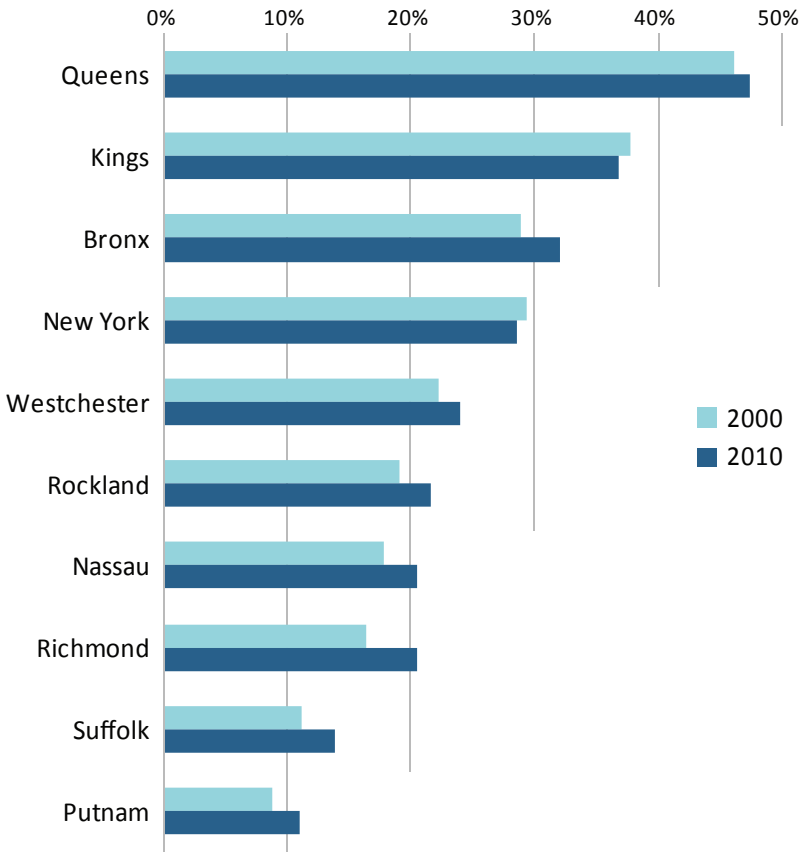
Two significant trends have influenced the development of the labor force in the NYMTC planning area in recent decades: an aging working population and an influx of immigrants. Of particular concern for the labor force is that the growth in the number of older adults is being accompanied by slower or negative growth rates in the lower age brackets (Figure 2.7).[24] This is somewhat different from the trend from 1990 to 2000: during this earlier decade the most significant growth occurred within the 35 to 60 age brackets while very young children and the elderly saw moderate growth.[25] From 2000 to 2010, the regional rate of growth for the number of people 85 years old and over was 25 percent, while the rate of growth for those between 80 and 84 years old was 17 percent. Although the actual number of those in the upper age brackets remains relatively low compared with the rest of the population, the aging of the baby boomer generation (currently aged 48 to 66 years old) will likely swell the ranks of the older adult age brackets (those 65 and older). As a

Figure 2.7: Change in Population By Age Groups in the NYMTC Region, 2000 to 2010



Source: U.S. Census Bureau, 2000 and 2010

Figure 2.8: Percentage of Population that Is Foreign Born by County, 2000 and 2010



Source: U.S. Census Bureau 2000 Census, 2010 American Community Survey

result of this recent trend, older adults represent an increasingly larger share of the overall population.

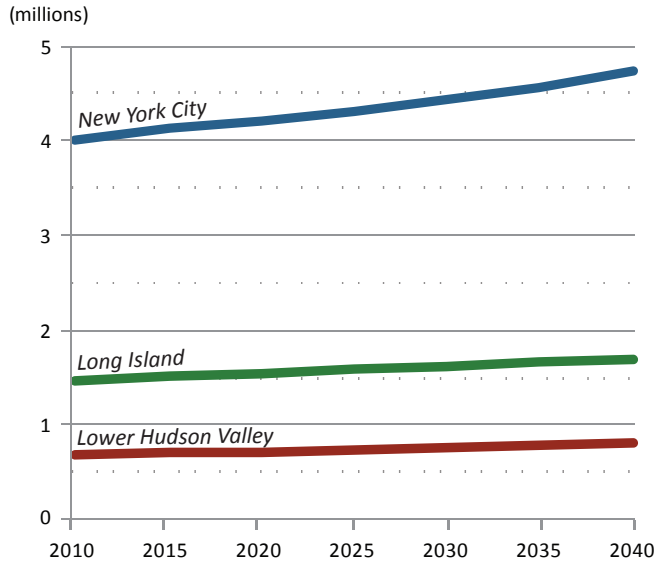
If the trend continues, this imbalance may have serious implications for the labor force that supports the region's economy and the transportation services needed to support the labor force. One central challenge an aging workforce could pose is the loss of the skills and institutional knowledge of the baby boomers. Due to the significant amount of retirees whose employers will not provide health benefits[26] it may also increase the reliance upon government services of a significant portion of the population as people reach retirement age. Additionally, older adults often eventually find themselves unable to drive and in need of alternative transportation modes, be it traditional public transit or demand-responsive transit services. An aging population also requires more specialized pedestrian facilities such as curb extensions and pedestrian islands to compensate for slower walking speeds when crossing streets. However, a recent national survey of the population over 50 years of age indicated that 40 percent did not find adequate sidewalks in their neighbor-

Table 2.3: Labor Force Trends and Forecasts By County and Subregion (1000s)

AREANAME	1970	1980	1990	2000	2005	2010	2015	2020	2025	2030	2035	2040
NYC	**3,330.8**	**3,161.3**	**3,579.8**	**3,666.0**	**3,734.0**	**4,003.4**	**4,123.5**	**4,218.8**	**4,301.4**	**4,429.4**	**4,570.4**	**4,742.0**
Bronx	552.4	443.9	501.7	486.6	503.6	543.4	556.3	566.5	575.2	588.7	603.5	621.4
Brooklyn	1,012.4	902.3	1,036.0	1,042.6	1,052.7	1,133.4	1,163.8	1,187.9	1,208.7	1,240.8	1,276.1	1,318.9
Manhattan	741.7	754.1	837.2	855.3	875.3	935.4	963.8	986.2	1,005.7	1,035.9	1,069.2	1,109.6
Queens	908.9	907.4	1,015.7	1,064.3	1,074.6	1,141.6	1,180.4	1,211.4	1,238.4	1,280.1	1,326.3	1,382.7
Staten Island	115.3	153.6	189.2	217.2	227.8	249.6	259.1	266.8	273.4	283.8	295.2	309.3
LI	**988.7**	**1,228.6**	**1,388.8**	**1,413.9**	**1,474.1**	**1,474.3**	**1,508.9**	**1,540.8**	**1,579.9**	**1,616.1**	**1,662.1**	**1,702.0**
Nassau	585.5	654.8	690.1	677.9	694.6	687.5	702.8	711.2	725.6	739.7	751.8	761.7
Suffolk	403.2	573.8	698.7	735.9	779.4	786.7	806.1	829.6	854.3	876.3	910.3	940.3
LHV	**490.4**	**594.6**	**655.7**	**663.0**	**693.5**	**687.3**	**705.7**	**717.1**	**739.4**	**756.2**	**781.1**	**806.1**
Putnam	20.7	35.9	46.9	52.4	56.2	54.3	60.2	58.1	60.2	62.1	64.7	67.3
Rockland	86.6	125.0	141.0	145.3	152.3	151.9	159.7	155.8	160.1	157.3	159.8	162.5
Westchester	383.1	433.7	467.8	465.3	485.0	481.0	485.8	503.2	519.1	536.8	556.6	576.2
REGION	**4,809.9**	**4,984.5**	**5,624.2**	**5,742.9**	**5,901.6**	**6,164.9**	**6,338.1**	**6,476.6**	**6,620.7**	**6,801.7**	**7,013.7**	**7,250.0**

Source: NYMTC

Figure 2.9: Labor Force Growth in the NYMTC Region, 2010 to 2040

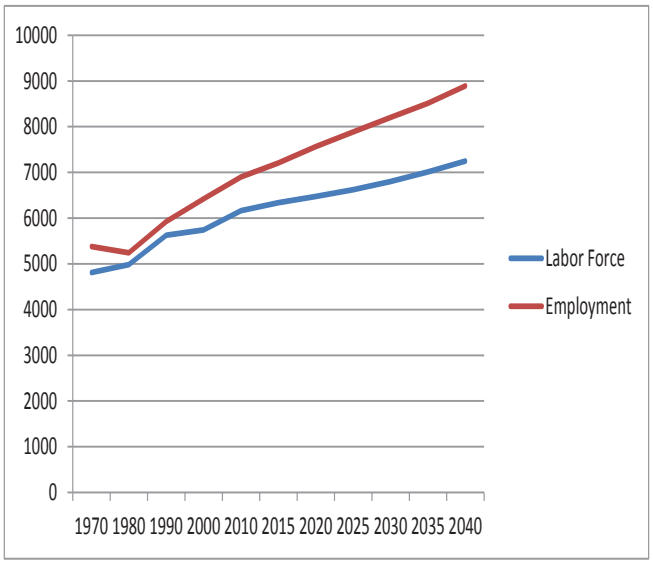


Source: NYMTC

hoods, while roughly half of those polled were concerned about not being able to safely cross streets. In fact, 40 percent of pedestrian fatalities in the United States involve this age group.[27] Transportation services will also need to be handicapped accessible in order to handle the needs of the larger senior population.

Foreign-born workers, however, are likely to play an important role in the region's labor force. These workers help sustain the region's economy: in 2010, 43 percent of New York City's workforce consisted of foreign-born residents, notably from the Dominican Republic, China, and Jamaica.[28] In the year 2000, the overall foreign-born population represented about 29 percent of the total 10-county population and by 2010, the proportion of foreign-born residents increased in all NYMTC counties except Manhattan and Brooklyn (where it decreased slightly) (Figure 2.8).[29] If this trend continues, it could mitigate the effects of an aging native-born workforce.

Figure 2.10: Labor Force Vs. Employment in the NYMTC Region, 1970 to 2040



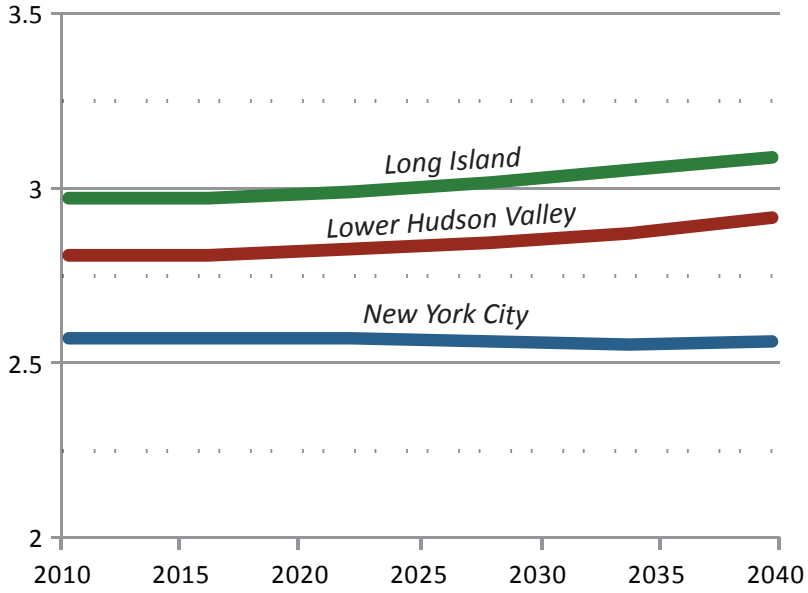
Source: NYMTC

Overall, the number of eligible workers in the NYMTC planning area is projected to grow at a rate of 14 percent between 2015 and 2040, a slower rate of increase than the number of jobs (Figure 2.10). The largest percentage growth in labor during this period is expected in New York City, at about 15 percent.[30] This forecast predicts the continued expansion of the gap between labor force and employment numbers that has been widening since the 1980s. It indicates that greater and greater numbers of people are commuting from outside the NYMTC planning area to work there. A particular attraction for work trips in the NYMTC planning area is the Manhattan central business district. This topic will be discussed in greater detail in the section on commuting patterns below. The forecast also indicates that, while population growth and labor force growth will be fairly consistent in the region overall, the population will grow faster than the labor force in the Lower Hudson Valley. This could mean that certain groups of people are leaving the labor force in significant numbers. It could also be an indication of changing demographics: as those of prime labor force age leave the labor force and more children are born, the population may rise and the labor force may shrink. According to the Rockland County Comprehensive Plan, this is forecast to be the case for Rockland County.[31]

HOUSEHOLDS

The number of households in the NYMTC planning area is projected to increase at a slightly slower pace than population between 2015 and 2040. Household size is expected to rise slightly from 2.66 to 2.72 persons per household, consistent with past trends in the United

Figure 2.11: Change in Household Size in the NYMTC Region, 2010 to 2040



Source: NYMTC

States. While New York City is forecast to show a small decrease in average household size, the Lower Hudson Valley and Long Island subregions are both forecast to show distinct increases of 7.8 percent in average household size.[32]

The projected growth in households reflects the expected population growth and emerging trends in the average size of new households. Between 2010 and 2040, almost 600,000 new households will be formed in the region due to a significant increase in the household population. Partly as a result of the immigrant influx and immigrants' more youthful age structure, average household size will level off slowly over the 30-year period.

Table 2.4: Total Households Trends and Forecasts by County and Subregion

AREANAME	1970	1980	1990	2000	2005	2010	2015	2020	2025	2030	2035	2040
NYC	**2,836.9**	**2,788.5**	**2,819.4**	**3,021.6**	**3,026.2**	**3,109.8**	**3,164.0**	**3,217.3**	**3,303.9**	**3,431.3**	**3,540.6**	**3,567.6**
Bronx	497.2	429.3	424.1	463.2	468.2	483.4	498.1	501.0	518.6	537.6	553.7	570.4
Kings	876.1	828.3	828.2	880.7	882.2	916.9	933.8	956.5	980.5	1,015.3	1,043.7	1,036.5
New York	687.3	704.5	716.4	738.6	731.4	763.8	762.7	768.1	789.9	838.5	879.8	892.2
Queens	690.1	711.9	720.1	782.7	782.5	780.1	801.4	815.9	833.2	850.5	867.1	868.0
Richmond	86.2	114.6	130.5	156.3	161.9	165.5	168.1	175.9	181.7	189.4	196.3	200.5
LI	**696.6**	**809.1**	**856.2**	**916.7**	**921.2**	**948.5**	**975.4**	**988.6**	**1,005.6**	**1,020.9**	**1,031.0**	**1,037.1**
Nassau	401.0	423.4	431.5	447.4	437.1	448.5	451.7	452.9	457.7	460.1	464.4	465.2
Suffolk	295.6	385.7	424.7	469.3	484.1	499.9	523.6	535.7	547.9	560.8	566.6	571.9
LHV	**359.0**	**409.8**	**433.0**	**462.5**	**460.6**	**481.5**	**492.2**	**500.7**	**511.6**	**521.0**	**529.0**	**533.3**
Putnam	16.0	24.4	28.1	32.7	34.5	35.0	37.6	39.3	41.3	42.8	44.3	48.1
Rockland	60.4	77.9	84.9	92.7	92.9	99.2	102.4	104.5	106.3	106.9	109.3	108.9
Westchester	282.6	307.5	320.0	337.1	333.2	347.2	352.2	356.9	364.0	371.2	375.4	376.4
NYMTC	**3,892.5**	**4,007.4**	**4,108.6**	**4,400.8**	**4,408.0**	**4,539.7**	**4,631.5**	**4,706.7**	**4,821.1**	**4,973.1**	**5,100.6**	**5,138.1**

Source: NYMTC

3. Travel Demand for Passengers and Freight

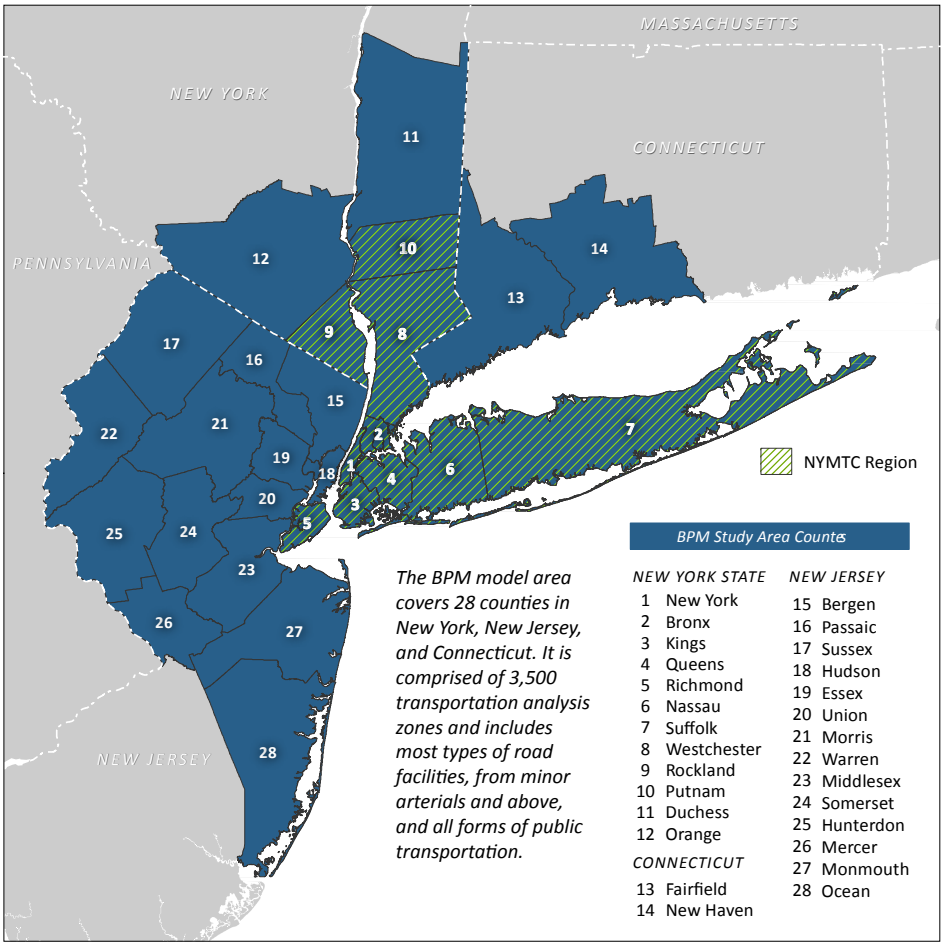
The impacts of the future trends identified by the socio-economic and demographic forecasts described above are expected to be significant and will likely result in substantive changes to the characteristics and frequency of travel in the region. As mentioned earlier and described in more detail in Appendix 3, these socio-economic and demographic forecasts are key inputs to the New York Best Practice Model which is used to generate forecasts of passenger and freight travel demand. This section discusses recent trends in passenger and freight transportation and describes how these will develop in the future.

NYMTC forecasts travel for people and goods over the same tri-state metropolitan region as the socio-economic and demographic forecasts. The resulting trends in average travel times; regional travel between counties; and mode choice aggregated by region, county, and the New York City "Hub" (Lower and Midtown Manhattan) are described below.

It is important to note that all forecasts created by the NYBPM are baseline forecasts, meaning that only transportation projects with funding commitments are assumed to be built. The distinction between a "build" forecast (including all funded and planned projects) and a baseline forecast is described in more detail in Appendix 3.

Figures 2.13 (a) and (b) display NYMTC's NYBPM forecasts for 2014 and 2040. As with socio-economic and demographic change, growth is expected to occur in the NYMTC planning area in all four basic transportation metrics over the course of the RTP: daily auto trips, daily transit trips, daily vehicle miles of travel (VMT), and daily vehicle hours of travel (VHT). While total daily trips is expected to grow by 13 percent, significant contrast can be seen in the growth of transit trips and auto trips; the former are expected to grow by 20 percent and the latter by only 10 percent.

Figure 2.12 : NYMTC New York Best Practice Model (NYBPM) Study Area



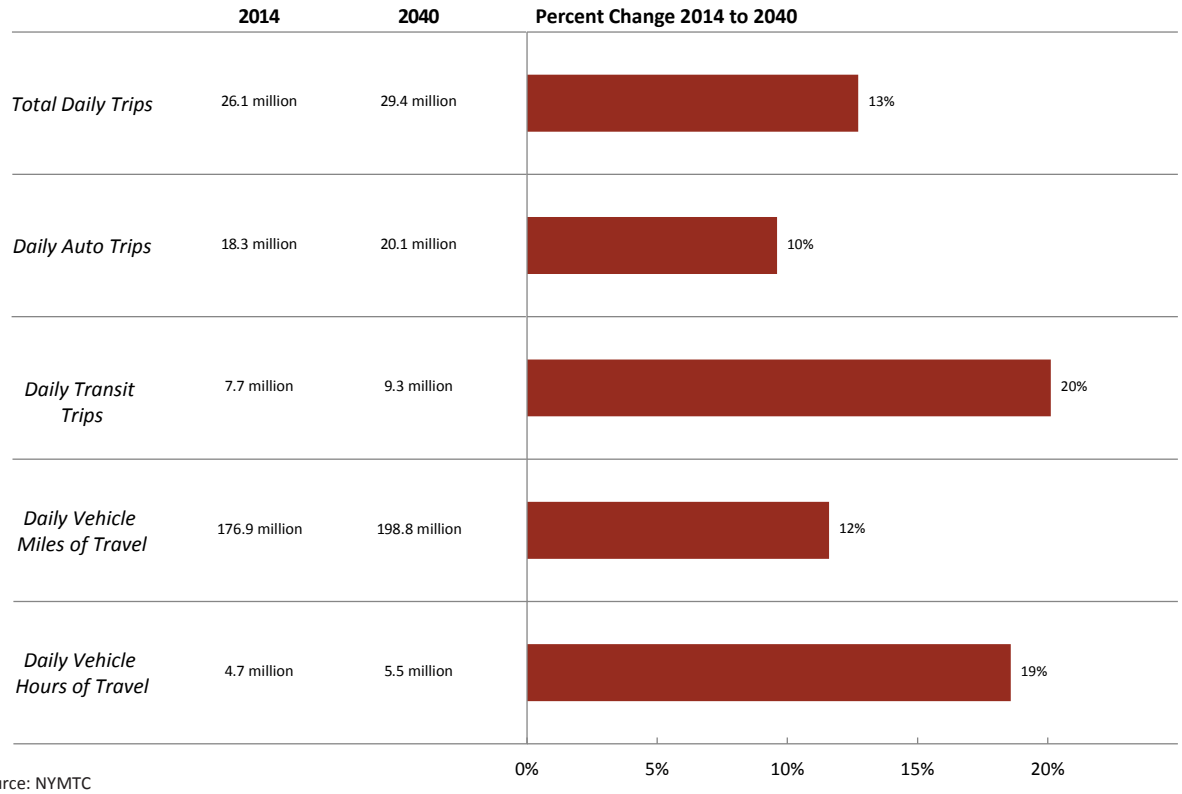
As we saw with the socio-economic and demographic figures, when these figures are broken down by TCC, the Lower Hudson Valley is expected to show the strongest growth of all TCCs in all four transportation categories. This TCC is expected to see much larger percent increases in VMT (23 percent) and VHT (28 percent) compared with the other two TCCs. Daily transit trips are expected to grow dramatically at 33 percent. Meanwhile, New York City will see mild growth in auto trips at 8 percent.

As with the previous discussion on socio-economic and demographic forecasts, the following sections will delve into each of these metrics and discuss past and future trends.

PASSENGER TRAVEL

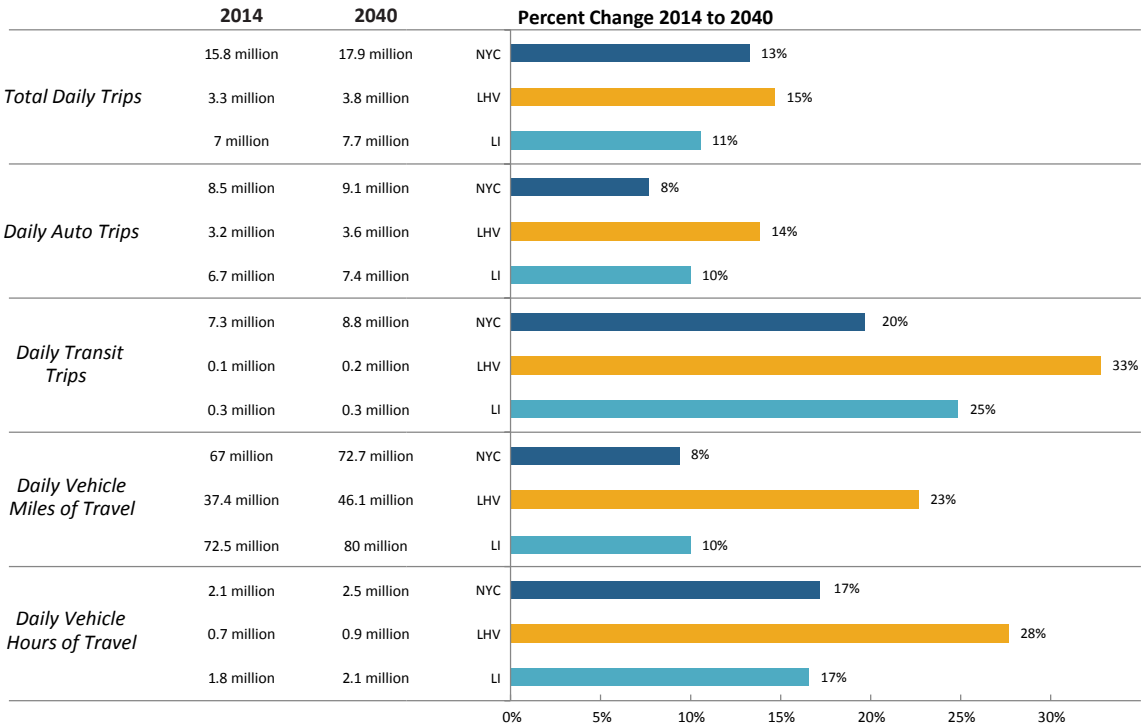
The region's transportation network supports daily approximately 3.2 million people by bus, 6.3 million on rail rapid transit, 110,000 on ferries, and 143,000 on airlines.[33]

Figure 2.13a: Travel Indicators for the NYMTC Planning Area, 2014 to 2040



Source: NYMTC

Figure 2.13b: Travel Indicators for the NYMTC Planning Area by TCC, 2014 to 2040
Note: TCC trips are those that begin in the TCC plus those that originate outside the NYMTC Planning Area and end in the TCC.



Source: NYMTC

In 2011, MTA subways, buses and railroads alone accounted for the equivalent of about one in every five users of mass transit in the United States and one-third of the nation's rail riders.[34] Metro-North and Long Island Rail Road are the most used commuter rail systems in the nation, averaging over 560,000 riders every weekday.[35] The New York City subway provides over 5 million unlinked passenger trips on a typical weekday.[36] An unlinked trip is any trip or part of a trip that does not include transfers between different vehicles. Several unlinked trips can form one linked trip.

Between 2000 and 2010, the total number of journey to work trips increased by 10.3 percent throughout the entire region. Public transit saw a 17.1 percent increase in passenger trips between 2000 and 2010. In New York City, the number of single occupant vehicle work trips increased by 5.4 percent from 2000 to 2010. During the same period, public transportation trips to and from work increased by 19.2 percent. On Long Island, the number of single occupancy vehicle trips increased by 5.2 percent and in the Lower Hudson Valley, these trips decreased by 0.4 percent.[37]

Motorized vehicles are not the only types of transportation seeing significant use. Over 350,000 commute trips by walking are made in New York City each day, accounting for about 11 percent of all commute trips in the city. The absolute number of people walking to work in the region grew nearly 11 percent between 2000 and 2010. In addition, the number of people commuting by bicycle in New York City increased 60 percent from 2000 to 2010. Another energy saving mode, carpooling, declined over 18 percent in the NYMTC planning area from 2000 to 2010.[38]

The region's three major airports are among the busiest in the nation, with an estimated 47.7 million passengers traveling through John F. Kennedy (JFK) International Airport in 2011.[39] An estimated 24.1 million passengers used LaGuardia Airport in the same year.[40] Combined with Newark Liberty International Airport in New Jersey, the number of annual passengers handled by the "big three" New York City area airports is among the most for any city in the world.

As the data shows, the steady projected growth in regional population and jobs will put pressure on the transportation system. Some factors to consider include:

- Baby-boomers continue to make up a sizeable and mobile share of the workforce. Smaller fluctuations in the relative populations of younger age cohorts should be watched closely for the implications on labor force and population growth.
- Household sizes have leveled after declining since the 1970s, leading to steady or increasing numbers of travelers and trips.
- Older adults are more active than previous generations, continuing to remain active in their communities longer, either at work or in retirement. Furthermore, many older adults work past traditional retirement age in order to achieve financial security.

Table 2.5: Total Daily Passenger Trips By Transit in the NYMTC Region, 2011

Transit Mode	Total Daily Trips in NYMTC Region
Rapid Transit (Subway)	5,125,895
Bus	3,205,668
Commuter Rail	1,171,580
Ferry	109,858

Source: NYMTC

Travel Time

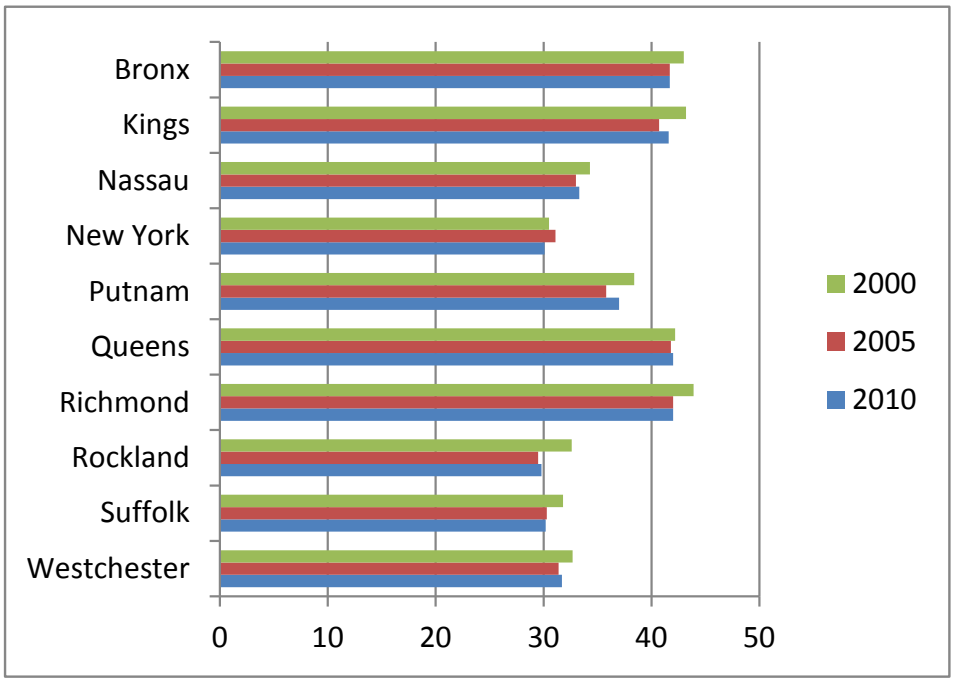
Mean travel time to work decreased across all the NYMTC counties from 2000 to 2010 raising the possibility of a trend toward shorter commute times across the region. Rockland County saw the largest decrease of all counties, with an 8.6 percent decrease in travel time, while Suffolk saw a 5 percent decrease and Staten Island a 4.3 percent decrease.[41] Figure 2.14 shows the mean travel times for all the NYMTC counties.

While the decline in commute times is consistent across all counties in the region, it is difficult to find a long-term trend in this change because the declines were not substantial and the time period for the decline was only ten years. In addition, some of the decline could be attributed to the change in mode choice from driving alone to other modes such as public transit (see Figures 2.17(a) and (b)). Whether this is a long-term trend or a historical anomaly associated with the recession and volatile gasoline prices is difficult to determine at this point.

Inter- and Intra-County Travel

The majority of travel in the NYMTC planning area consists of travel within counties and the number of these trips is expected to grow from 2010 to 2040. In every county throughout the region, the number of local, intra-county transit trips is expected to grow at a faster rate than the number of local, intra-county auto trips (see Table 2.6 below). However, as shown in Tables 2.7(a) and (b), with the exception of Manhattan, automobiles are the mode of choice for the majority of passenger trips within each

Figure 2.14: Mean Travel Time for All Trips in NYMTC Region, 2009 and 2010



Source: U.S. Census Bureau, 2000, 2005, 2010 American Community Surveys

county and borough, and will remain the dominant mode for local trips in the 2040 forecast year. Automobiles also are the predominant mode choice for trips between and within subregions, as shown in Figure 2.15, with the exception of trips within New York City.[42]

From 2014 to 2040, total transit trips are expected to increase 22 percent region-wide. According to forecasts, the share of all trips by transit (commute trips and non-commute trips) is expected to grow from 2014 to 2040 within most counties and between most county pairs. Substantial increases in transit ridership are expected in Westchester and Staten Island.[43]

Table 2.6: Forecast Change in Number of Intracounty Trips by Mode, 2014 to 2040

	Automobile	Transit
Bronx	9%	18%
Brooklyn	6%	25%
Manhattan	3%	13%
Queens	8%	21%
Staten Island	15%	41%
Putnam	5%	24%
Rockland	15%	32%
Westchester	12%	40%
Nassau	12%	16%
Suffolk	24%	34%

Source: NYMTC

Intra-county automobile trips in Putnam County and Staten Island are forecast to increase approximately 19 and 10 percent respectively, the largest such increases in the region. In New York City boroughs, with the exception of Staten Island, motorized trips are expected to increase less than 5 percent.[44] Figure 2.15 displays these figures graphically, with one set of bars between TCCs representing trips between those TCCs and the other set of bars within each TCC representing trips within that TCC.

Vehicle Miles Traveled

Vehicle Miles Traveled (VMT) is a measure commonly used to describe the extent of automobile use on a daily or annual basis. When analyzing trends over time VMT can be an indicator of changes in travel demand across the region.

As mentioned in the previous section, a growing population and an increase in jobs can be key factors in pushing up VMT, as more people make trips. The distance that workers must travel to get to their jobs is also a factor in increasing VMT. In the NYMTC planning area, VMT is expected to rise by about one-half of a percent annually from 2014 to 2040, or about 12 percent overall. However, it should be noted that the rate of increase is less than that projected in Plan 2035. This may indicate a correlation with national VMT trends: a 2008 study from the Brookings Institution indicates that VMT nationally has been essentially flat since 2004, and declined from 2007 to 2008, the first yearly decline since 1980. The authors of the study argue that this is an indication of a significant change in travel behavior by the U.S. public.[45] The Brookings study was subsequently confirmed by a 2012 study by the State Smart Transportation Initiative.[46] While the effects of the recession of 2007-2009 and historically high gas prices should be taken into account in future studies that assess this trend,

Table 2.7a: Daily County-to-County Auto Trips, 2014 and 2040

	Manhattan	Queens	Bronx	Kings	Staten Island	Nassau	Suffolk	Westchester	Rockland	Putnam
Manhattan	1,145,793	119,105	120,379	123,860	9,636	20,981	9,362	31,107	2,829	586
Queens	118,507	1,535,830	37,758	197,280	6,730	316,001	64,888	13,097	1,288	294
Bronx	117,945	37,093	766,052	17,926	750	14,576	4,791	186,172	2,032	543
Kings	124,835	195,714	17,013	1,715,723	27,533	36,032	17,535	8,097	956	226
Staten Island	8,299	7,117	843	29,552	683,360	2,564	771	375	546	11
Nassau	21,305	315,407	14,739	35,264	2,725	2,601,347	141,317	5,951	765	164
Suffolk	8,409	64,480	5,502	15,938	1,793	144,293	3,269,809	1,359	364	82
Westchester	31,025	12,180	185,174	8,972	257	5,503	1,855	1,299,241	34,295	43,251
Rockland	2,595	1,272	1,933	1,323	655	603	813	34,854	643,238	252
Putnam	636	146	658	302	4	83	107	43,033	232	155,282

	Manhattan	Queens	Bronx	Kings	Staten Island	Nassau	Suffolk	Westchester	Rockland	Putnam
Manhattan	1,251,159	123,199	125,699	128,015	9,544	20,558	9,205	32,130	2,817	699
Queens	121,542	1,629,878	39,783	209,597	7,049	329,371	69,683	14,353	1,537	458
Bronx	123,020	38,578	786,569	18,980	852	14,207	4,966	204,539	2,313	621
Kings	128,852	207,463	17,972	1,849,219	27,852	38,709	19,600	8,544	1,151	332
Staten Island	8,177	7,309	1,033	30,469	785,541	3,810	1,202	752	756	34
Nassau	20,742	327,190	14,576	37,618	4,242	2,720,677	155,833	6,682	798	156
Suffolk	8,011	69,529	5,662	18,044	2,445	158,875	3,756,139	1,476	369	97
Westchester	32,216	12,916	203,094	9,746	668	6,177	2,033	1,456,011	37,218	53,094
Rockland	2,579	1,556	2,150	1,541	844	666	819	37,701	718,708	293
Putnam	749	182	760	437	32	83	117	52,740	276	192,880

Source: NYMTC

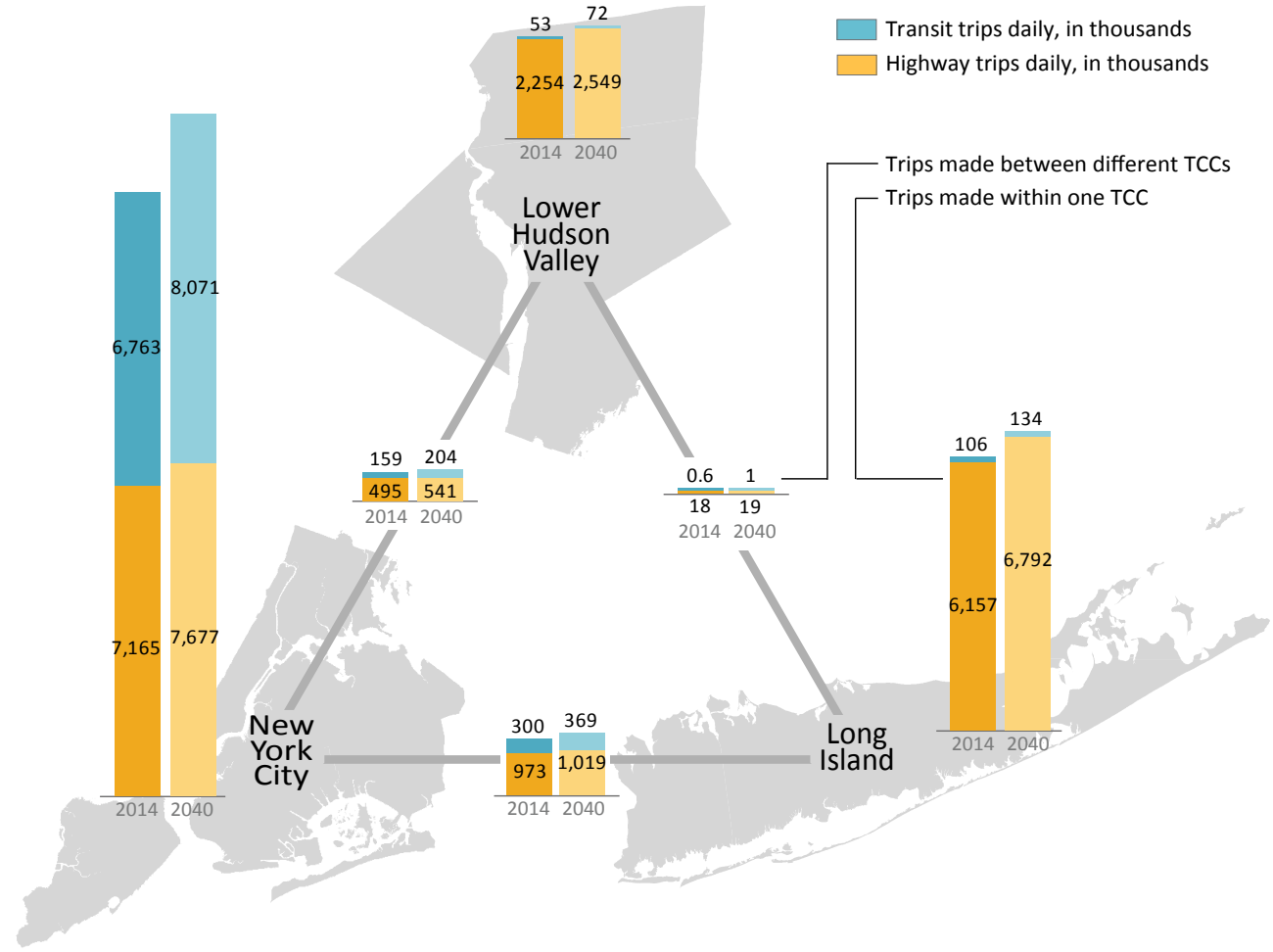
Table 2.7b: Daily County-to-County Transit Trips, 2014 and 2040

	Manhattan	Queens	Bronx	Kings	Staten Island	Nassau	Suffolk	Westchester	Rockland	Putnam
Manhattan	2,032,743	403,039	311,261	493,088	39,815	48,943	47,872	48,220	2,127	2,167
Queens	400,787	555,486	23,643	84,708	1,685	30,535	6,248	3,122	69	173
Bronx	312,016	24,236	362,332	21,774	500	3,296	1,849	21,559	63	10
Kings	493,332	84,018	21,345	955,567	7,178	6,633	3,953	1,372	42	19
Staten Island	40,215	1,473	384	7,417	84,784	313	473	32	6	-
Nassau	50,866	30,223	3,121	6,209	228	72,932	3,742	254	14	5
Suffolk	48,192	5,754	1,664	3,422	435	4,394	24,483	22	1	-
Westchester	49,454	2,264	21,725	1,341	64	259	23	42,690	592	169
Rockland	2,169	68	65	50	6	14	-	609	8,434	-
Putnam	2,188	110	8	21	1	5	1	217	-	104

	Manhattan	Queens	Bronx	Kings	Staten Island	Nassau	Suffolk	Westchester	Rockland	Putnam
Manhattan	2,394,930	496,284	362,563	574,658	41,479	58,558	60,765	60,138	2,401	2,680
Queens	493,371	694,896	28,735	108,830	2,247	36,873	8,462	4,338	90	184
Bronx	364,146	29,315	408,991	25,104	545	3,858	2,309	29,468	86	16
Kings	574,901	107,907	24,921	1,156,750	8,500	7,746	4,880	1,896	64	36
Staten Island	41,445	2,220	481	8,927	119,203	433	609	55	10	4
Nassau	61,078	36,601	3,482	7,227	309	90,389	5,306	392	19	4
Suffolk	60,874	8,026	2,079	4,225	572	6,065	32,196	60	4	1
Westchester	62,044	3,103	29,640	1,841	92	408	60	59,828	817	232
Rockland	2,422	96	110	63	9	24	3	814	9,825	-
Putnam	2,684	141	11	38	2	3	1	295	2	139

Source: NYMTC

Figure 2.15: Inter- and Intra-Regional Travel for Auto and Transit, 2014 and 2040



Source: NYMTC

this could be evidence that a prediction by the U.S. Department of Transportation (USDOT) of moderating driving habits is being realized. A study undertaken by USDOT argued that a number of demographic trends, including the stabilization of female participation in the labor force and the movement of the baby boomers out of their peak travel years, may lead to an eventual moderation in driving by the U.S. population.[47]

As for NYMTC's subregions, the Lower Hudson Valley is expected to have the highest increase in VMT at 23 percent over 26 years, with Putnam County forecast to see a 36 percent increase. Long Island growth in VMT will vary from 5.4% in Nassau County to 14.4% in Suffolk County. New York City, due in large part to an aging population combined with

Table 2.8: Daily Vehicle Miles Traveled by County, 2014 and 2040

	2014	2040	% Change
Bronx	10,636,250	11,397,786	7.2
Brooklyn	14,960,260	16,225,594	8.5
Manhattan	9,470,560	10,702,575	13.0
Queens	26,356,540	28,011,559	6.3
Staten Island	5,581,650	6,319,429	13.2
New York City Total	67,005,260	72,656,943	8.4
Nassau	32,784,990	34,553,560	5.4
Suffolk	39,731,990	45,453,222	14.4
Long Island Total	72,516,980	80,006,782	10.3
Putnam	6,026,010	8,198,783	36.1
Rockland	8,067,290	10,055,092	24.6
Westchester	23,328,850	27,840,339	19.3
Lower Hudson Valley Total	37,422,150	46,094,214	23.2
NYMTC Region	**176,944,390**	**198,757,939**	**12.3**

Source: NYMTC

ordinary population growth projections, will have modest VMT increases except for Staten Island which is forecasted to have an increase of 13 percent over 26 years.[48]

Vehicle Hours Traveled

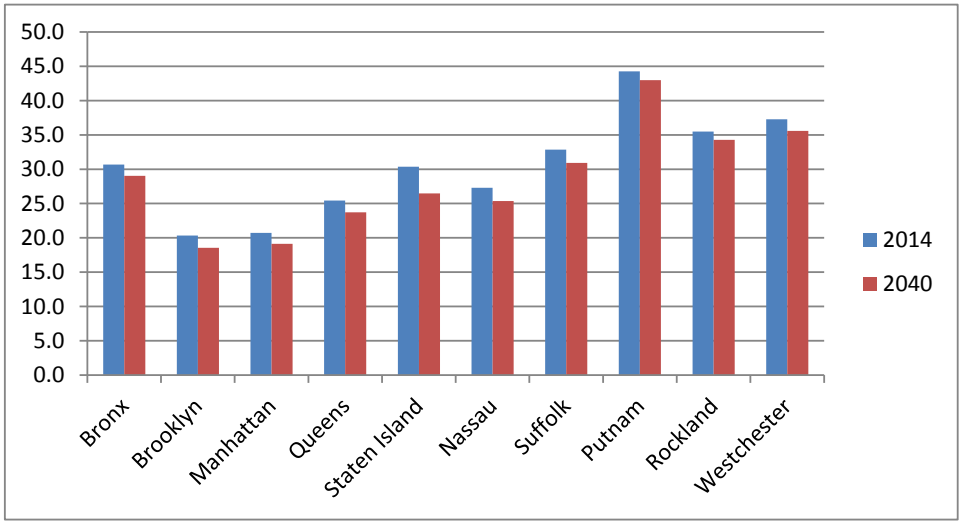
Vehicle Hours Traveled (VHT) reflects the efficiency of travel, primarily in terms of average speed. In the NYMTC planning area, VHT is expected to rise by about 0.5 percent annually, or 15 percent by 2040. The Lower Hudson Valley and Staten Island in New York City should see the greatest increases, with a 37 percent increase in Putnam County and a 30 percent increase in Staten Island. VHT in the rest of New York City and in Long Island is expected to rise by about 13 percent by 2040, or 0.45 percent annually.[49]

Table 2.9: Daily Vehicle Hours Traveled by County, 2014 and 2040

	2014	2040	% Change
Bronx	252,865	287,051	13.5
Brooklyn	593,910	704,458	18.6
Manhattan	364,786	434,547	19.1
Queens	769,573	877,559	14
Staten Island	131,069	172,106	31.3
New York City Total	2,112,203	2,475,721	17.2
Nassau	944,285	1,069,562	13.3
Suffolk	890,335	1,069,339	20.1
Long Island Total	1,834,620	2,138,901	16.6
Putnam	64,761	91,447	41.2
Rockland	176,138	232,843	32.2
Westchester	479,428	595,294	24.2
Lower Hudson Valley Total	720,327	919,584	27.7
NYMTC Region	4,667,150	5,534,206	18.6

Source: NYMTC

Figure 2.16: Average Vehicle Speed by County, 2014 and 2040



Source: NYMTC

Dividing VMT by VHT gives average vehicle speed. As figure 2.16 shows, average daily vehicle speeds are expected to decrease in all NYMTC counties over the course of Plan 2040. This indicates the possibility of increased congestion in many areas.

FREIGHT AND GOODS MOVEMENT

NYMTC also compiles data on trends in freight movement in the region. In recent years, freight movement has increased significantly and continues to be a source of economic growth. If the region is to continue growing, however, the infrastructure and methods for transporting goods must be upgraded and modernized. In a region that relies heavily on trucks to move freight, important steps toward the use of multimodal transport have been taken, but these measures must be expanded. Expanded multimodal transport, the use of several modes of transportation together in an efficient and coordinated manner, would greatly increase the economic potential and environmental sustainability of the region's economy. This section will briefly discuss current issues in the region's freight industry and will then delve into NYMTC's forecasts for the development of freight transport through 2040.

The term "freight" refers to any product that is consumed, manufactured, or disposed of that must be transported in the region via truck, train, ship, plane, or a combination thereof.[50] Food, raw building materials, clothing, and gasoline—


Truck on the Brooklyn-Queens Expressway.

all of which are necessary for sustaining daily activities in the NYMTC planning area—constitute the majority of freight goods imported into the NYMTC planning area. The freight transportation support system consists of ports, warehouses, and distribution facilities which provide terminals in which to store, inventory, and repackage goods as well as sites to transfer freight between transportation modes.

New York is currently the nation's third-busiest seaport, but trade in the region is growing at a faster rate than at the two highest ranking ports. From 2010 to 2011 two-way trade through New York's seaports and airports increased by 18 percent on top of increases in rail traffic and truck traffic of 9.9 percent and 28.9 percent, respectively. The significant increase in trade at the seaports was largely a result of increased imports from China, which grew faster in New York than in Los Angeles, and infrastructure improvements in and around New York's ports. During this period, overall exports increased by 18.2 percent. Growth has been predicted for every item currently being imported into the region through 2020.[51]

Several infrastructure improvements are currently being executed in the NYMTC planning area, including roadwork around the ports, the raising of the Bayonne Bridge roadway, expansion of rail service, and the dredging of New York Harbor to accommodate larger ships. These developments seek to position the New York metro area as a competitive port for the import and export of freight for decades. Within the greater metropolitan area, agencies and jurisdictions are working to increase opportunities to move goods by rail and water. However, as in the nation as a whole, most goods move by truck,[53] and freight moved by other modes generally involve truck trips for pick up and/or delivery. Efforts to shift more freight to rail are limited, as rail passenger service limits or precludes freight service on much of the regional rail network, especially east of the Hudson River. Many freight shipments destined east of reaching the region by rail are transferred to truck for delivery for the "final mile" of travel to New York City and Long Island. Airborne cargo relies entirely on trucking for "last mile" trips while waterborne freight is also somewhat reliant on trucks to transfer products directly to their final destinations within the region.

This dependency on highway transport is problematic for the region because it decreases efficiency, increases the costs of overall transport, and causes pollution, which hurts the environment. As the effects of climate change have become more widespread, well-founded concerns over the region's significant "carbon footprint" must be addressed. The emission of high volumes of carbon from trucks contributes to global climate change and negatively impacts health and quality of life in local communities incurring a major expense to the entire region. Due to the high cost of land acquisition and taxation and the need to improve the distribution of freight, the NYMTC plan-

Container ship passing under the Bayonne Bridge.

New York and Atlantic Railway.

ning area has some of the highest freight shipment costs in the nation. Regional infrastructure deficiencies also add to these costs, which impacts the final costs for both consumers and businesses. A hindrance affecting both rail and highway freight modes is limitations on their use due to inadequate height and weight capabilities on bridges. One of the region's major challenges, aggravated by the heavy reliance on truck transport, is traffic congestion, which increases travel time, decreases the reliability of freight movement, and intensifies air pollution caused by vehicles' diesel emissions. Complicating the distribution options is the intensive use of the NYMTC planning area's rail system as one of the principal modes for commuting to and from New York City. This results in rail freight being restricted to the late evening and overnight time slots due to the capacity limitations of the region's commuter railroads. Further operational limitations are caused by the necessity of freight trains to share publicly owned and intensively used passenger rail lines.

This truck dependency is not only inefficient, but relies on infrastructure that cannot accommodate growth which in turn inflates the prices of goods and services, thus hurting the region's economic vitality.[54] Multimodal transport offers a significant alternative for the NYMTC planning area. If properly implemented, it could eliminate or reduce a number of these regional weaknesses and could also represent a significant step in reducing the region's carbon footprint.

Freight improvement projects, however, compete for federal funding with other NYMTC projects in the region including those for passenger transportation.[55] Over the last decade, private investment in freight rail on the national level has grown significantly and the industry has expanded. Freight rail systems have even begun to ship much of the freight that had previously been shipped by truck. Annual expenditures by this industry are expected to increase from approximately $20 billion per year to $23 billion in 2012.[56] These investments, however, are supplemented by significant contributions from the federal government as well as the states. Nationally, public-private partnerships such as the National Gateway and Heartland corridors have benefited from billions of dollars in public funds.[57] Such partnerships are essential and must grow if the freight rail industry is to continue its expansion in decades to come. These kinds of projects will yield significant economic benefits for the national economy, but also for the states through which they pass. Given the importance of the NYMTC planning area in terms of freight shipment, increased funding for freight rail projects will play a significant role in promoting economic growth and attracting jobs.

Projects and studies are currently underway in the NYMTC planning area to improve freight transportation. The New York State Department of Transportation (NYSDOT), for example, is seeking to establish Trade Corridor routes, which will be prioritized for maintenance and repair to enhance reliability and the capability to handle increased volume. Funded through the Port Authority of New York and New Jersey, rail yards in both Brooklyn and Staten Island have been reopened for freight movement and additional initiatives are being explored to expand rail freight service access into the NYMTC planning area. Waterborne transportation options are also being considered, including short-haul barges and freight ferries.[58] An additional project is the Port Authority's cross-harbor freight study. Truck-only lanes on key freight corridors and the adoption of freight villages are also being considered. Each proposed option that reduces the current reliance on trucks will increase energy efficiency, ease traffic conditions, and mitigate the environmental impact of freight transportation by reducing diesel emissions.

Improvements to the freight transportation system are being made by both individual agencies and NYMTC-facilitated collaborations between agencies. Eventual improvement of the physical infrastructure of the overall transportation system will encourage multimodal shipments and expand transportation alternatives. This in turn will improve reliability and sustain the expected increased movement of freight in the region. These improvements can be supplemented by federal funding from initiatives such as SAFETEA-LU and MAP-21 which apply to freight related infrastructure.

4. Commuting Patterns

Data from the U.S. Census Bureau provides a snapshot of recent commuting patterns (Table 2.10). In 2008, for the five boroughs of New York City, 82 percent of workers commuted within their home county, or to Manhattan. Eighty-five percent of Manhattan resident-workers commuted within Manhattan. Counties in which the majority of workers commuted outside their home counties included the Bronx, Putnam County, Staten Island, and Queens.[59] In addition to workers from within the region, a number of residents from beyond the NYMTC planning area commute to New York City each day. For example, in 2008, roughly 8 percent of New Jersey workers and over 7 percent of workers in Fairfield County, CT, were employed in New York City.[60] According to a recent study by the Rudin Center for Transportation Policy and Management, the greatest increase in commuting to Manhattan from 2002 to 2009 from other areas within the New York Metropolitan region was from Northern New Jersey, at 21 percent. In 2009, approximately 246,000 commuters traveled to Manhattan from this area. More people are commuting longer distances than in previous decades, with the number of "extreme commutes" (people commuting over 1.5 hours each way) increasing by 3.6 percent from 2000 to 2008.[61] Overall, however, the greatest rate of increase was "super-commuters," those who commute from outside the New York City-Newark-Bridgeport Combined Statistical Area such as from Boston, Massachusetts. This group saw a 60 percent increase in commuting to Manhattan.[62]

This trend, as mentioned earlier, contributes to the growing gap between the NYMTC planning area's labor force and its employment level: greater numbers of people are commuting to the region for work. The trend also has significant implications for transportation and public transit in particular. Due to heavy commuting from New Jersey, PATH ridership reached a record high in 2011. Furthermore, 75 percent of all commutes to Manhattan in 2009 used public transit as the primary mode.[63] This is a further indication of the need to ensure a state of good repair and reliable service for these vital transit systems.

Table 2.10: Top Work Locations by Residence, 2008

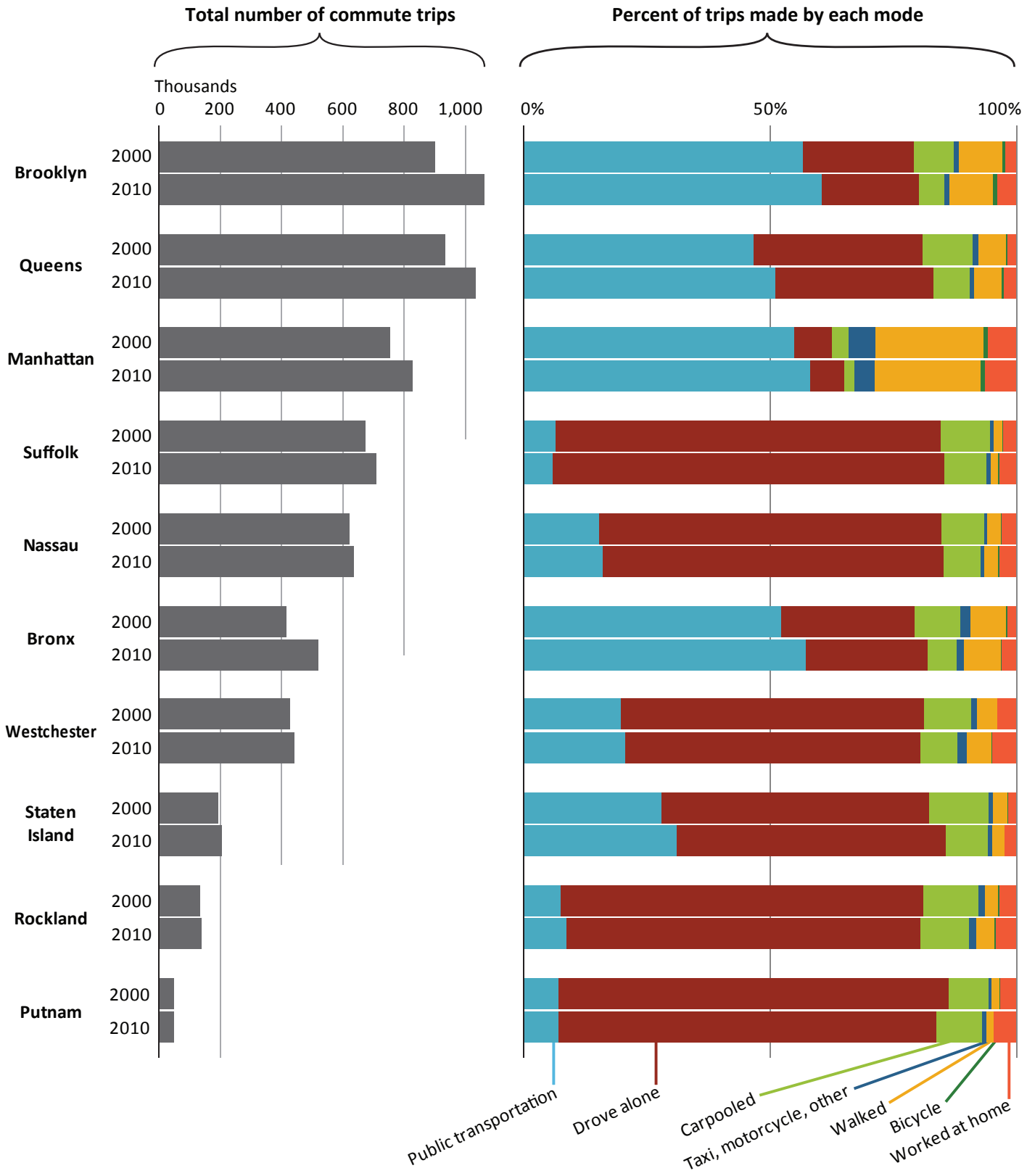
Residence	Work Location	Share of Total Workers
Bronx	Bronx	44%
	Manhattan	36%
Brooklyn	Brooklyn	51%
	Manhattan	36%
Manhattan	Manhattan	85%
	Bronx	3%
Queens	Queens	42%
	Manhattan	36%
Staten Island	Staten Island	47%
	Manhattan	26%
Nassau	Nassau	59%
	Manhattan	15%
Suffolk	Suffolk	76%
	Nassau	12%
Putnam	Westchester	42%
	Putnam	31%
Rockland	Rockland	59%
	Manhattan	12%
Westchester	Westchester	64%
	Manhattan	19%

Source: U.S. Census Bureau, Census Transportation Planning Package

Some additional trends in work and demographics may affect traffic and transit ridership. One is the increase in the number of people working from home, which lowers the strain on the transportation system especially during rush hours. Second, as mentioned earlier, spikes in energy prices in 2008 led to less driving and to calls for more efficient vehicles and public transit systems. Energy price increases, combined with efforts to create sustainable, transit-oriented development (TOD), support the development of regional centers, which might increase efficiencies in the travel network. One regional center where such transit-oriented development is possible is the Long Island TCC. An analysis by the Long Island Index, a Long Island research organization, shows that there is indeed the capacity and demand for development in Long Island's downtown areas located within a half-mile of LIRR stations. In addition, the political will and vision for TOD is beginning to emerge as mixed-use downtown centers are being created in towns such as Mineola, Wyandanch, and Patchogue and innovative ideas for sustainable development are beginning to percolate.[64]

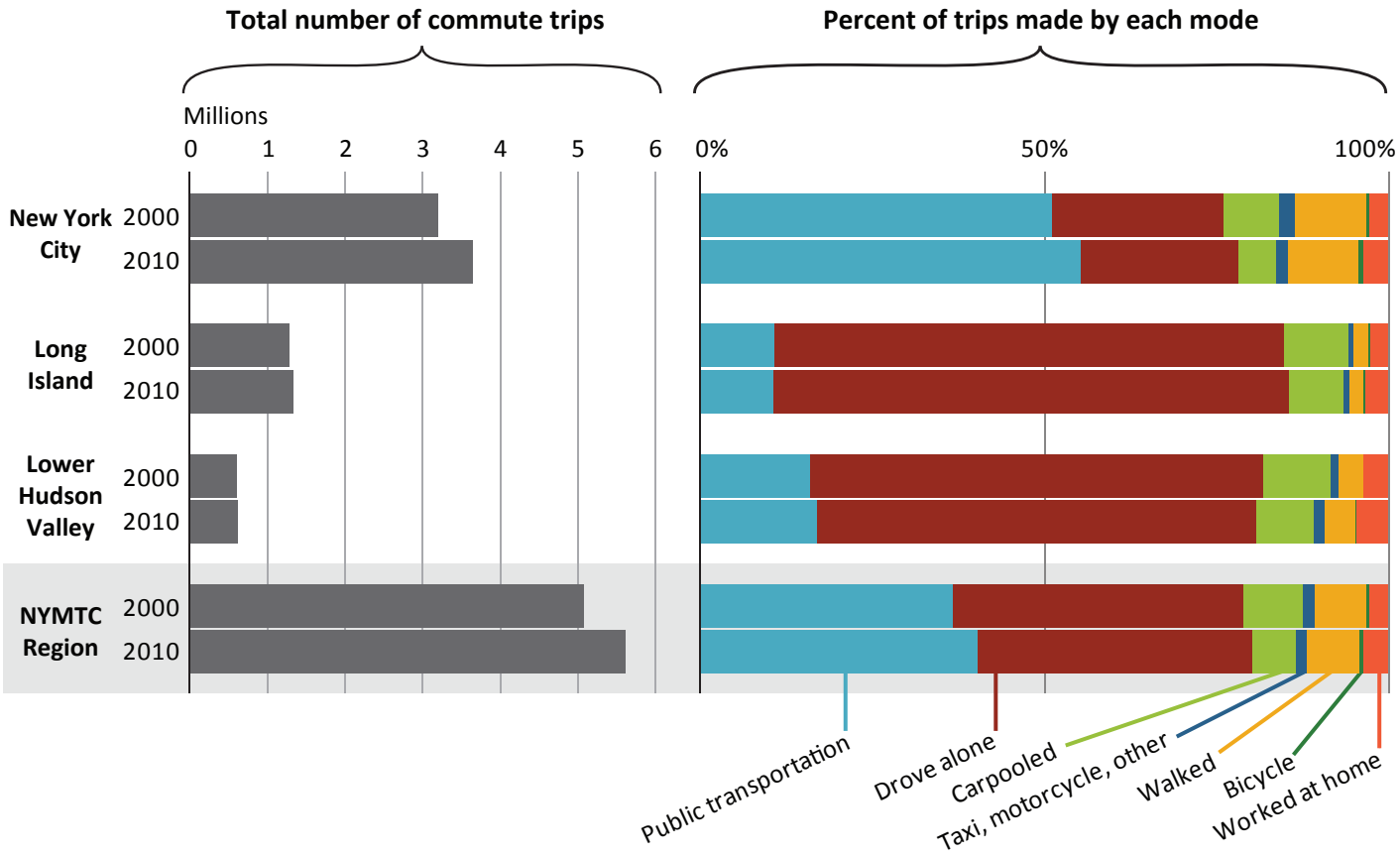
Transit-oriented development has been implemented in several cities across the U.S. and the world. One example of a successful implementation of this concept is the Transit Village Initiative (TVI) sponsored by New Jersey Transit (NJ Transit) and the New Jersey Department of Transportation (NJDOT). This pro-

Table 2.17a: Modes Used for Daily Commute Trips by County, 2000 and 2010



Source: U.S. Census Bureau, 2000 Census, 2010 American Community Survey

Figure 2.17b: Modes Used for Daily Commute Trips by TCC, 2000 and 2010



Source: U.S. Census Bureau, 2000 Census, 2010 American Community Survey

gram aids mixed-use redevelopment in designated municipalities near transit facilities. The results were largely positive: construction investment totaled $522 million from 1999 to 2004, a significant portion of which went to building 879 new housing units. Survey results from municipalities that engaged in TOD indicated that the majority of residents felt their towns were more attractive than before redevelopment. They also showed that residents within Transit Village areas were more likely to use transit and less likely to own a vehicle than those outside these areas.[65]

Commuters entering a subway station.

Flooding in Lower Manhattan following Hurricane Sandy.

5. Resiliency and Climate Adaptation Strategies

Concerns over climate change, and recent severe weather events, have led to the re-evaluation of the present configuration of energy use. Higher energy prices in recent years and volatile oil prices have created further incentives to reduce fossil fuel consumption, through efficiency and conservation measures and/or the use of alternative energy sources. These measures address both energy and climate change concerns. As the effects of climate change begin to be felt in the NYMTC planning area, the implementation of adaptation strategies to protect transportation infrastructure has become necessary.

There is widespread recognition in the scientific community that human activities – primarily the combustion of fossil fuel and deforestation – are changing global climate patterns.[66] In addition to climate change, our reliance on oil has created a drag on the national economy; oil prices have seen sustained increases over the past decade. Yet despite warnings of potentially serious consequences, the "carbon footprint" (the amount of carbon emissions attributed to an individual or group) of the United States continues to grow. The reasons for this situation are summarized in a report by the Metropolitan Policy Program at the Brookings Institution: "with a growing population and an expanding economy, America's settlement area is widening, and as it does, Americans are driving more, building more, consuming more energy, and emitting more carbon." The reliance of the U.S. energy sector on fossil fuels is a strong contributor to this trend. This report also warns that "rising energy prices, growing dependence on imported fuels, and accelerating global climate change make the nation's growth patterns unsustainable."[67] Key variables that determine the carbon footprint of a region include access to and availability of public transit, population density, prices (e.g. of gasoline and electricity), and the carbon intensity of electricity generation.

The transportation sector in the New York Metropolitan Area is particularly exposed to climate variability, floods, storm surges, and land subsidence. In-

creased incidence of high winds and flooding could disrupt major thoroughfares, tunnels, and transit services. Leading climate models indicate that these kinds of incidents will occur more frequently in coming decades.[68] Past weather trends cannot be an effective guide to preserving the region's transportation infrastructure in the future.[69]

The most significant environmental effects of climate change that will impact New York State are summertime droughts and coastal inundation. The latter is a particular concern for New York as it has the second-highest coastal population of any state in the country,[70] much of which is concentrated in the NYMTC planning area. Climate adaptation plans for New York City, whose 520-mile-long coastline includes vital transportation infrastructure, must be implemented to sustain this economic hub. Recent storms that have impacted the NYMTC planning area have revealed how vulnerable our transportation system really is. In the fall of 2012, Hurricane Sandy made landfall in the northeastern United States, killing well over 100 people and causing tens of billions of dollars in damage to infrastructure, businesses, and residences in several states, particularly New York and New Jersey. The storm surge, which reached fourteen feet in some areas, submerged coastal roadways and flooded subway and auto tunnels. Most subway lines in New York City were closed for several days and some stations did not re-open for months. The damage to MTA property caused the agency to make plans to sell $4.8 billion in bonds in order to cover the costs of repairs.[71] The impacts of Hurricane Sandy, as well as Tropical Storm Irene in 2011, suggest that transportation infrastructure must be better equipped to handle the effects of extreme weather events in future plans.

Governor Cuomo convened the NYS 2100 Commission in response to recent severe weather events and the group was tasked with examining and evaluating key vulnerabilities in the State's infrastructure and to recommend actions to strengthen and improve the resilience of those systems. The transportation recommendations outlined in the Commission's report[72] are grouped into four areas.

1. Undertake a risk assessment of infrastructure around New York State by identifying the transportation assets that are most at risk for storm surges, seismic events, and extreme weather events as well as those whose functioning is essential during an emergency situation. Investments will be targeted according to this analysis.

2. Specific infrastructure improvements will be made to existing facilities to ensure that they are more resistant to extreme natural events.

3. Resources will be allocated to expanding the transportation network to create redundancies and incorporate alternative modes, which will allow the region to be more flexible in future emergency situations.

4. The agency will improve its design, planning, and administrative coordination and integration so that personnel will be prepared to handle the next Hurricane Sandy.

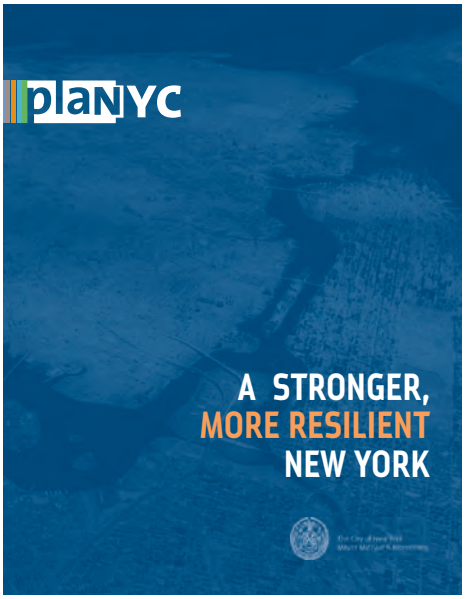
Governor Cuomo, along with officials from New Jersey and Connecticut succeeded in obtaining a $60.2 billion aid package from the federal government for the regions affected by Sandy. In his 2013 State of the State address, the Governor said, "Steps must be taken to make the State's transportation infrastructure more resilient to future severe events."[73] He outlined infrastructure improvements such as flood-proofing subways and bus depots with vertical roll-down doors, vent closures, inflatable bladders, and upsized fixed pumps with back-up power sources. New York City Transit will also be adapting its policies in response to the effects of the storm on its infrastructure including hardening up its infrastructure, improving its operations planning response, and focusing on ways to more effectively coordinate with state, local, and federal authorities.

At the federal level, the Federal Highway Administration (FHWA) has initiated pilot programs involving MPOs and state DOTs in the process of assessing the vulnerabilities of existing transportation infrastructure and finding the best strategies to protect it in the face of future extreme weather events. The goal of the programs is to assist states in vulnerability assessments and to improve FHWA's model for responding to the potential effects of extreme weather events on transportation infrastructure.

In addition, in the aftermath of Hurricane Sandy, FHWA is sponsoring the NY-NJ-CT Vulnerability Assessment which is a pilot program to conduct climate change and extreme weather vulnerability assessments of transportation infrastructure and to analyze options for adapting and improving resiliency.

At the regional level, a process of collaboration to respond to the effects of climate change has been initiated in New Jersey with the New Jersey Climate Adaptation Directory, a resource established by the Regional Plan Association and Clean Air-Cool Planet. The Directory brings together data, models, existing and proposed policy, and other tools to be shared and applied by various practitioners across a range of fields. The directory is designed for New Jersey but can be used by anyone.

At the local level, New York City created *PlaNYC* in 2007 in part to address challenges brought on by climate change. The report includes recommendations to increase transportation options; measures to combat congestion such as



modifications to freight movement; and maintaining and improving the physical conditions of roads and the transit system so they can accommodate more users safely. After Sandy, New York City formed the Special Initiative for Rebuilding and Resiliency and charged it with producing a plan to provide additional protection for New York's infrastructure, buildings, and communities from the impacts of climate change. The result of this effort is A Stronger, More Resilient New York which is a roadmap for creating a sustainable 21st century New York.

Westchester County is undertaking various initiatives to adapt services and infrastructure to address the increasing severity and frequency of storms such as Sandy, including identifying detours for bus routes and developing flood mitigation plans to minimize roadway closures. The county will continue to make full use of its Emergency Operations Center to facilitate up-to-date communication among transportation agencies, first responders and utility companies, and work with them to direct resources to the areas of greatest need.

Rockland County plans to stepup efforts to work more closely with utility companies and other agencies to continue establishing a more organized approach to restoring the transportation infrastructure in a timely manner. This will include pursuing more direct communication links between transportation agencies, responders and utilities, as well as more basic efforts like further encouraging that main power lines be secured underground and implementing more vigorous tree monitoring programs to limit future exposure to outages. Plans to define more specific staging areas, improve resources, establish more widespread power redundancies, increase supply levels before a storm and continuing to call for all service stations and food stores to have generators will improve response and recovery time.

In Suffolk County, initial lessons of Sandy underscore the urgency of some of the plans already being pursued, including an initiative to Connect Long Island through Bus Rapid Transit that will help reduce dependence on automobiles. A less auto-dependent Suffolk County will be less vulnerable to disruptions in the availability of fuel; and innovative transit will enhance Suffolk's resiliency and economy. Suffolk County also seeks to reinvigorate hazard mitigation plans and go beyond previous paradigms to create comprehensive, state-of-the-art flood protection systems that balance "bricks and mortar" such as buildings, roads, waste-water infrastructure and power grids with Suffolk's natural water systems of ocean, bay, sound, rivers and creeks.

In addition to local initiatives in New York City, statewide plans have been created by the State Climate Action Council, established by former Governor David Paterson. The New York State Climate Action Plan seeks, for example, to build all new transportation infrastructure inland from or above rising water levels and to use heat resistant construction materials that can withstand higher temperatures.[74] More must be done, however, to ensure that these plans are carried out and that existing infrastructure is protected from future storms, floods, and other severe effects of climate change.

Climate adaptation strategies, however, are not the only way to respond to the effects of climate change. A number of strategies have also been introduced by municipalities and organizations in the NYMTC planning area that can help reduce the consumption of fossil fuels, the main anthropogenic contributor to climate change. The integration of alternative energy sources and efficiency measures into our consumption patterns can contribute to a reduction in the nation's carbon footprint. Subsequent sections will highlight two particular approaches to achieving this goal: the use of cleaner sources of energy to power automobiles such as natural gas, propane, biogas, biodiesel, ethanol, and electric power; and the implementation of car share programs.

6. Energy Trends and Other Issues

FUEL PRICES AND CONSUMPTION

35A County Road, Spring Valley, Rockland County

The United States remains the leading consumer of petroleum in the world. Between 2007 and 2011, the U.S. consumed an average of approximately 19.4 million barrels of petroleum per day. The next two leading countries were China and Japan, which consumed 8.5 million and 4.6 million barrels per day, respectively.[75] The importance of petroleum to the U.S. economy cannot be overemphasized; the increase in oil prices internationally and domestically in recent years has hit the U.S. economy hard, resulting in higher consumer prices, a depressed consumption rate, an upward inflationary trend, and financial instability throughout various sectors of the economy.

Most of the demand for petroleum stems from the transportation sector, which consumed nearly 71 percent of the total petroleum sold in the U.S. in 2011. Nearly all motor vehicles are fueled by petroleum products at 93 percent, while natural gas and renewable energy account for only 7 percent.[76] The increased demand for fuel has come from a 34 percent increase in vehicle miles traveled by light-duty motor vehicles from 1990 to 2010.[77] While the use of hybrid vehicles is significantly higher today than it was in the late 1990s, this trend has not had an appreciable effect on use of petroleum in the transportation sector.

Average gasoline prices have risen sharply over the past ten years nationally and in New York State. From July 2002 to July 2012, gas prices in both areas rose almost 150 percent. The price of a gallon of gasoline in New York State spiked to over $4.00 in the spring of 2011 and the spring of 2012.[78] Such dependence on expensive oil makes the region vulnerable to supply disruptions which could harm the economy. The events surrounding Hurricane Sandy are an important example of this vulnerability.

New York Harbor serves as a major hub for oil transport in the Northeastern United States, taking in 1.5 million barrels per day. This oil is then distributed to states from New Jersey to Maine, a region that consumes six percent of the world's oil. In addition to its impact on transportation infrastructure, Hurricane Sandy had a severe impact on oil supplies in the Northeast, as the storm surge in New York Harbor reached almost fourteen feet. Several factors related to the storm combined to cause a severe shortage of fuel for the region affected. They include the following:

- Many people bought excess amounts of gasoline before the storm hit in order to prepare for shortages, which then accentuated those shortages;
- Damage to oil refineries and terminals from the storm caused many to be shut for weeks, cutting off supplies to the region;
- Barges were kept at bay due to the hazards of the storm and the post-storm damage, further reducing supplies;
- Power was cut off to several regional filling stations which prevented people from obtaining fuel and caused back-ups at stations that had fuel; and
- The practice of just-in-time production, whereby suppliers reduce inventories to save money, meant that there was less fuel stocked than there would otherwise have been, which made supplies more vulnerable.[79]

The result was severe gasoline and heating oil shortages and miles-long lines at gas stations. Furthermore, the storm

caused a disruption in the oil supply chain in the Northeast and exposed a major weakness in the region's ability to respond to extreme weather events. Steps should be taken to ensure that the NYMTC planning area's oil logistics network remains resilient in the face of such events.

CLEAN ENERGY FOR VEHICLES

NYMTC has identified three alternative methods of powering automobiles that can be used throughout the region.

Natural Gas and Propane

Natural gas and propane have several advantages over petroleum products, including suitability for spark-ignited internal combustion engines, safer storage, and they are less of a threat than petroleum to soil, surface water, or groundwater. However, one disadvantage to natural gas-powered vehicles is that they require specialized fueling station infrastructure.

Biogas, Biodiesel, and Ethanol

These are flexible forms of renewable energy that can produce heat, electricity, and serve as vehicle fuels. Biogas is the gaseous product of the decomposition of organic matter. It is produced naturally in landfills and from the processing of animal waste, sewage, crop waste, and cellulosic and non-cellulosic crops. In the NYMTC planning area, biogas could be captured from regional waste streams and would require little land area for conversion. Ethanol is a transportation fuel primarily made from vegetable crops such as corn, sugar beets, sugar cane, and cellulosic materials such as trees and grasses. Ethanol requires larger land areas to grow vegetable crops, and the production of ethanol can compete with production of crops for food.

Electric-Driven (EV) and Hybrid Electric Vehicles (HEV)

These vehicles are propelled fully or partially by electric motors powered by rechargeable battery packs. Recharging of EVs is available from standard electricity sources. HEVs combine an internal combustion engine with an electric motor. They also convert energy from coasting and braking into electricity, which is stored in batteries that power the vehicle. Some HEVs automatically shut off the gasoline engine when the vehicle comes to a stop and restart it when the accelerator is pressed, increasing fuel efficiency. Hybrid electric buses are currently operating in New York City Transit and in Westchester and Rockland Counties. Hybrid electric buses have greater fuel efficiency than standard diesel buses, resulting in lower tailpipe emissions and reduced reliance on petroleum products. They also may require less maintenance and lower operating costs than conventional diesel engines. Smith Electric, a manufacturer of small electric trucks, has decided to locate one of its manufacturing plants in the Bronx. Some local delivery companies currently use their vehicles.

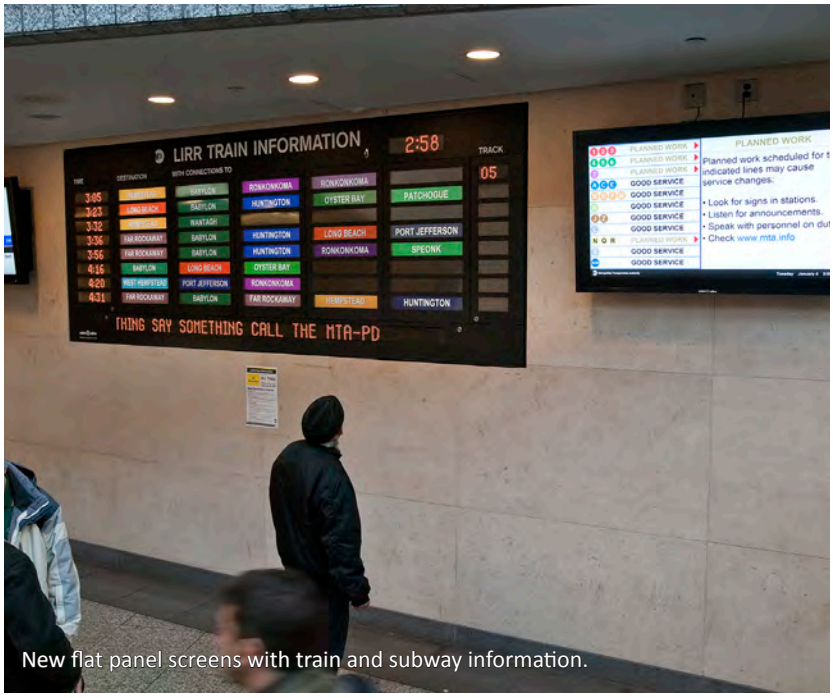
Car Share

Car share is a service that can help reduce the number of cars on the road thus decreasing greenhouse gas emissions. It can improve the mobility of NYMTC residents, workers, and visitors by providing a wider range of economical transportation choices, while helping to increase parking availability within densely populated, urban neighborhoods. For the infrequent driver, those who drive less than approximately 7,500 miles annually, car sharing can offer an efficient, economical and convenient alternative to car ownership. Yearly membership in a car sharing organization allows the individual member to avoid paying for the costs of owning, maintaining, and parking and instead, pay only for the time he or she uses the shared vehicle. One of the benefits of car sharing for the local area is that a percentage of members who join a car sharing organization will likely give up owning or delay purchasing a car. This reduced car ownership will help increase the availability of local parking and reduce traffic congestion, air pollution, and greenhouse gas emissions.

The City of New York approved a citywide zoning text amendment that defined car sharing in the Zoning Resolution and established clear rules allowing car share vehicles to park in public parking facilities, as well as in parking facilities accessory to residential, commercial, and other uses with some limitations on the number of spaces based on use, zoning districts, and the size of the facilities.

TECHNOLOGY CHANGES

Technological innovations, particularly the expansion of information and transportation technologies may lead to changes in travel patterns (e.g., increases in telecommuting and e-shopping) that could help relieve congestion. Intelligent Transportation Systems (ITS), which utilize a variety of communications and detection technologies to increase the efficiency of transportation systems operations and management, can potentially mitigate congestion and improve safety. A variety of agencies in the region have deployed various types of ITS, including portable and fixed variable message systems, closed circuit TVs, highway advisory radio, integrated incident management systems, and electronic payment systems (E-ZPass), among others.[80] Applications of ITS for goods movement



New flat panel screens with train and subway information.

can also play an important role along with Integrated Corridor Management, Vehicle Infrastructure Integration (VII), global positioning systems (GPS), adaptive ramp metering, and Radio-Frequency Identification (RFID). Within safety and security technologies, there are hundreds of technologies and variations related to the five general categories of collision avoidance, public safety, roadway characteristic alert (sign extension), vehicle diagnostics and maintenance, and other vehicle information. The development of energy and environmental technologies, such as those mentioned above to power automobiles, is increasing in the region.

GLOBALIZATION AND SECURITY

Globalization intensifies social relations worldwide.[81] Technological advances, which have reduced time and space barriers in moving information, people, and goods, have enabled globalization. From both the transportation and economic perspectives, "globalization underlies higher levels of integration between different production and distribution systems."[82] This integration has brought expanding international trade and the development of a global supply chain, translating into an increasingly interconnected global society. However, such openness and greater connectivity may increase the vulnerability of the global network to events such as natural disasters and terrorist attacks. In the NYMTC planning area, ensuring a redundant, resilient, and robust transportation system is a daunting task. With respect to freight, the NYMTC planning area is in large part reliant on trucks, and therefore, roadways, bridges, and tunnels. Many of these facilities are already at or over capacity, outdated, dilapidated, and/or prone to flooding. Complicating the situation further, most freight warehousing is separated from key regional markets by the Hudson River which has only a small number of bridge and tunnel crossings. With relatively little redundancy, robustness and resiliency become more important. For passengers, the highway issues are similar. Some redundancy exists in the form of commuter rail, subway, and ferry options. Nevertheless, as the region has seen in years past, these systems may not be sufficiently robust, and redundancy remains a challenge at several critical junctures.

In terms of trade, economic integration at the global scale has also accelerated since the 1980s, resulting in an interdependent supply chain of production, distribution, and consumption that extends beyond national boundaries.[83] As a result, international, national and interregional trade has increased at a dramatic pace. As the largest world market, the United States has been at the center of international trade for many years. Between 1948 and 2007, the total value of U.S. trade (exports and imports together) with other countries increased nearly 150 times, from $20 billion in 1948 to over $3 trillion in 2007.[84] While both exports and imports rose, the share of imports in U.S. total trade has increased significantly, exceeding 50 percent of total U.S. trade in 1968, and rising to approximately 64 percent of total U.S. trade in 2007.[85] The global trade trend is also reflected in intense activity in the region's marine and air trade gateways. In particular, the Port of New York and New Jersey, and John F. Kennedy (JFK) International Airport are major hubs of freight activity in the NYMTC planning area. Other notable trends are: the spread of just-in-time (JIT) logistics systems designed to increase productivity by reducing logistics costs; the increased number and popularity of Post-Panamax ships, ocean vessels too large and deep to pass through the Panama Canal; and the development of a sophisticated supply chain network of interconnected actors in many countries, which stems from the integration of production and consumption, and for which supply chain security is critical.

TRANSPORTATION AND PUBLIC HEALTH

Transportation and public health are linked because a person's mobility is vitally connected to his or her health. Lack of activity and obesity, two major

health concerns, can be attributed to vehicle-dependent lifestyles. The NYMTC planning area is focusing on land use planning that includes smart growth, transit-oriented development, and improved mass transit options in response to regional health concerns. Health and quality of life can be improved for all people in the NYMTC planning area by implementing policies that integrate housing, transportation, and environmental sustainability, and by promoting Complete Streets which benefit all users.

The low-density developments and segregated land use patterns that have characterized the peripheral urban expansion throughout the country over the last half-century have discouraged walking and have not supported transit use. One consequence is that most children can no longer walk to school as they had done in prior times. In 1969, 48 percent of children 5 to 14 years of age usually walked or bicycled to school. By 2009, that number had dropped to 13 percent.[86] The widespread availability of private automobiles enabled people to live further away from their workplaces. Such vehicle-dependent environments have fostered sedentary lifestyles conducive to obesity and poor health. The relationship between suburban lifestyles and social isolation, stress, and depression is also increasingly debated.[87] In areas with limited transit options and few opportunities to walk and bike, people spend hours in cars getting to and from work, and children are bused or driven to and from school and after school activities. Those who cannot drive must rely on others to transport them or risk social isolation.

The health consequences of current lifestyle trends are alarming. As the population grows more sedentary, the risks of chronic and preventable diseases such as heart disease, stroke, diabetes, osteoarthritis, and certain types of cancer increase.[88] This ever-rising epidemic of obesity at all ages has become a major health crisis. The U.S. Surgeon General released a report in January 2010 warning that the rate of obesity among adults has more than doubled since 1980.[89] According to the National Center of Chronic Disease Prevention and Health Promotion, childhood obesity has more than tripled in the past 30 years. Currently, 12.5 million children are overweight in the U. S. – more than 17 percent of all children.[90] The 2007 New York Youth Behavior Risk Survey revealed that among high school students (grades 9 to 12) in New York State, 16 percent were at risk of becoming overweight and 11 percent were already overweight.[91]

In addition, the large number of motor vehicles creates air pollution which has detrimental effects on the regional environment and public health. Autos produce particulate matter that contributes to hospital admissions for several respiratory conditions including asthma, bronchitis, chronic obstructive pulmonary disease, pneumonia, and upper respiratory tract infection.[92] Scientists now see a nationwide epidemic of diseases that have been worsened by air pollution. Children, the elderly, and people who already have the aforementioned conditions are especially vulnerable to the adverse effects of air pollution.[93]

Another challenge to the current transportation infrastructure is the aging of the population. As discussed earlier, Americans aged 65 and older are the fastest-growing population segment in the United States. Older Americans will form a greater proportion of the overall population and a greater share of all licensed drivers. New York is one of the ten states with the highest percentage (18 percent) of drivers 65 and older and is the state with the greatest total number (1,995,069) of licensed drivers aged 65 and older. The dominant mode of transportation among older Americans is the private vehicle, as the elderly may be physically unable to use other modes such as transit, walking, and bicycling.[94] Accordingly, policy makers must create and implement a transportation system that better serves the safety and mobility needs of older Americans and of the population at large. Options to achieve this include designing safer roads and vehicles as well as improved transportation options. Planning strategies such as smart growth, transit- and pedestrian-oriented development, complete streets, and universal design can address the needs of older adults as well as the en-

Bicyclists enjoying a car-free street in Manhattan.

tire community. Minimizing sprawl and adapting and improving existing transportation infrastructure will create more opportunities for transit accessibility and lead to greater mobility.

In the 21st century a new vision of health-promoting communities and active transportation can play a crucial role in combating the most rapidly growing public health epidemics brought about by physical inactivity and unhealthy diet, which are currently second only to tobacco as the main cause of premature death in the United States.[95] Through polices, urban planning, and design strategies that encourage walking, bicycling, and use of public transportation, a regional transportation system can promote a healthier community.

TRANSPORTATION, HOUSING, AND JOBS

In 2011, the new United States Department of Housing and Urban Development (HUD) and United States Department of Transportation (USDOT) Sustainable Communities Regional Planning Grant was created with the purpose of promoting a more holistic and integrated approach to affordable housing, jobs, and transportation. The New York-Connecticut Sustainable Communities Consortium was established as a requirement for the grant. The program involves a variety of activities that fall into three broad categories:

Metropolitan planning and policy integration: This will identify missing elements and opportunities for better alignment across political boundaries and between levels of government. The key outcomes of this process will be an enhancement of existing plans, a regional housing analysis and incentive fund for affordable housing implementation, and a regional public dialogue to share knowledge about building sustainable communities in our bi-state metropolitan area. A climate resilience strategic planning process will be undertaken within New York City that will help the region's coastal communities better understand the risks and strategies associated with adapting to the impacts of global warming.

Northern Sector sustainability planning Projects connected by the Metro-North Railroad will link large-scale, transit-oriented development projects at key nodes and corridors stretching from the Bronx through Westchester through four coastal cities in Connecticut. Station area regeneration and infrastructure investment planning will take place around New Haven's Union Station, on Bridgeport's East Side, in South Norwalk, on Stamford's East Side, in central New Rochelle, and at several locations in the Bronx. Action strategies will be developed for the I-287 and Cross County Parkway corridors.

Eastern Sector sustainability planning: Four projects linked by the Long Island Rail Road from central Brooklyn to Eastern Suffolk County will emphasize different elements of sustainability planning that can be replicated in different parts of the region. An interdisciplinary sustainability plan will be developed for the East New York neighborhood in Brooklyn. In Nassau County, a feasibility study for sustainable infill development will be conducted for several LIRR stations. A transfer-of-development-rights study in Suffolk County will explore this potential mechanism for jointly preserving land and spurring transit-oriented communities. A Long Island housing strategy will identify the greatest needs and opportunities to provide affordable options for the area's young professionals and families while adding revenue to local budgets.

New York State has created the Climate Smart Communities program which is a state-local partnership to reduce greenhouse gas emissions, save taxpayer dollars and advance community goals for health and safety, economic vitality, energy independence and quality of life. Any town, city, village or county can join Climate Smart Communities. The program is sponsored by a number of state agencies including the Department of Environmental Conservation and Department of Transportation.

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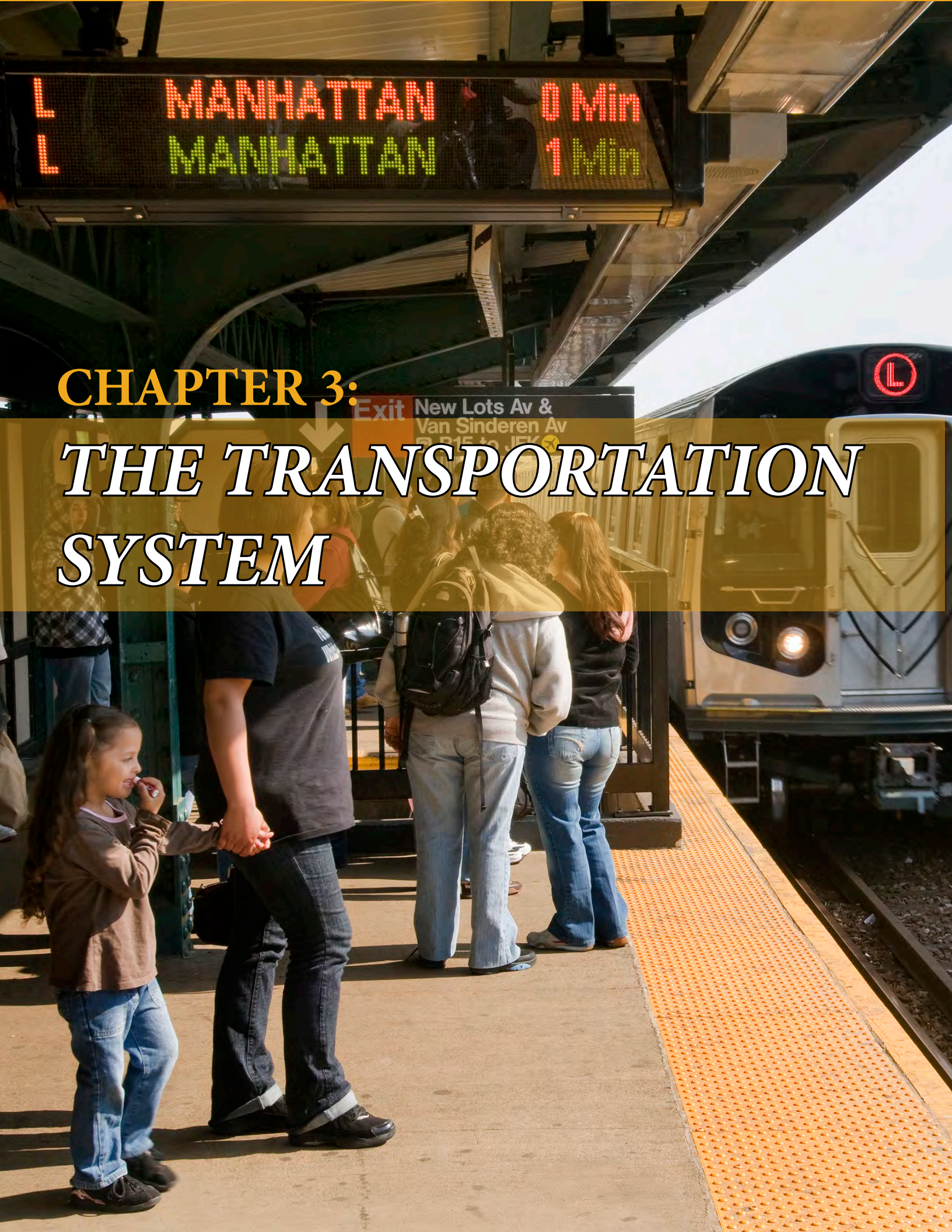
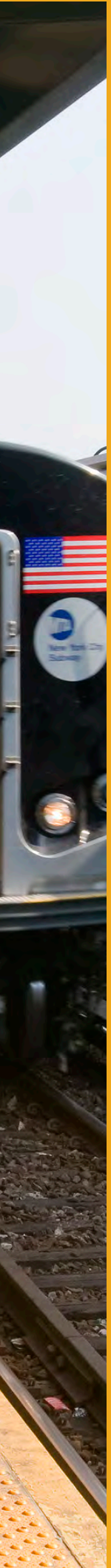
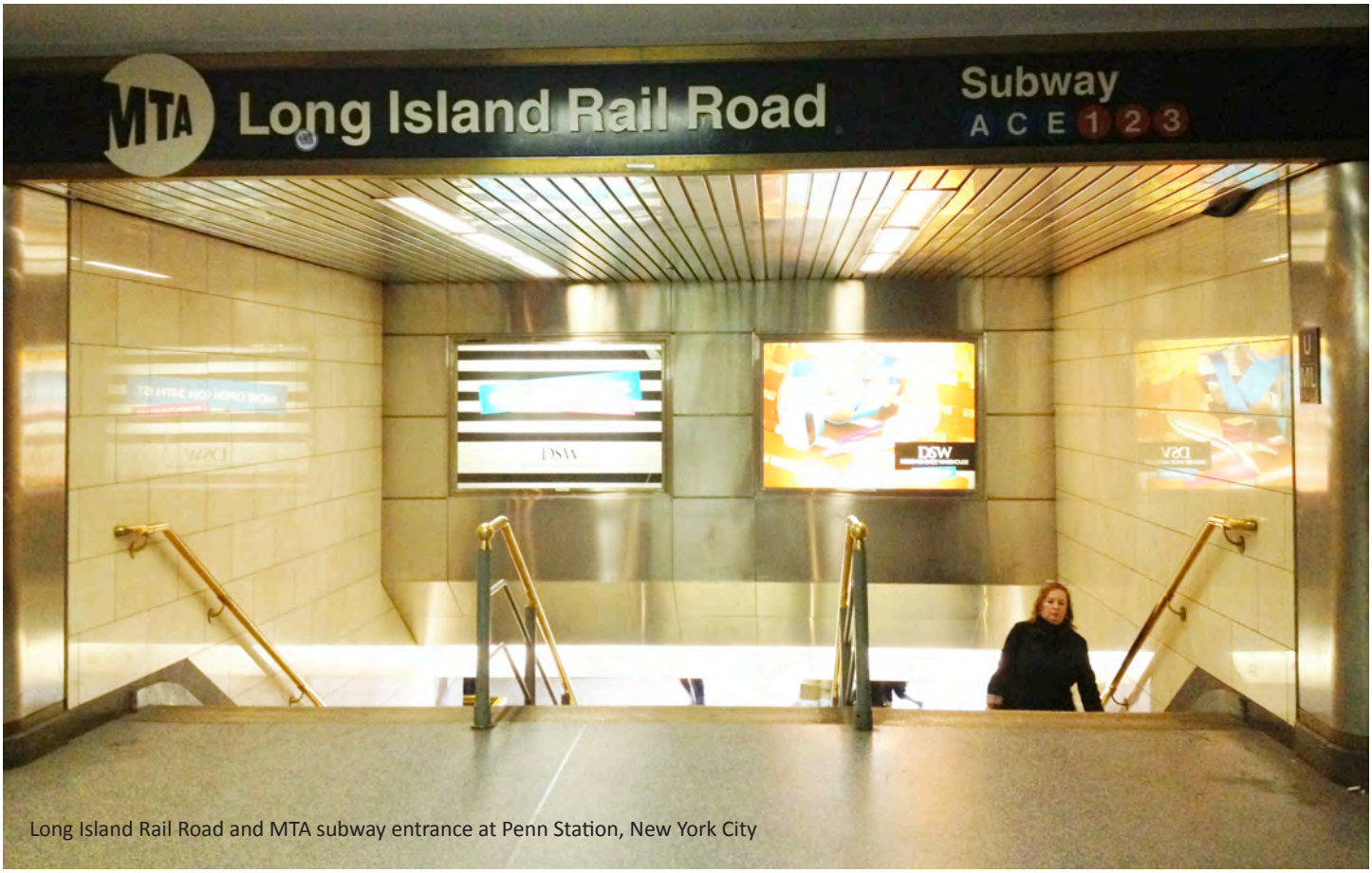


CHAPTER 3:
THE TRANSPORTATION SYSTEM



PLAN 2040
Chapter 3: The Transportation System

MTA New York City Transit's new signal system Communication Based Train Control on the L train.



Long Island Rail Road and MTA subway entrance at Penn Station, New York City

1. INTRODUCTION

The New York metropolitan area has one of the oldest, most complex and highly utilized transportation networks in the world. On a typical weekday, the region's multimodal transportation network handles millions of passenger trips and thousands of tons of freight shipments. Public transportation mode share is much higher than in other regions of the United States. Within the NYMTC planning area, the transportation system includes:

- Nearly 480 route miles of commuter rail and 225 route miles of subway tracks in passenger service, plus hundreds of miles of local, express, commuter, and intercity bus routes and an aerial tramway;
- An extensive network of passenger hubs, such as bus terminals and subway transfer facilities, ferry landings, and train stations where people transfer between modes of transport, including one of the most successful rail-to-airport links in the country;
- More than 1,100 miles of bicycle facilities, ranging from shared-use bike trails to on-road bike lanes, in addition to pedestrian sidewalks, trails, and paths;
- More than 50,000 lane miles of roads and highways, including more than 30 major bridges crossing navigable waterways (there are over 3,200 bridges of all types in the region), four major underwater vehicular tunnels, and special lanes for high occupancy vehicles (HOVs) and buses;
- Four commercial service airports, plus general aviation and heliport facilities;
- Major deepwater seaport facilities owned and operated by a mix of public and private sector entities, plus an extensive network of marine cargo support infrastructure and services;
- An extensive network of inland waterways supporting barge and ferry services;
- More than 400 route miles of freight rail, some of which is shared with commuter rail services;
- A widespread network of freight hubs, including rail transfer facilities, rail yards, and truck-oriented warehouse and distribution centers; and

- Supporting infrastructure like rail yards and highway maintenance facilities, highway rest areas, parking lots and garages, bus depots and transit storage yards, bicycle parking areas, toll plazas, signage, signals, electronics, and other equipment.

The NYMTC planning area also plays a major role in the national rail, road, air, and waterborne networks. Amtrak's busiest facility in the nation is Penn Station, which served 9,493,414 passengers in fiscal year 2012, and 77 percent of Northeast Corridor air and rail passengers between New York and Washington, DC chose train travel. The Port Authority Bus Terminal has long been the primary location for long-distance bus service. In addition, since the late 1990s, curbside-pickup carriers have played an increasing role in transporting bus passengers beyond the region. There are four commercial service airports, including the John F. Kennedy (JFK) and LaGuardia (LGA) airports in New York City, along with several other general aviation and heliport facilities of varying sizes that together serve millions of passengers and ship tons of freight both within and immediately beyond NYMTC's borders. Finally, New York and New Jersey remain significant port regions that are essential to international trade and domestic distribution with one of the largest concentrations of public and private marine terminal facilities in the United States.

Although not a part of the NYMTC planning area, northern New Jersey's and southwestern Connecticut's transportation infrastructure is inextricably linked with New York's. In January 2008, a Memorandum of Understanding (MOU) was created in the three state region of New York, New Jersey and Connecticut in order to better coordinate transportation planning activities. New Jersey Transit has an extensive network of commuter rail, light rail and bus services, much of which enters the NYMTC planning area. New Jersey's highways interface with New York at six bridges and tunnels, along with roads which cross the state line into Rockland County. Connecticut funds the majority of Metro-North's New Haven Line operations, as well as crucial bus routes such as the I-Bus linking Westchester and Connecticut destinations. Numerous roads also cross the state line, and ferries regularly cross from Connecticut to New York destinations.

Federally Supported Transportation System

A major focus of Plan 2040 in terms of assessment of needs and allocation of resources is that portion of the regional transportation system which receives both Federal Highway Administration (FHWA) and Federal Transit Administration (FTA) aid. For the highways and bridges network that would include over 19,000 lane-miles of interstates, freeways, parkways, expressways, arterial highways and streets. The Functional Classification of roadways (discussed later in this chapter) is an important factor in identifying roadways that are eligible for federal aid. It also describes the importance of a particular road or network of roads to the overall system and, therefore, is critical in assigning priorities to projects and establishing the appropriate highway design standards to meet the needs of the traffic served. In terms of bridges the federally supported system includes over 2400 bridges of all types under the ownership of the State, counties and local municipalities.

The federally supported portion of the transit system includes qualifying equipment and other infrastructure owned and operated by the various agencies in the region including the MTA (all agencies), NYCDOT, Nassau, Suffolk, Putnam, Westchester, and Rockland Counties. These are described in the financial supporting documentation in Appendix 10.

This chapter reviews all of these elements, including recent major events and trends, and their impacts on the NYMTC planning area. Also presented are a number of operational data tables for the various transportation entities.

2. Passenger Rail

The New York City metropolitan area is unique among North American cities due to the sheer volume and proportion of passenger traffic carried by rail in the region. Including the Metropolitan Transportation Authority (MTA) New York City Transit, MTA Long Island Rail Road (LIRR), MTA Metro-North Railroad, and MTA Staten Island Railway, there are over 9 million unlinked passenger trips made daily, amounting to 30 percent of all commuter trips made in the New York City metropolitan area. Other major cities in the United States – even those with substantial passenger rail networks, such as Washington D.C., Boston, Chicago and Philadelphia, do not come close to this number or proportion of trips.[1]

This section reviews three categories of passenger rail: rapid transit (subways), commuter rail, and long-distance rail (Amtrak). While the New York City subway is the dominant rapid transit system in the region, tens of millions of passengers annually are also carried by Port Authority Trans-Hudson (PATH) trains. Three major commuter rail systems also serve the region. Two of them, the LIRR and Metro-North Railroad, are operated by the MTA, while New Jersey Transit operates commuter rail services between New York's Penn Station and much of northern New Jersey. Finally, Amtrak, the nation's long-distance passenger rail carrier, also serves the NYMTC region and surrounding areas. All of these services are described in the section below.

RAPID TRANSIT

Rapid transit is a transit system that can carry large numbers of people with great frequency. It can include a passenger rail system and bus rapid transit (which is described in section 3 of this chapter). The passenger rail system can be underground or elevated and is grade separated from other traffic. In the NYMTC planning area, the New York City Subway is one of the world's premier rapid transit systems; PATH trains serve as the primary transit link between Manhattan and the neighboring New Jersey urban communities and suburban commuter railroads. Ridership on both is expected to continue to increase with the anticipated growth in regional residential, commercial, and business development.

MTA New York City Subway

The MTA New York City subway system operates 24 routes, spanning 660 miles of track and 420 stations.[2] In 2011, annual subway ridership was 1.640 billion – its highest level since 1950. The most significant reason for this growth is the one-third increase in average weekday ridership between 1998 and 2011. However, weekend subway usage has also increased, both in absolute numbers and relative to weekday travel. See Table 3.1.[3]

A new railcar fleet and four new free transfer connections were two of the most visible signs of capital expenditures. The new transfers – at South Ferry-Whitehall Street (R, 1), Jay Street-MetroTech (A, C, F, R), Court Square (E, G, M, 7), and Broadway-Lafayette-Bleecker Street (B, D, F, M, 6) – provided passengers with new travel options. (The Bleecker Street transfer complements an existing transfer between the downtown Bleecker Street (6) platform and the Broadway-Lafayette station.) The new South Ferry (1) station, which included an entirely new 10-car platform, was financed largely with federal post-9/11 recovery money. Finally, the Fulton Street Transit Center, scheduled for completion in 2014, will provide enclosed free transfers between the existing Fulton Street station (A, C, J, Z, 2, 3, 4, 5) in lower Manhattan, the Cortlandt Street (R) station and the World Trade Center (E) station.

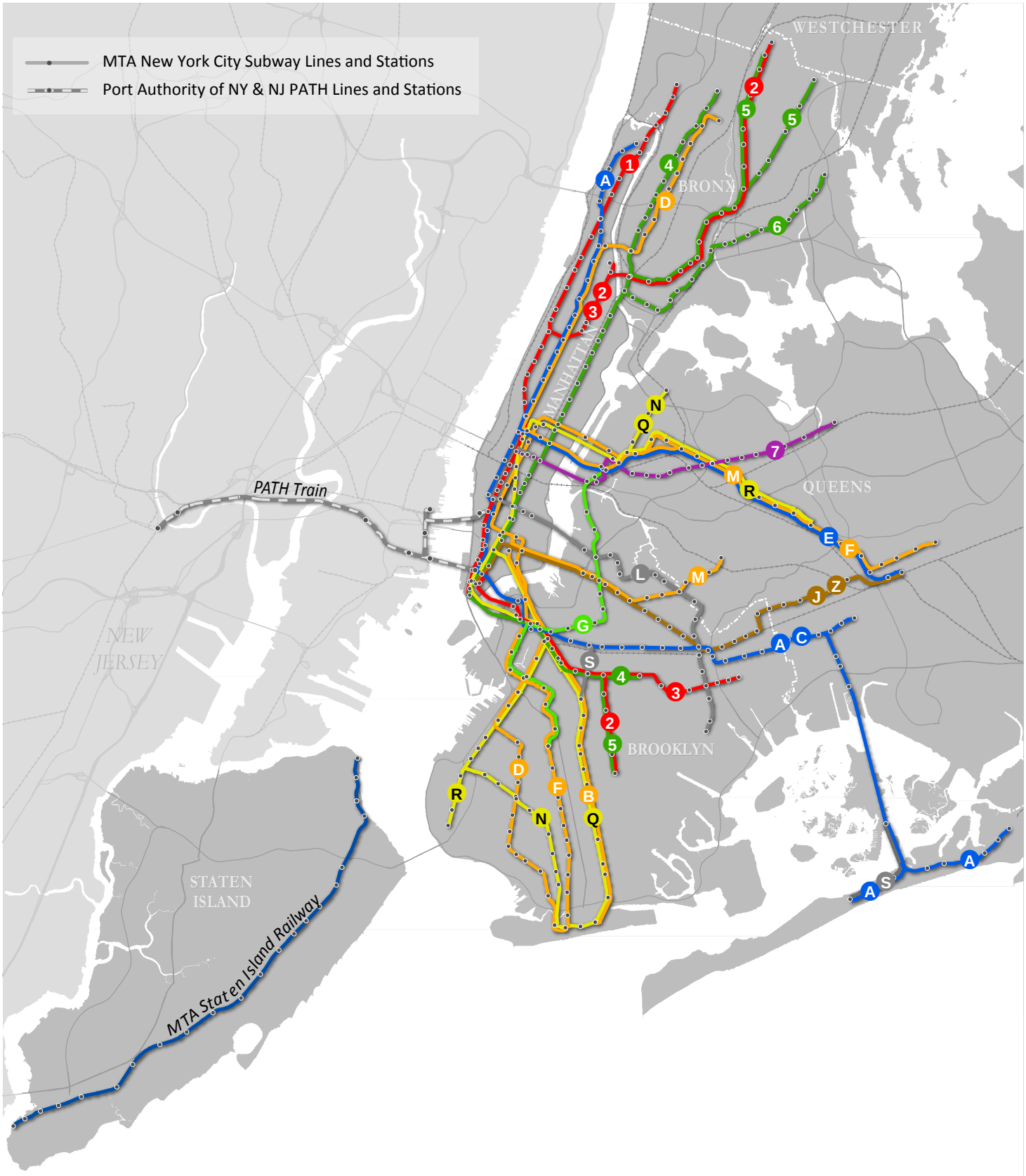
The delivery of the new R160 subway car fleet between 2005 and 2010 replaced rolling stock which had been running since the 1960s and 1970s. The R160 cars are running on the lettered (former BMT and IND) routes.

Table 3.1

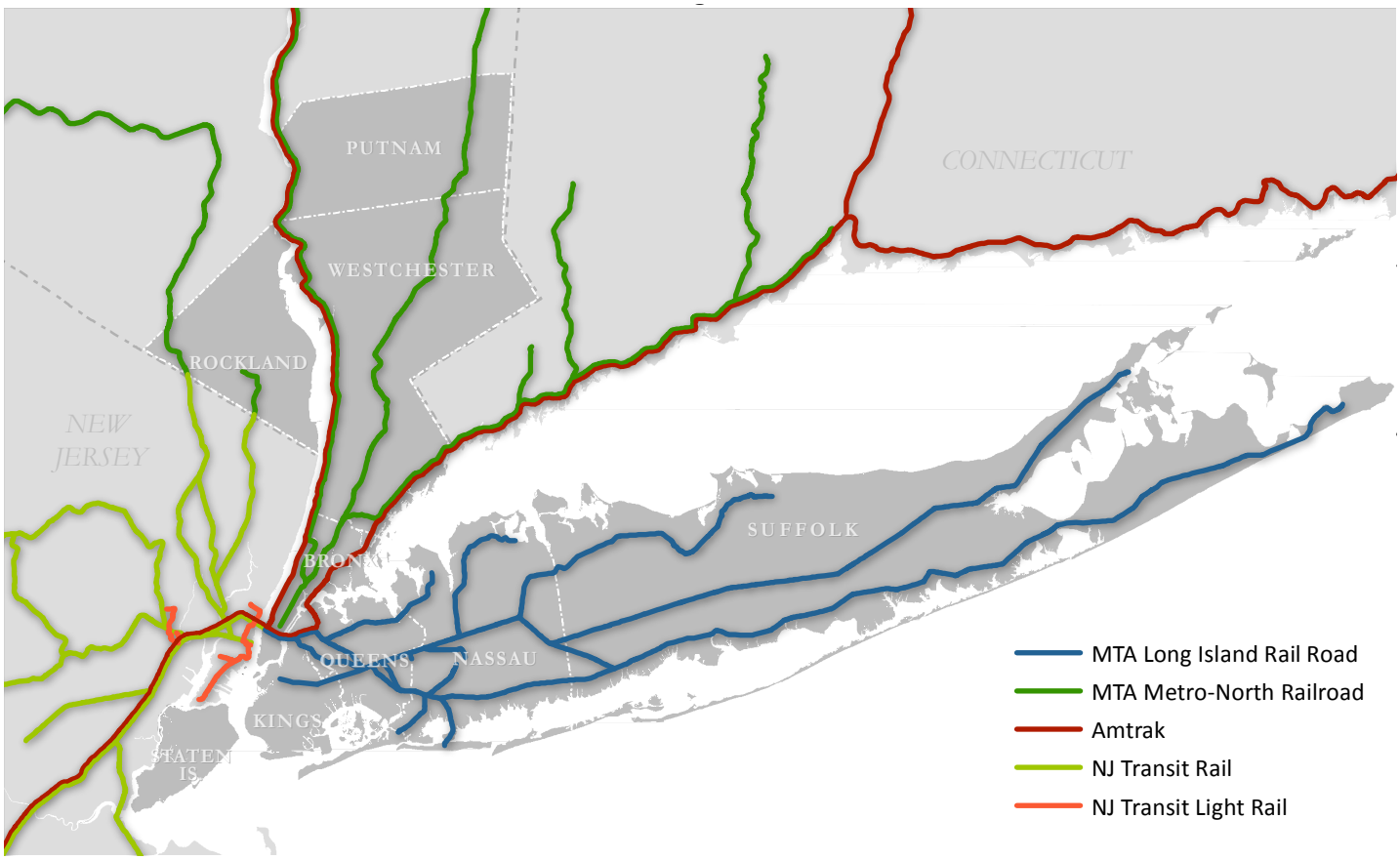
Proportional Increases in Weekend NYC Subway Ridership, 1998-2012

Year	Weekday	Saturday	Sunday	Saturday % of Weekday	Sunday % of Weekday
1998	3,962,222	2,015,003	1,490,327	50.86	37.61
1999	4,226,709	2,206,869	1,625,211	52.21	38.45
2000	4,522,410	2,393,186	1,794,874	52.92	39.69
2001	4,579,222	2,512,490	1,883,489	54.87	41.13
2002	4,590,570	2,573,817	1,937,375	56.07	42.2
2003	4,511,857	2,469,237	1,884,342	54.73	41.76
2004	4,612,703	2,594,065	1,973,605	56.24	42.79
2005	4,737,093	2,660,594	2,058,666	56.17	43.46
2006	4,865,769	2,735,177	2,090,005	56.21	42.95
2007	5,042,150	2,917,234	2,211,490	57.86	43.86
2008	5,229,435	2,981,699	2,312,745	57.02	44.23
2009	5,086,822	2,928,247	2,283,621	57.57	44.89
2010	5,156,913	3,031,289	2,335,077	58.78	45.28
2011	5,284,295	3,033,660	2,367,261	57.41	44.8
2012	5,380,184	3,172,627	2,490,736	58.96	46.92

Rapid Transit Systems in the NYMTC Planning Area



Commuter Rail and Amtrak Networks in the NYMTC Planning Area



Two major network expansion projects in Manhattan also continued. The City-funded extension of the Flushing (7) line to a new terminal at 11th Avenue and 34th Street continued, with an anticipated opening date of June 2014. However, lack of funds caused an intermediate station at 10th Avenue and 41st Street to be eliminated from the project.[4] Work also continued to progress on Phase 1 of the 2nd Avenue Subway with the MTA projecting the opening in December 2016.[5]

Major station rehabilitations also continued throughout the MTA network, along with the introduction of the new component-based rehabilitation program in 2010. Prior to this, station work was delayed until undertaking full-station rehabilitation projects in order for deficiencies to be addressed, but this new program emphasizes repairing and replacing individual elements of a station as they need attention.

There were a number of new technological developments that also appeared throughout the MTA network. The Canarsie (L) Line, which was the first in the City to receive Communications-Based Train Control and active train arrival time displays, also became the first to have flat-panel video screens installed at one station showing train locations in real time along a route map. While Canarsie Line passengers had already been using the arrival time screens (called Public Address Customer Information Screens, or PA/CIS) since January 2007, a larger rollout of the technology began on most of the numbered subway routes starting in February 2010. By December 2012, active PA/CIS screens, which include automated audio announcements, were installed in 179 stations. On most of the lettered routes, which were not fitted with the same technology, NYCT personnel developed an in-house solution allowing less specific but still viable information to reach passengers; by the end of 2012, 44 stations had this system. A pilot station communications system called Help Point, which provides push-button access to personnel who can provide information and emergency services, was launched at two stations in April 2011; multiple Help Point stations were located at each station, and each of them were equipped with both information and emergency buttons. An additional 102 stations are receiving Help Point as part of the 2010-2014 Capital Plan.

PATH

Operated by the Port Authority of New York and New Jersey, PATH is a rapid transit system which is comprised of four routes and 13 stations located in Manhattan, Hoboken, Jersey City, Harrison and Newark. Manhattan stations are located at the World Trade Center, the West Village, and along 6th Avenue from 9th to 33rd streets. Connections are

available to the New York City subway system at the World Trade Center, 14th Street, 23rd Street, and 33rd Street. The PATH system also serves Newark Penn Station, a major transportation hub in downtown Newark. (See Table 3.2 for annual ridership.)

New fare media and new railcars figured prominently in PATH's development since 2008. Although PATH accepted non-NYCT-compatible MetroCards when it introduced its contactless SmartLink card in 2007, within 2 years half of all PATH customers had switched to SmartLink. In 2010, PATH tested a cross-jurisdictional, contactless farecard which could be used on three connecting NJTransit bus routes, eight MTA NYCT bus routes, and the Lexington Avenue (4,5,6) Line.

PATH's rolling stock has recently been entirely replaced by 340 new PA5 cars, with the first train of new cars entering service in July 2009, and the entire fleet of older cars – some of which dated back to the mid-1960s – being replaced by October 2011. Less visible but of equal significance was the October 2009 awarding of $340 million in contracts to replace PATH's entire signal network with an electronically-managed automatic train control system.

Construction continued on the World Trade Center Transportation Hub which includes a new entrance to the temporary PATH terminal that opened in March 2008. The hub's last major contract was awarded in February 2011 and the hub station is expected to open in early 2015.[6]

COMMUTER RAIL

The region has three commuter rail entities – the MTA Long Island Rail Road (LIRR), MTA Metro-North Railroad (Metro-North), and New Jersey Transit (NJ Transit). The LIRR and Metro-North are subsidiaries of New York State's MTA. Compared to subway service, commuter rail services generally offer greater distances between stations, wider coverage areas, zoned fares, and a greater emphasis on rider comfort. There are also regulatory differences as all three agencies fall under Federal Railroad Administration jurisdiction because their tracks are connected to the national railroad network. Generally, commuter rail operations are separated from rapid transit, which is regulated by the Federal Transit Administration.[7]

From April 2012 to March 2013, the LIRR carried a rolling 12-month average of approximately 6.8 million passenger trips per month on 735 daily trains. The LIRR system is comprised of over 700 miles of track situated on 11 different branches, stretching 120 miles from Montauk – on the eastern tip of Long Island – to Penn Station in the heart of Manhattan, and to Atlantic Terminal in Brooklyn.

Metro-North recently surpassed the LIRR as the busiest commuter railroad in North America, servicing 120 stations distributed across five lines in seven counties in New York State – Dutchess, Putnam, Westchester, Bronx, Manhattan, Rockland, and Orange, as well as two counties in the state of Connecticut – New Haven and Fairfield. From April 2012 to March 2013, Metro-North carried a rolling 12-month average of approximately 6.9 million passenger trips per month on 697 daily trains.

Although New Jersey Transit's rail operations are primarily outside the NYMTC region, most of its rail routes indirectly or directly serve New York's Penn Station. From April 2012 to March 2013, NJT's rail operations carried a rolling 12-month average of approximately 6.0 million passenger trips, nearly equaling the LIRR's and Metro-North's ridership levels. (The impacts of Hurricane Sandy, along with more severe winter weather, reduced this average by approximately 200,000 from 6 months earlier.)

NJ Transit is New Jersey's public transportation corporation which serves an area of 5,325 square miles and operates a commuter rail network (along with fleets of buses and light rail vehicles) – including five rail lines that link directly into New York Penn Station in Manhattan.

Railroad ridership generally continued to climb to levels not seen in recent history. In, 2008, its 25th anniversary year, Metro-North set a ridership record, while the LIRR attracted over 87 million passengers. However, system-wide usage declined in 2009 before stabilizing in 2010.

By April 2013, The LIRR East Side Access project, a plan to construct a LIRR terminal beneath Grand Central Terminal, had completed all blasting in the tunnels and caverns, and the project had spent 52.4 percent of its $245 billion budget. The MTA estimated that the project would be completed in August 2019.

In September 2009, Metro-North New Haven Line trains began through service to the Meadowlands for football games and special events. In May 2009, Metro-North also opened a new train station on the Hudson Line, located near Yankee Stadium. By the 2012 baseball season, game-day ridership averaged nearly 3,100 on weekdays and 4,100 on weekends.[11]

In January 2009 the LIRR and Metro-North entered into a $257 million joint procurement contract with multiple parts suppliers – the largest mutual effort between the two railroads yet.

Transit-oriented development (TOD) also began to play a more visible role in the relationship between commuter rail and land use, as the MTA and its NYMTC partners sought to encourage more use of walkable communities near some of its stations, such as Harrison,

Table 3.2

Rapid Transit and Railroad Annual Ridership and Usage, 2008-2012						
	NYCT Subway	PATH	SI Railway	LIRR	Metro-North	NJ Transit
2008	1,623,881,370	74,955,660	4,379,855	87,358,476	83,555,228	84,508,279
2009	1,579,866,601	72,281,310	4,127,137	82,950,847	79,899,148	83,586,312
2010	1,604,070,666	73,911,746	4,370,233	81,507,851	81,095,849	82,223,534
2011	1,640,434,672	76,555,644	4,583,389	80,983,003	82,037,786	79,632,021
2012	1,562,515,065	72,563,052	4,445,112	81,745,989	82,953,628	81,353,894

Poughkeepsie, Wyandanch, Farmingdale, Patchogue, and Ronkonkoma.

NJ Transit runs numerous trains into and out of New York Penn Station daily. Presently, there are four NJ Transit lines accessing the station; these lines serve more than 77,000 passengers daily.[12] In 2009, NJ Transit opened a new rotunda for its passengers at New York Penn Station. Located at the corner of West 31st Street and 7th Avenue, the new rotunda features new stairs, elevators and escalators that connect directly to the NJ Transit concourse.

A rail spur at Secaucus Junction in New Jersey allows one-transfer trips to the MetLife Sports Complex from New York Penn Station on days where events expect more than 50,000 patrons. Service in July through September 2012 averaged nearly 15,700 people per event, up from its first year in 2009.[13] Metro-North provides round-trip through-service from major New Haven Line stations to Secaucus Junction on game days, where passengers can connect to NJ Transit rail service directly to the Meadowlands via a new rail spur.

The MTA and the Connecticut Department of Transportation (ConnDOT) have introduced the new M8 railcar for Metro-North's New Haven Line.[14] Manufactured by Kawasaki, the new cars will be phased in, with the last railcar expected to be in service by 2014. There are 405 rail cars in the entire order, costing about $3 million each. As of April 2013, 156 M8 cars had been delivered and 200 were in revenue service. MTA and ConnDOT are working together to maintain and update catenary wire on the New Haven Line. Currently being completed in multiple phases, the new catenary wire will be able to withstand changes in temperature and higher speeds. Five bridges along the route are also being replaced. Funding is coming from a combination of MTA Capital Construction and ConnDOT funds.

Table 3.3 summarizes vital statistics for rapid transit and commuter rail service providers in the NYMTC planning area, along with services to and within New Jersey.

AMTRAK

Since its creation in 1971, Amtrak has been the provider of long-distance passenger rail service to the NYMTC area. Amtrak operates three groups of services through the region:

- **Acela/Northeast Regional Service**: Frequent service along the Northeast Corridor between Boston and Washington (Recently through service to Virginia has been added.) Acela service uses a dedicated fleet of trains to provide higher-speed express service along the corridor, while Northeast Regional trains use standard Amtrak equipment and generally make more stops.


Grand Central Station

- **Empire Corridor Service**: Frequent service between New York City and Albany with more limited but daily service to Buffalo. An additional train, the Ethan Allen Express, serves the New York-Albany corridor and continues north to Rutland, VT.

- **Long distance routes:** Other services originating or passing through New York Penn Station include trains to northern Vermont, Montreal, Toronto, Chicago, Pittsburgh, New Orleans, North Carolina, and Florida.

Both regionally and nationally, Amtrak ridership has increased in recent years, setting ridership records in 2010 and 2011, and continuing to set records throughout 2012. The railroad carried

Table 3.3

Vital Statistics for Rapid Transit and Commuter Rail Providers in the NYMTC Region and in the Metropolitan Area (2012)						
Agency/ Entity/ Transport Type	*Route miles*	*Routes*	*Stations*	*Fixed route fleet size*	*Average weekday unlinked trips*	*Geographic reach*
Rapid Transit						
MTA NYCT (subway)	660 track	25	420*	6,375	5,156,913	Bronx, Brooklyn, Queens, Manhattan
MTA Staten Island Railway	29 track	1	22	63	28,054	Staten Island
PATH	13.8	4	13	375	281,764	Manhattan, Jersey City, Hoboken, Newark
New Jersey Only						
NJ Transit Hudson-Bergen Light Rail	36.5	3	24	52	40,975	Bayonne, Jersey City, Hoboken, Union City, West New York
NJ Transit Newark City Subway	13.9	1	17	21	18,807	Newark, Bloomfield
Commuter Rail						
MTA LIRR	594 track	11	124	1,185	333,683	Manhattan, Brooklyn, Queens, Nassau, Suffolk
MTA Metro-North Railroad	774 track	5	110	1,101	277,171	Manhattan, Bronx, Westchester, Putnam, Dutchess, Rockland, SW Connecticut
NJ Transit Railroad	536 track	9	164	1,332	276,459	Manhattan, New Jersey

*Many of the system's 468 stations are linked by free transfers.

All data compiled from member agencies and agency websites, American Public Transportation Association, National Transit Institute 2010 National Transit Database.

over 30 million passengers for the first time in its 40-year history in 2011.[15] The increase occurred against a backdrop of a national recession, shrinking vacation budgets, and increasing gasoline prices.

In the NYMTC planning area four commuter rail stations are served by Amtrak trains: New York City, New Rochelle, Yonkers, and Croton-Harmon. Additional stations immediately surrounding the NYMTC planning area are in Stamford, CT; Bridgeport, CT; New Haven, CT; Poughkeepsie, NY; Newark, NJ; Newark Airport, NJ, Elizabeth, NJ; and MetroPark, NJ. Limited service is also provided to New Brunswick, NJ. Table 3.4 displays ridership data for these stations since 2008.

Population growth and increase in transportation demand expected in the Northeast for the next decades has placed increasing pressure on the saturated Northeast Corridor (NEC), the country's busiest rail artery, and present challenges in terms of accommodating more trains, reducing trip time, and increasing train speed and service reliability. Amtrak's NEC Capital Investment Program identifies funding options and priorities for improving service in the existing rail network (the NEC Upgrade program) and developing a dedicated high-speed rail system (the NEC Next-Generation High-Speed Rail program). At an early planning stage as of 2012, the implementation of both overlapping programs is expected to occur in incremental steps over the next 30 years. Funding and implementation priority would be given to the elements of the program that would have the largest impact on improving reliability, increasing capacity, and reducing trip times, in order to generate the revenue and capital needed for additional elements of the program.[16]

Major infrastructure work on the railroad network that Amtrak uses within and beyond the NYMTC planning area has significant implications for the metropolitan area. For example, multiple rail bridges over Connecticut's coastal waterways were replaced, or were in the process of being replaced, over the past few years – some as far away as New London, i.e. the replacement of the Niantic Bridge due to be completed in May 2013. Aside from causing temporary service changes, these bridge repairs were needed to maintain and upgrade Amtrak-owned infrastructure along the Northeast Corridor.[17] Federal stimulus money helped rebuild out-of-commission railcars,[18] while the Passenger Rail Investment and Improvement Act of 2008 authorized additional federal support of state grants to upgrade designated high-speed rail corridors.[19]

Parts of Amtrak's aging Northeast Corridor constant tension catenary electric power supply system are also being rehabilitated – a need demonstrated by incidents such as an unplanned May 2006 power outage, which stranded numerous passengers.[20] Amtrak also began the process of purchasing new electric locomotives.[21]

Within the NYMTC planning area, a settlement between New York State and Amtrak in 2007 paid for upgrading the

Table 3.4

Amtrak Ridership, Fiscal Years 2008-2012*
(Fiscal years run October through September.)

	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2007-2012 Change %
Stations Serving the NYMTC Region						
New York, NY	8,739,345	7,832,874	8,377,944	8,995,551	9,493,414	7.94
New Rochelle, NY	87,463	79,674	78,876	79,264	84,777	-3.17
Yonkers, NY	18,720	18,850	20,433	20,987	22,187	15.63
Croton-Harmon, NY	39,893	42,003	41,570	42,562	45,578	12.47
Stations Serving the Surrounding Metropolitan Area						
Newark, NJ	679,279	630,939	658,089	683,626	680,803	0.22
Newark Airport, NJ	116,979	109,517	116,526	120,428	126,705	7.68
Metropark, NJ	406,287	369,477	388,371	396,902	393,713	-3.19
New Brunswick, NJ**	7,538	7,204	6,609	6,678	8,470	11
Stamford, CT	368,918	337,674	355,232	385,069	393,703	6.3
Bridgeport, CT	75,487	70,765	72,809	76,653	84,446	10.61
New Haven, CT	705,458	661,656	723,287	740,902	755,669	6.64
Poughkeepsie, NY	65,860	67,492	75,775	84,236	88,354	25.46

*Amtrak State Fact Sheets

**limited service

Empire Corridor tracks located beneath the George Washington Bridge, improving both safety and train speeds in upper Manhattan.[22] A 2010 USDOT TIGER (Transportation Investment Generating Economic Recovery) grant, disbursed under the American Recovery and Reinvestment Act of 2009, provided $83 million to improve access to and within New York Penn Station and laid the groundwork for the conversion of the Farley Post Office to Moynihan Station.[23]

Amtrak's largest project in the NYMTC planning area is a $295 million commitment to a $368 million bypass of Harold Interlocking, a section of track within Sunnyside Yards in Queens used by Amtrak, the LIRR and NJ Transit. When completed, the bypass will divert Amtrak trains from the interlocking, increasing speeds and reliability for all three railroads. The grant money was diverted from Florida after that state rejected federal high-speed rail funds.[24]

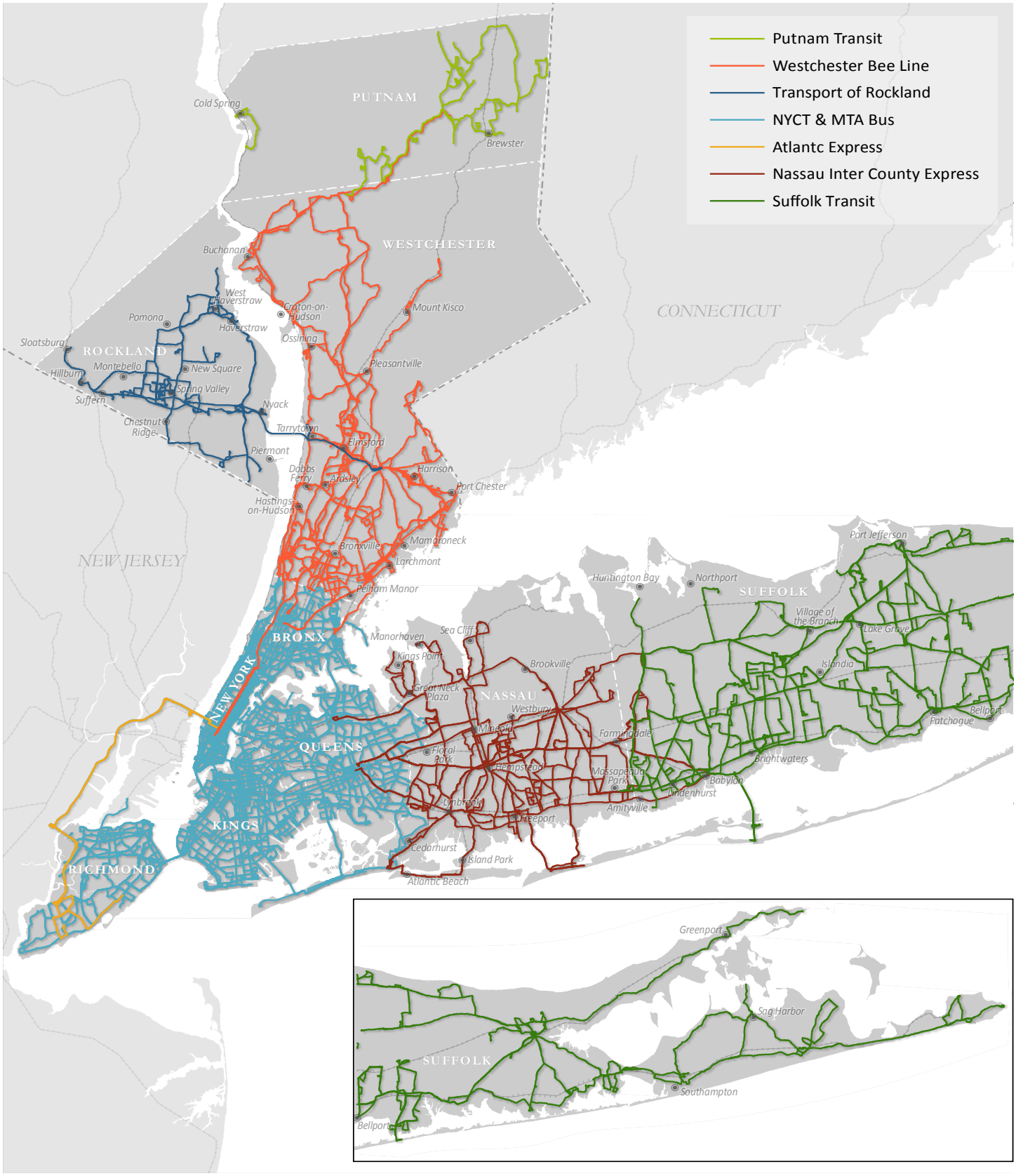
On the technology front, Amtrak began providing wireless internet service to its passengers in early 2010, and expanded the service through the rest of 2010 and into 2011.[25] Passengers also began receiving Northeast Corridor service disruption notifications via Twitter as part of a pilot program launched in March 2011.[26]

Despite the numerous Northeast Corridor-related infrastructure upgrades previously mentioned, the issue of high-speed rail in the region and nationwide remains a compelling topic. In 2010 and 2011, Amtrak devoted resources to developing a vision for high-speed rail, even enacting a departmental reorganization to focus more intently on its development and potential.[27] However, Congress removed all funding for high speed rail from the federal 2012 transportation budget.[28]

After the cancellation of the Access to the Region's Core project, Amtrak began to pursue an alternative called the Gateway tunnel, which would be located under the Hudson River and connect Secaucus, NJ to the south side of New York's Penn Station via two single-track tunnels paralleling the current North (aka Hudson) River tunnels. The new tunnels would lead to an expansion of Penn Station, currently referred to as "Penn South."[29] It is estimated to cost $10 billion and is proposed to open in 2020, depending on funding.[30] In November 2011, Amtrak received $15 million to begin engineering work on the tunnels.[31]

In May 2013, Amtrak received $185 million in federal post-Sandy recovery money to construct an 800-foot tunnel section beneath Hudson Yards, thus preserving a right-of-way for the Gateway project through the new neighborhood.

Major Local Bus Transit Systems in the NYMTC Planning Area



3. Buses

This section primarily focuses on local transit operators in each county including MTA Bus, Nassau Inter County Express (NICE; formerly, MTA Long Island Bus), Suffolk Transit, the Westchester Bee-Line System, Transport of Rockland, and other providers. Also included is information on the various commuter buses and long-distance buses in the region.

LOCAL TRANSIT

Table 3.5 provides total annual ridership for the major local bus transit providers in the NYMTC planning area. New York City's MTA bus services, NICE Bus, and Westchester Bee-Line all accept MetroCard fare payment; passengers can transfer between any of the three services and to New York City subways.

MTA New York City Bus System

MTA New York City Bus provides bus service throughout New York City 24 hours a day, 7 days a week, via over 15,000 bus stops served by 253 local and 71 express routes. (However, not all services run at all times, or on Saturdays and Sundays.)

The launch of Select Bus Service (SBS), which incorporates several elements of bus rapid transit, was a recent development for local bus transit in New York City. SBS generally uses a proof-of-payment system; customers prepay their fares using ticket machines at bus stops, allowing them to board buses through any door, reducing dwell times. Signal prioritization and designated bus lanes also reduce travel times.

The first SBS route was launched in 2008 along the heavily-used Bx12 route, which begins in the Inwood section of Manhattan and traverses the Bronx. (Local Bx12 service also remains in operation.) In its first year of service, Bx12 speeds increased by 20 percent along the route, with 98 percent of riders satisfied or very satisfied with the new service. In October 2010, New York City Transit (NYCT) and New York City Department of Transportation (NYCDOT) added SBS – along with a new, dedicated fleet of three-door articulated buses – along its busiest route, the M15 route which travels along 1st and 2nd Avenues in Manhattan, leading to a 9 percent increase in M15 ridership and 15-18 percent improvement in travel times in the first year of operation. A modified version of SBS was introduced along 34th Street in Manhattan in November 2011, in order to speed crosstown travel, and the S79 route between Bay Ridge Brooklyn and the Staten Island Mall via Hylan Boulevard was launched in September 2012.

Other SBS routes are currently under design or implementation. The Nostrand Avenue/Rogers Avenue B44 SBS in Brooklyn is scheduled to start service in the latter half of 2013. B44 SBS buses will make stops approximately every ½ mile. Local B44 bus service will continue to operate 24 hours a day. implementation of a Webster Avenue (Bronx) route is scheduled to start in 2013-2014. Potential SBS corridors for improved access to LaGuardia Airport/East Elmhurst in Queens are also under study. In addition, NYCT and NYCDOT identified additional potential SBS improvements and extensions in the 2009 Phase II BRT Study after having identified as potential candidates for SBS service areas that are either not served by the subway or seeing significant population growth, and corridors along which trips are long and slow, or subway crowding is heavy. Subsequent public workshops led to the selection of 16 potential future SBS corridors in 2010. Further potential improvements to SBS service include enhanced transit signal priority and off-board fare payment, offset or physically separated bus lanes, and camera-assisted enforcement of bus lane rules.

Table 3.5

Major Bus Transit Providers, Annual Ridership, 2008-2012*

Year	*MTA NYC Bus*	*NICE Bus*	*Suffolk Transit*	*Westchester Bee-Line*	*PART (Putnam County)*	*Transport of Rockland*
2008	868,005,155	32,649,109	6,699,354	32,256,000	250,300	3,884,100
2009	846,464,099	30,787,662	6,462,628	31,979,682	177,600	3,682,900
2010	817,137,824	30,816,889	6,531,849	32,264,688	186,867	3,534,231
2011	790,079,732	30,327,226	6,708,021	31,557,909	172,781	3,405,632
2012	781,978,816	29,545,079	6,538,326	32,069,161	168,331	3,390,268

*"2010 NTD Data Tables." American Public Transportation Association. N.p., 2010. Web. 23 Aug. 2012. <http://www.apta.com/resources/statistics/Pages/NTDDataTables.aspx>

Table 3.6

MTA NYC Bus: Vital Statistics as of December 31, 2012					
# Route miles	*Routes Operated*	*# Stations/ stops*	*# passenger fleet*	*# paratransit fleet*	*# passengers: Average weekday usage*
2,895	324	15,226	5,908	2,348	2,623,766

In September 2007, NYCT introduced the peak-only S89 Limited bus route from Staten Island to NJ Transit's 34th Street Hudson-Bergen Light Rail station in Bayonne – the first NYCT route ever to make stops in New Jersey. The service proved popular enough to be expanded slightly within less than a year.

As part of an increased focus on employee and rider safety,[32] MTA/NYCT announced in late 2010 that it would be outfitting 400 of its buses with video surveillance equipment.

MTA/NYCT began providing its customers with real-time bus tracking, using Brooklyn's B63 route as a pilot, starting in February 2011. The application, called BusTime, was a harbinger of much larger developments in bus tracking.[33] By April 2013, the locations of all Staten Island and Bronx buses also became viewable in real time, along with most express bus routes and a handful of routes in Brooklyn, Manhattan and Queens.

In addition to operating the subway system and bus network, NYCT administers New York City's paratransit service, known as Access-A-Ride. The service is available to individuals deemed unable to use the public transportation system. At present individuals age 65 and over and those with a qualifying disability are eligible for a reduced-fare MetroCard, which costs $1.25 per ride (full fare is $2.50 per ride). The reduced-fare benefits are available on all MTA New York City Transit subways, local and MTA buses. NYCT and MTA express buses offer reduced fares during non-rush hours only, and the LIRR, and Metro-North offer reduced fares anytime except weekday rush hours to New York City terminals.

Smaller New York City Bus Systems

A handful of smaller service providers operate other bus service within New York City. Atlantic Express, a bus company which primarily owns and operates school and charter buses, also operates two peak-period express bus routes from southern Staten Island to Midtown Manhattan.[34] The Roosevelt Island Operating Corporation runs that island's ubiquitous red buses; service operates 21 to 23 hours a day and is coordinated with tram arrivals and departures. The one-way fare is 25 cents.[35]

Other bus services have developed mainly to connect ethnic groups which are located in multiple communities. Private Transportation Corp. runs a single bus route that connects the Orthodox Jewish communities living in Borough Park and South Williamsburg.[36] In addition, several private van companies provide service connecting some of the City's major populations of Chinese immigrants: Chinatown in Manhattan, Sunset Park in Brooklyn, and both Flushing and Elmhurst in Queens.[37]

There are other small New York City bus systems. For example, New York University's (NYU) Department of Public Safety operates three bus routes during the fall and spring semesters (and one during summers) for NYU faculty, staff, students, administrators and alumni. NYU also operates an on-demand overnight service.

The following sections discuss Long Island's bus operations. Table 3.7 provides a statistical overview of each system.

Nassau County: From MTA Long Island Bus to Nassau Inter County Express (NICE)

On January 1, 2012, Nassau County transferred operation of its bus system, both fixed route and paratransit, from the MTA to Veolia Transportation Services. The system was renamed the Nassau Inter-County Express or NICE. The bus service runs 48 fixed route bus lines throughout Nassau County, and extends service into eastern Queens and western Suffolk counties. MetroCard is accepted on the fixed route system, and the base fare is $2.25. The fare for the Able-Ride ADA paratransit service is $3.75. NICE operates a fleet of 298 wheelchair-accessible, Compressed Natural Gas (CNG) powered, 40-foot fixed route buses, and a fleet of 93 paratransit vehicles that are used for the Able-Ride service.

NICE serves 96 communities, 47 MTA Long Island Rail Road stations and five MTA New York City Transit (NYCT) subway stations in addition to shopping centers, colleges, museums, parks, theaters, and beaches, with fixed route service provided seven days a week.

Suffolk Transit

Suffolk Transit provides bus service throughout Suffolk County, with service into southeastern Nassau County at the Sunrise Mall. Suffolk Transit does not accept MetroCards as payment. The base fare is generally $2.00, and service does not run on Sundays or during major holidays, but a 2012 fare increase to $2.25 for two eastern Long Island routes was accompanied by Sunday service on these routes at least through the summer. Suffolk Transit also provides Suffolk County

Accessible Transportation (SCAT), a curb-to-curb paratransit service.

Suffolk operates 158 fixed route buses consisting of 30-, 35-, and 40-foot diesel and hybrid diesel buses. The paratransit fleet consists of 143 gasoline and diesel powered wheelchair lift equipped buses. Bus service and route planning is done by Suffolk Transit itself (which is an agency of Suffolk County), and Suffolk Transit maintains a single brand identity. However, actual operations and maintenance of the buses is provided by private companies. Suffolk Transit provides service 6 days per week with limited Sunday service on the eastern portion of the County during the summer season and is anticipating operating additional Sunday bus service in late 2013 or early 2014.

Smaller Long Island Bus Systems

The City of Long Beach's Department of Transportation owns and operates a separate bus system from that of Nassau County. The five-route system serves the City of Long Beach, with one route operating east to the hamlet of Point Lookout. The N15 (departing from Roosevelt Field) and N33 (departing from Far Rockaway, Queens) NICE routes also serve Long Beach.

For a city of its size (with a 2010 population of 33,275),[38] Long Beach is unusual in that at least some part of its bus system runs 24 hours a day, five days out of the week. A special late-night route runs approximately once an hour, and the bus can deviate from its route upon request from a departing or arriving passenger who calls in advance.[39] The base fare for most of the system is $2.00; the N69 bus to Point Lookout is $2.50.[40] The system does not accept MetroCards. Long Beach also runs a 7-day-a-week paratransit service.[41]

The Town of Huntington in northwest Suffolk owns and operates its own bus system, called Huntington Area Rapid Transit, or HART. As of January 2013 the base fare is $2.00 with no service on Sundays or major holidays. Transfers are available to Suffolk Transit and NICE. The Village of Patchogue also ran a local bus system, but this was discontinued in late 2010 or early 2011.[42]

The following sections discuss the Lower Hudson Valley's bus operations. Table 3.8 provides a statistical overview of each system.

Westchester County Bee-Line Bus System

Westchester County holds a contract with Liberty Lines Transit to operate the majority of its public bus system, known as the Bee-Line. Westchester County owns all Bee-Line buses along with the related maintenance facilities and is responsible for route planning and fare policy.[43] Three routes in the northwest part of the county are operated by PTLA Enterprise, another bus company. With 59 bus routes in 2012, consisting of local and express service, the Bee-Line service area extends from the northern and central Bronx through Westchester, and into

Bee-Line Hybrid Electric Bus, Westchester County

Table 3.7

Bus Operators on Long Island: Vital Statistics as of December 31, 2012				
Operational Elements	**NICE (Nassau County)**	**City of Long Beach Bus**	**Suffolk Transit**	**HART (Town of Huntington)**
# Route Miles	740.5	5	1,087.20	64.8
# Routes Operated	49	25	52	5
# Stations / Stops	51/2200	67	3,100	Hail Stops
# Passenger Fleet	310	11	158	12
# Paratransit Fleet	95	4	132	12
# Maintenance Fleet	59	2	NA	2
# Passengers: Average Weekday Usage	99,735	857	22,434	832

Putnam County. A number of Bee-Line routes serving the Bronx connect with New York City subway stations. Several routes within the county operate as feeders to Metro-North Stations and others provide access from the White Plains Metro-North Station to office parks in the I-287 corridor. An express route, the BxM4C, provides service to Manhattan from White Plains, operating along 5th and Madison Avenues in Manhattan, terminating at 23rd Street. The entire Bee-Line fleet accepts MetroCard, and is ADA compliant. The base fare for local buses as of March 2013 was $2.50. Service operates 7 days a week, though not all routes operate on all days.

Unlike most other localities in the region, Bee-Line ParaTransit service operates on two different types of schedules. Service is available Monday through Friday from 6:00am to 7:00pm and Saturday from 8:00am to 7:00pm. However, paratransit users whose trips begin and end within three-quarters of a mile of a Bee-Line bus route have expanded service hours which generally correspond with those of the parallel Bee-Line route. In 2011, Ford Transit Connect vehicles were added to the paratransit fleet in order to help achieve operational and cost efficiencies. Prior to that, the fleet was comprised solely of standard lift equipped paratransit vans that are more costly to purchase and operate than the smaller new vehicles. The Ford Transit Connect vehicles are not lift equipped, but are able to serve the approximately 80 percent of paratransit eligible riders who are ambulatory. In May of 2012, Bee-Line ParaTransit launched a one-year "Bee-Line Taxi" pilot program in White Plains to help reduce costs and make service more convenient for users. ParaTransit riders may now opt to use a taxi service for trips within White Plains. Given the success of this program, Westchester launched similar programs in Peekskill and New Rochelle and is pursuing opportunities to expand the taxi program to other parts of the county.

In 2009, Westchester County released its *Central Avenue Bus Rapid Transit Assessment Study Final Report*, which analyzed the potential for a 14.4-mile BRT route from downtown White Plains to the Bedford Park Boulevard stations of the 4, B and D subway routes in the Bronx. Over 10 percent of the Bee-Line system's total ridership traveled this corridor as of 2012. The proposed BRT route is seen as not just a way to decrease bus travel times and increase ridership, but as a possible engine for future transit-oriented development.[44] Improvements are being phased in, due to the varying timeframes required for implementation and different jurisdictions with responsibility for the roadway and traffic signals. The development of transit signal priority in the Central Avenue Corridor is in progress.[45]

PART (Putnam Transit)

Putnam County's bus system, PART, is made up of four fixed routes and a seasonal trolleybus that operates in the Cold Spring area. Aside from the seasonal route, which runs Fridays through Sundays and on some holidays, from May through December, all of PART's services are in the western half of the county. One route crosses the border into northern Westchester County. The Putnam County Department of Planning, Development and Public Transportation administers the system while First Transit, Inc., a private company, operates the system.

As of September 2011, the base fare was $2.50. MetroCards are not accepted on PART. Except for the system's central transfer point at Putnam Plaza, there are no fixed stops – passengers can flag down a bus anywhere along its routes. Some stops are also "on-call," which means that passengers need to phone in advance to schedule a pickup. Service does not operate on Sundays. PART Paratransit operates only when the rest of the system is running, and only in locations within three-quarters of a mile of a PART route. It is not a countywide service.

Rockland County –Transport of Rockland/Tappan ZEExpress

Rockland County holds a contract with a Coach USA for the operations and maintenance of Transport of Rockland (TOR) and TAPPAN ZEExpress (TZx) inter-county bus service. Fixed schedules are posted, but passengers can flag down a bus at any safe location along each route.

Rockland County is responsible for the TOR fixed-route intra county bus system which serves 11 local routes with 41 vehicles, and for the TZx inter-county bus service, which uses 21 vehicles. The TZx bus service runs from Suffern to selected locations in Rockland County, then across the Tappan Zee Bridge to Tarrytown and White Plains in Westchester County. TZx buses stop at the Metro-North station in both of these localities, along with other major destinations along the I-287 corridor. Numerous park-and-ride lots also exist throughout the county.

The county operates the demand-responsive system called TRIPS (Transportation Resources Intra-County for Physically Handicapped and Senior Citizens). TRIPS is a curbside-to-curbside, shared-ride paratransit service for Rockland residents with physical or mental disabilities or senior citizens over the age of 60 who find it difficult or impossible to use municipal fixed-route service. The TRIPS bus system has 25 buses.

Transport of Rockland (TOR), Rockland County

In May 2011, TOR raised its base fare from $1.50 to $2.00 and eliminated some trips on five of its routes. However, a strip of 10 "SuperSaver" tickets costs $11.00. (The TZx base fare is $3.00, or two SuperSaver tickets.) Fixed schedules are posted, but passengers can flag down a bus at any safe location along each route.

Municipal Bus Routes in Rockland

Mini-Trans, which is operated by the town of Clarkstown, has five routes which operate Mondays through Saturdays. The base fare is $1.50. Passengers can flag down a bus at any safe location along each route.[46]

Spring Valley Jitney, a publicly run bus service, runs a single fixed bus route with a $1.50 base fare. Service runs Monday through Saturday.[47]

COMMUTER BUSES

New York City acts as a hub for commuter buses, attracting passengers from as close as Hudson County, New Jersey, and as far as Montauk and western Pennsylvania. Commuter buses remain an alternative to driving into the city during rush hour. Most commuter buses operate into the Port Authority Bus Terminal on West 42nd Street and the George Washington Bridge Bus Station on West 178th Street, both in Manhattan. NJ Transit also provides commuter bus service to the Port Authority Bus Terminal and the George Washington Bridge Station. Service is frequent, and serves destinations throughout New Jersey and Rockland County.

Several commuter bus routes bypass the major bus terminals and operate along city streets, especially in Lower Manhattan. The largest such presence is Academy Bus, which offers commuter bus services between Lower Manhattan and multiple locations in New Jersey such as Burlington, Mercer, Middlesex, Monmouth, and Ocean counties.[48] Single ride tickets range between $14 and $21.[49] Taking advantage of federal funds, Academy Bus has increased the number of stops it provides, expanding its ability to serve passengers in Ocean County, New Jersey.[50] Passengers are allowed to transfer between routes at certain stops, allowing for increased mobility into New York. Sussex County, New Jersey, has also received federal funds to operate a local van service that connects to NJ Transit.[51] The service, which costs $1, operates between Route 515 and Route 23, where customers transfer to another bus into New York, with two morning trips and two evening trips.

NJ Transit's Route 120 also operates peak-directional bus service between Lower Manhattan and Bayonne, New Jersey,[52] and Trans-Bridge Lines operates peak-directional service between Lower Manhattan and the Bethlehem/Allentown/Easton region of Pennsylvania.[53] In addition, Martz Trailways provides service to the Poconos and Scranton and Wilkes-Barre, PA, primarily from the Port Authority Bus Terminal. However, Martz also provides limited service to Lower Manhattan central and eastern Midtown, and points in between.[54]

In June 2011, a $183 million public-private partnership, guided by the Port Authority of New York and New Jersey, launched the rehabilitation of the George Washington Bridge Bus Station. The station will feature a modernized waiting area, create a new 21-gate station, and attract major retailers to its commercial spaces.

A major bus holding company, Coach USA, operates numerous commuter bus services into New York City. Coach USA also operates the Orange Westchester Link (OWL) which provides bus service between Orange County and White Plains, NY. Rockland Coaches, which is

Table 3.8

Bus Operators in Lower Hudson Valley: Vital Statistics as of December 31, 2012

Operational Elements	Westchester Bee-Line	PART (Putnam Transit)	Rockland TOR & TZx	Clarkstown Mini-Trans
# Route Miles	831.9	NA	154	17
# Routes Operated	59	4	11	5
# Stations / Major Terminals	3,300+ stations; 4 terminals	Hail Stops	2	Hail Stops
# Passenger Fleet	329	12	63	10
# Paratransit Vehicles	81	12	25	0
# Maintenance Fleet	0	1	0	0

owned by Coach USA, operates about 20 bus routes in Rockland County, New York, and Bergen County, New Jersey, with service to both the George Washington Bridge Bus Station and Port Authority Bus Terminal.[55] Some service operates consistently throughout the day, while other services are more commuter-oriented. Depending on distance traveled, fares ranged between $1.50 and $9.80 as of September 2011. Leprechaun Lines provides bus service between various points in Dutchess County and White Plains.

More intercity buses are enforcing rules about quiet commutes, similar to "quiet cars" on trains. Lakeland Bus Lines, serving various destinations in New Jersey, has responded to passenger and driver complaints about loud cell phone users by restricting phone calls to emergencies only. Signs within the buses instruct passengers of the rule, while drivers can also instruct passengers.[56] Meanwhile, Lakeland Bus Lines increased its fare for routes traveling to New York City in June 2010 by roughly 9 percent.

Hampton Jitney, in existence since 1974, operates a fleet of luxury motor coaches and limousines providing all-year service between Eastern Long Island (including the North and South forks and the Westhampton areas) and New York City. Hampton Jitney's Ambassador Class provides a premium service offering more space and amenities. Fares on the Hampton Jitney range between $22-$30 one way and $44-$53 round trip, and on the Ambassador Class between $45 one way and $80 round trip.[57]

In order to provide additional options to commuters in Danbury, CT, the MTA began a shuttle bus between New Fairfield, CT and the Metro-North Railroad station in Southeast, NY. The service provides five morning trips and eight evening trips. Funding is provided by NYSDOT and ConnDOT. Connecticut's Housatonic Area Regional Transit (HART) provides similar service to two rail stations in New York. Bus service is provided in both directions between Federal Road Park-and-Ride in Danbury and Brewster station in New York throughout the day. Service to Metro-North's Katonah station in New York is provided from Ridgefield, CT during peak hours.[58] CT Transit operates the I-Bus Express service between Stamford, CT and White Plains, NY.[59]

Various inter- and intrastate bus routes have installed geographic positioning system (GPS) technology on their buses as a precaution in case of a bus hijacking.[60] Using GPS, dispatchers can find the location of the bus, remotely control its speed, and also stop the bus from being restarted. Gray Line, Coach USA, DeCamp Bus Lines and NJ Transit have all installed the GPS system on their buses. Funds were provided by the Department of Homeland Security.

LONG-DISTANCE BUSES

New York City is also a major hub for long-distance buses from destinations such as Boston and Washington, DC, but also from more distant cities such as Toronto and Atlanta. Many intercity buses operate into the Port Authority Bus Terminal and the George Washington Bridge Bus Station. Newer intercity bus routes allow the boarding and alighting of passengers along city streets.

Leading the resurgence in intercity bus travel has been the introduction of discount operators like Megabus, a Coach USA brand, and BoltBus, a joint venture of Greyhound Lines and Peter Pan Bus. Megabus and BoltBus offer discount express city travel between New York and various destinations throughout the eastern United States and into Canada. With some tickets costing as little as $1, the buses serve major destinations including Washington, D.C., Boston, Philadelphia, Albany and Toronto. Both of these companies started in 2008, and their service continues to expand.[61] Other bus companies offer less variety in destinations but the same quality of service, including Vamoose Bus, which operates to Lorton, VA via Bethesda, MD and Arlington, VA, and LimoLiner, which operates to Boston Back Bay Station via Framingham, MA.[62] All of these discounted services arrive in Midtown Manhattan, instead of the Port Authority or George Washington Bridge Bus Station.

"Chinatown" buses, which began providing intercity service in the late 1990s, also operate often and at competitive prices. Such major bus companies include Fung Wah and Lucky Star, which both provide service to Boston, MA, from local streets in the Chinatown area. Both buses cost $15 per ride, which is slightly cheaper than Megabus and Bolt Bus.[63] These buses make Wi-Fi available, another perk for customers.

The allocation of curb space and the designation of bus stops has also been an issue for curbside pickup and drop off services within New York City. NYCDOT works closely with companies that wish to have dedicated areas on the sidewalk for their services, and applications must be approved by community boards in order to be signed.

Recent accidents involving intercity buses have led to a push for more regulations, along with increased enforcement of already existing guidelines. On May 31, 2012, USDOT's Federal Motor Carrier Safety Administration shut down 26 intercity bus operations largely controlled by three companies, citing them as "imminent hazards to public safety." Most of these companies were located in the eastern United States, and transported over 1,800 passengers a day along the I-95 corridor, including New York.[64] Three of these companies had already been ordered to cease service but were continuing to operate anyway; nu-

merous other violations such as lack of vehicle inspections, failure to use commercially licensed drivers, and failure to implement drug and alcohol testing programs were also cited. The three bus companies' complicated ownership and management structures also contributed to their ability to stay in service despite several of their carriers having had their operating authority revoked.[65]

TOUR BUSES

With the exception of chartered buses, tour buses are distinct in that they generally stay confined to New York City. Their passengers are not commuters, but rather tourists who are either riding in a closed loop or using a system of "hop on-hop off" routes to visit specific attractions or neighborhoods. Therefore, these buses often occupy road space without their motor coaches or passengers being counted in standard baseline traffic counts.

Although bus tourism has historically been confined to the Manhattan Central Business District with the occasional foray into Brooklyn, tour buses are now a more common sight in upper Manhattan, Brooklyn and the Bronx. Both Gray Line and City Sights tours' uptown loops now include Harlem, and each has a separate loop serving Brooklyn.[66] At least two tour operators now provide regular Bronx tours.[67]

The burgeoning bus tour industry has expanded not just to other boroughs, but to topic-specific tours, often centered on popular TV shows, local foods, or specific cultural sites. For example, in July 2012, one website advertised separate tours catering to tourists interested in Harlem gospel performances, pizza, and fans of the television show "Sex and the City."[68]

The question of where to store inactive tour buses in Lower Manhattan has also become more pressing as tours visit the World Trade Center site. A new Vehicle Security Center is being built, which will have the capacity to store 80 buses.[69]

FERRY COMPANY OPERATED BUSES

NY Waterway also operates a network of free bus routes in Manhattan providing connecting service to its West 39th Street terminal. Five peak-period routes provide crosstown service to locations as far east as 3rd Avenue via 57th Street, 49th/50th streets, 42nd Street, 34th Street and 23rd Street; the 23rd Street route loops south to the West Village.[70] A separate, more condensed network of routes serves western Manhattan during off-peak periods.[71] An additional peak-period bus route connects the company's ferry service at East 34th Street to a Midtown loop via East 34th Street, 6th Avenue, East 48th Street and Lexington Avenue.[72] NY Waterway also operates free bus services in New Jersey.

World Financial Center Ferry Terminal - south view in the evening, New York City

4. Ferries and Other Services

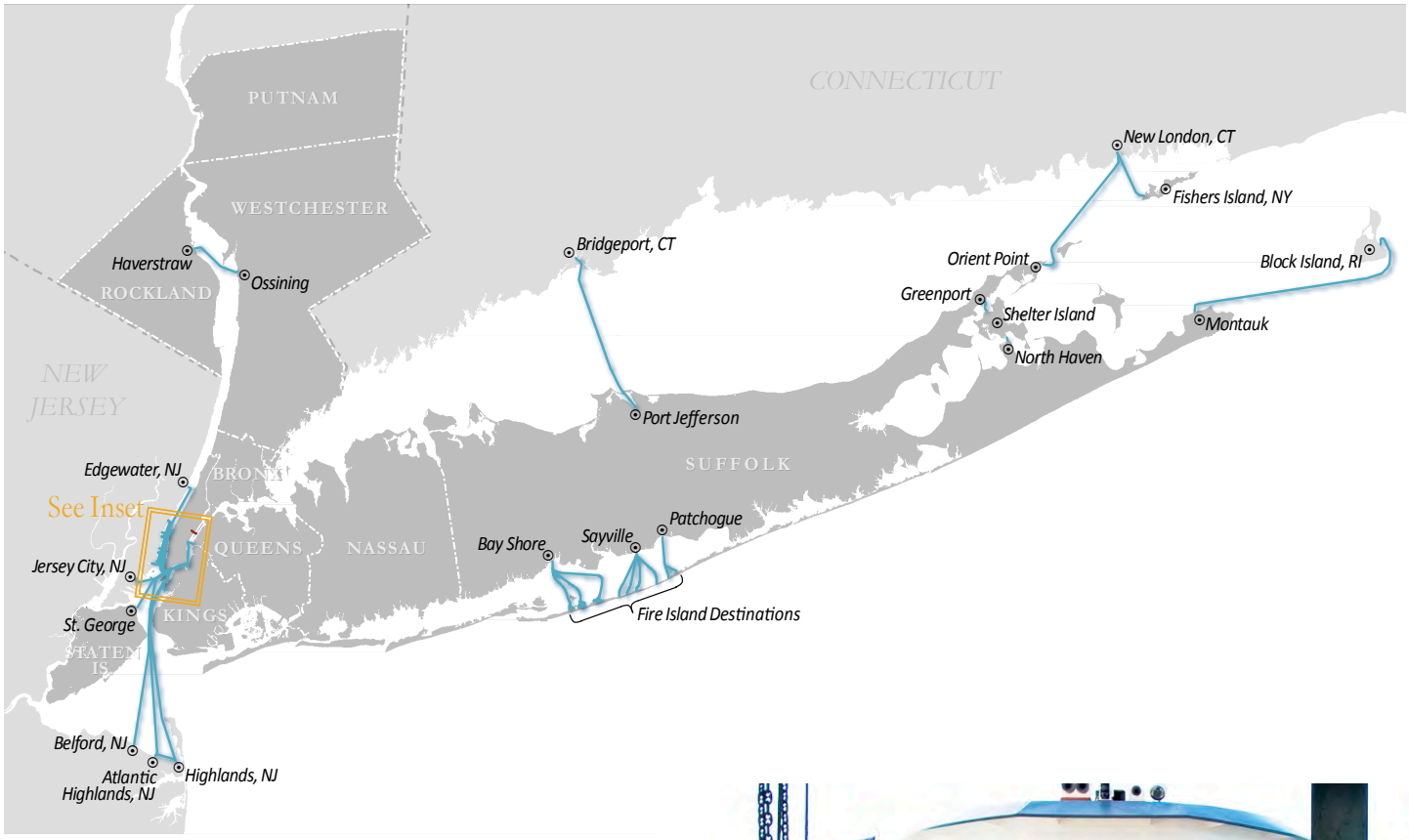
FERRIES

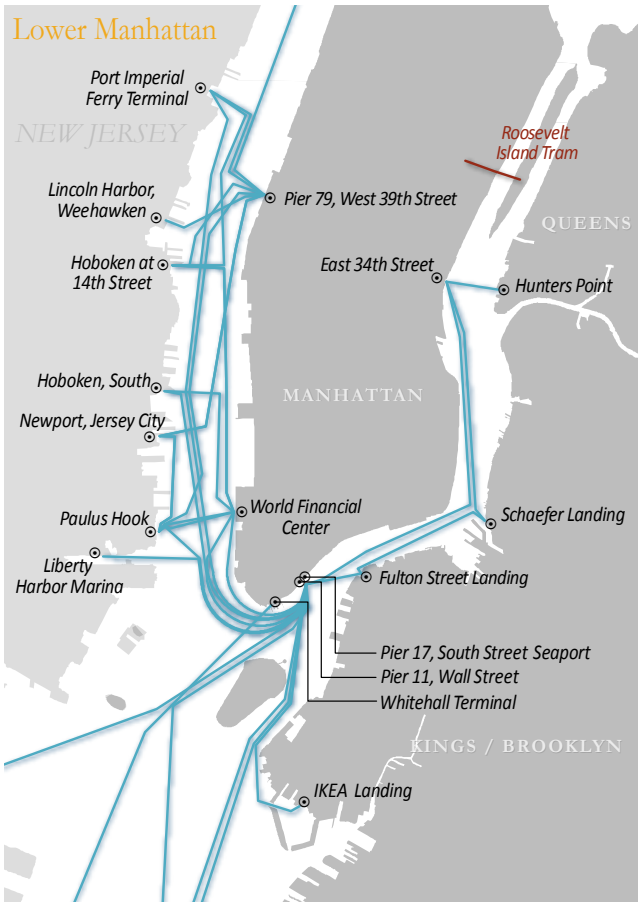
The island of Manhattan is well-connected to its surroundings by ferries, which access locations as far south as Middlesex and Monmouth counties in New Jersey. Long Island and Connecticut are also connected via two ferry routes. Within New York City, the major ferry operators include NYCDOT, which operates the Staten Island Ferry; NY Waterway, BillyBey and SeaStreak. Major terminals include St. George Terminal in Staten Island, Whitehall Terminal, the Battery Park City Terminal at the World Financial Center, and various other piers along the East and West sides of Manhattan.

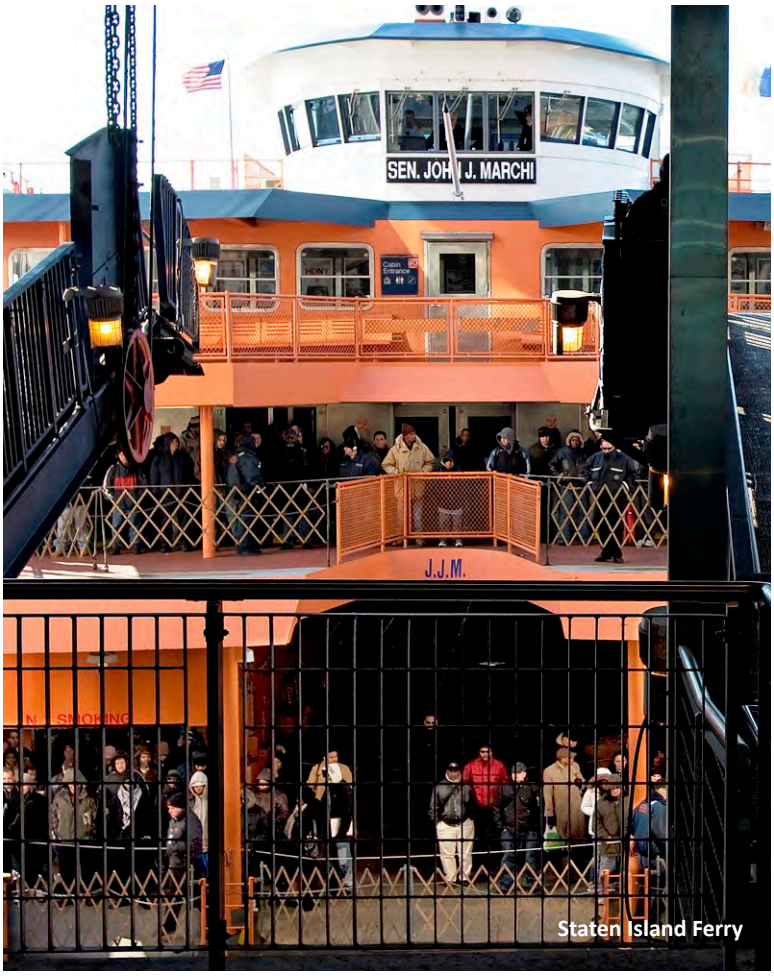
The Staten Island Ferry, the busiest and most frequent water transportation service in the New York City area, operates an extensive peak and off-peak schedule, connecting St. George Terminal on Staten Island to Whitehall Terminal at the southern tip of Manhattan. In 2011, the Staten Island Ferry carried almost 22 million passengers, its highest ridership ever, making 110 weekday trips between the two terminals, 77 trips on Saturdays and 68 trips on Sundays. In recent years, the Staten Island Ferry has transitioned to burning ultra-low sulfur fuel and embarked upon a fleet-wide emissions reductions program with the installation of various technologies. Subsequent to this endeavor, the New York City Council passed local laws that mirror NYCDOT's emission initiatives.[73] In addition, in 2012 the Staten Island Ferry received a $3 million grant under the Ferryboat Discretionary Fund to retrofit LNG-powered engines on one of the smaller ferryboats.[74]

In 2011, New York City introduced a 3-year pilot for an East River Ferry service as an alternative to the other modes of transit that currently cross the river between Brooklyn, Queens and Manhattan. The New York City Economic Development Corporation currently contracts with NY Waterway to run the service, while providing $9 million from the city.[75] The new ferry service makes stops at Pier 11 near Wall Street in Downtown Manhattan and Fulton Landing in Brooklyn, then makes multiple stops along the Brooklyn waterfront and Long Island City, Queens before reaching East 34th Street in Manhattan. Here, a New York Waterway connecting bus provides access along East 34th Street to 48th Street.[76] Ferries run approximate-

Ferry Services in the NYMTC Planning Area







Staten Island Ferry

ly every 30 minutes between the hours of 6:40am and 7:50pm. In the first four months of operation, weekend ridership was six times higher than the city projected, and average weekday ridership was about twice as high as expected. Though Ferry ridership declined slightly during the winter months, the number of riders continued to be higher than expected.[77]

There are a number of tourist ferries in the New York City area. The Circle Line is one of the oldest and largest tour companies to offer sightseeing cruises. They offer 3-hour and 2-hour cruises as well as shorter ones around the city. The New York Water Taxi has been a New York fixture since 2002, beginning with a fleet of five distinctive black and yellow checkered vessels. Some of the tours that they have provided are hop-on/hop off service to many attractions for the price of one pass. They also provide service to the Statue of Liberty, Ellis Island, and IKEA in Red Hook, Brooklyn. Statue Cruises is the concessioner authorized by the National Park Service, Department of the Interior, to serve the public at the Statue of Liberty National Monument and Ellis Island. In addition, while the Staten Island Ferry is a passenger service ferry operated by NYCDOT, the 5-mile, 25-minute ride serves as a free sightseeing vehicle. However, it is not possible to know what percent of its users are tourists.

Ferries usually operate to Mets and Yankees baseball games during the season, but this service tends to fluctuate by the season and operator. Seastreak offers ticket packages as well as boat only seating to both Yankee Stadium and Citi Field for weekend home games from April to September. Also, Seastreak has begun offering summertime service from Lower Manhattan and Midtown to Martha's Vineyard, MA.[78]

On the West Side of Manhattan, a new ferry terminal was incorporated into the World Financial Center in March 2009.[79] The new terminal can accommodate five ferryboats allowing multiple vessels to come and go simultaneously. The new facility is expected to boost ridership to and from Downtown Manhattan, with its passenger amenities and increased space.[80]

The recent and ongoing financial downturn has caused ferry companies to re-evaluate their services. SeaStreak, one of the major companies ferrying customers between Monmouth County and Manhattan, was bought several years ago by a New England company after its original owners filed for bankruptcy.[81] After the sale, fares were increased for the service.[82] Around the same time, NY WaterTaxi bought Circle Line Downtown, a large tourist ferry, expanding its services beyond just daily commuters, and has since removed itself from the commuter market.[83] Between 2008 and 2010, New York Water Taxi ran a ferry service ran between the Rockaways and Lower Manhattan. However, after a government subsidy ended, the service ceased running.[84] In November 2012, NYCEDC and Seastreak relaunched a temporary ferry to the Rockaways in the aftermath of Hurricane Sandy.[85] New York Water Taxi service between Yonkers and Lower Manhattan also ceased at the end of 2009 after funding from a Lower Manhattan Development Corporation grant ended.[86]

South Amboy, in Middlesex County, NJ, is also working to bring a ferry service to Lower Manhattan.[87] NY Waterway increased service between Jersey City and New York's World Financial Center in November 2009.[88] In March 2011 NYCEDC released its Comprehensive Citywide Ferry Study, which examined, inventoried and prioritized over 40 sites citywide and discussed potential service corridors.

On Long Island, numerous improvements have occurred recently. A new terminal is under construction in Glen Cove, which could house a possible ferry service to Manhattan.[89] In Patchogue, a new terminal welcomed its first passengers in April 2010, providing ferries to Fire Island.[90] Improvements will be made at the Bay Shore Terminal, while the Ocean Beach Terminal on Fire Island will be completely replaced.[91]

Ferry service also operates between Orient Point, on Long Island's North Fork, and New London, CT. The ferry service between Port Jefferson on Long Island and Bridgeport, CT became the first in the nation to hire a fully-trained K-9 team for heightened security.[92] Other Long Island ferries connect Shelter Island with Greenport and North Island, and (seasonally) Montauk with Block Island, RI, New London, CT and Marthas Vineyard, MA. An additional ferry serves Fishers Island, NY from New London, CT.[93]

In Rockland County, the ferry connecting Haverstraw to Ossining's Metro-North railroad station has seen increased ridership since its introduction in 2001. This service is operated by NY Waterway for Metro-North Railroad, and allows the distance from Haverstraw to Grand Central Terminal to be covered in approximately 70 minutes. On weekdays, there are fourteen trips leaving Haverstraw and 15 leaving Ossining. A monthly Uniticket (Metro-North and the ferry) costs $328. Haverstraw Ferry Terminal has free parking for up to 300 vehicles.[94]

ROOSEVELT ISLAND TRAM

Supplementing the Roosevelt Island subway station is the Roosevelt Island aerial tram, which operates between the island and a station located at East 59th Street and 2nd Avenue on Manhattan. Originally opened in 1976 as a compromise for islanders waiting for the subway station to be built, the tram, operated by the state-run Roosevelt Island Operating

Table 3.10

Ferry and Tram Operators in the NYMTC Region: Vital Statistics as of December 31, 2012						
Agency/ Entity/ Transport Type	*Route miles*	*Routes*	*Stations (landing)*	*Fixed route fleet size*	*Average weekday unlinked trips*	*Geographic reach*
Ferry						
Staten Island Ferry	5.2	1	2	8	67,238	Staten Island, Manhattan
NY Waterway (East River)	5.1	1	7	2	3,500	Manhattan, Brooklyn, Queens
Hudson River Ferries	46.4	15	13	25 ferry; 47 bus	23,500	Manhattan, New Jersey
NY Water Taxi	3.1	1	2	2	400	Manhattan, Brooklyn
Raritan Bay (NY Waterway; SeaStreak)	70.8	3	8	8	4,900	Manhattan, Monmouth
Haverstraw Ossining Ferry	5.5	1	2	1	490	Rockland, Westchester
Port Jefferson-Bridgeport Ferry	15	1	2	3	800,000 Annual	Suffolk; Bridgeport, CT
Orient Point-New London Ferry	NA	1	2	9	NA	Suffolk; New London CT
Fishers Island Ferry	NA	1	2	NA	NA	Suffolk; New London CT
Shelter Island North Ferry	NA	1	2	NA	NA	Suffolk
Shelter Island South Ferry	NA	1	2	NA	NA	Suffolk
Tram						
Roosevelt Island Tram	3,140 ft	1	2	2	NA	Manhattan

Corporation (RIOC), now carries over 6,400 people per day between the two stations.[95] The tram operates at 7.5-minute headways during peak hours, 7:00am to 9:30am and 3:30pm to 8:00pm, and at 15-minute headways otherwise, while the overall trip takes 4 to 5 minutes. At the Roosevelt Island station, the tram connects to the Red Bus Service provided by RIOC, while the 2nd Avenue tram station is within walking distance of the 59th Street-Lexington Avenue subway (N,Q,R,4,5,6) station, as well as the M15 local bus and Select Bus Service, which runs southbound on 2nd Avenue and northbound on 1st Avenue.

From March to November 2010, the tram closed for $25 million worth of renovations.[96] Service improvements include new and sturdier tram cars with wider windows, two cars that run independently of each other, and a faster ride. The system's expected lifespan was also extended by 30 years. Future renovations will now be easier because of the ability of the two cars to run independently of each other.[97]

Table 3.10 summarizes vital statistics for ferry and tram service providers in the NYMTC planning area.


TWA Flight Center designed by Eero Saarinen, JFK Airport, New York City

5. Air Travel

AIRPORTS

In 2010, over 104 million air passengers passed through the Port Authority of New York and New Jersey's major airports – John F. Kennedy International (JFK), LaGuardia and Newark Liberty International (Newark) – in 2010. JFK International Airport was used by over 46.5 million commercial passengers in 2010, while LaGuardia Airport was used by nearly 24 million passengers. In August 2010, JFK and LaGuardia airports had an average of nearly 1,100 scheduled daily nonstop departures.

Commercial air travel is available at four airports within the NYMTC planning area: JFK Airport and LaGuardia Airport, both in New York City and both operated by the Port Authority of New York & New Jersey; Westchester County Airport near White Plains, operated by Westchester County; and Long Island MacArthur Airport in Suffolk County, operated by the Town of Islip. Although outside the NYMTC planning area, Newark Liberty International Airport in New Jersey is the metropolitan area's other major airport. Stewart International Airport, near Newburgh in Orange County, serves areas to the north and west of the NYMTC planning area. Teterboro Airport in New Jersey is perhaps the region's best-known general and corporate aviation airport. General aviation reliever airports service smaller and slower aircraft and thus relieve congestion at the major commercial airports. In addition, Republic Airport, Brookhaven Airport, Gabreski Airport and Spadaro Airport in Suffolk County also serve general aviation traffic. Taken together, these airports are among the busiest in the nation.

Air freight facilities are available to private carriers at JFK and Newark airports. Both FedEx and UPS operate parcel hubs at Newark Airport, but JFK maintains its prominence as one of the nation's largest air cargo facilities by volume. Located in one of the busiest regions in the world for goods transport by air, these airports provide intermodal freight facilities to handle and transfer goods to and from other cities, and to local distribution centers, warehouses, and customers.

AirTrain / JFK is an automated rapid transit system serving JFK airline terminals, parking lots, hotel shuttle areas and rental car facilities, and connecting the airport to the MTA transit system. AirTrain / JFK set an annual record for ridership in 2011, carrying approximately 5.5 million passengers – more than double the 2.6 million passengers carried by the system in 2004, its first full year of operation. This rail line provides connections to the NYC Subway system and the LIRR at Jamaica.

Although outside the NYMTC planning area, in November 2007 the Port

Authority also assumed responsibility for Stewart International Airport, 60 miles north of New York City and immediately west of Newburgh. Terminal and access improvements were undertaken by both the Port Authority and the New York State Department of Transportation. In December 2007, the Port Authority earmarked $500 million for improvements to Stewart in its 10-year capital plan. By November 2010, the airport had received a Federal Inspection Service, allowing it to process international travelers. Limited bus service to the Beacon Metro-North railroad station provides a connection to the regional transit network. The Port Authority is continuing efforts to entice additional carriers and destinations to the airport flight schedule.

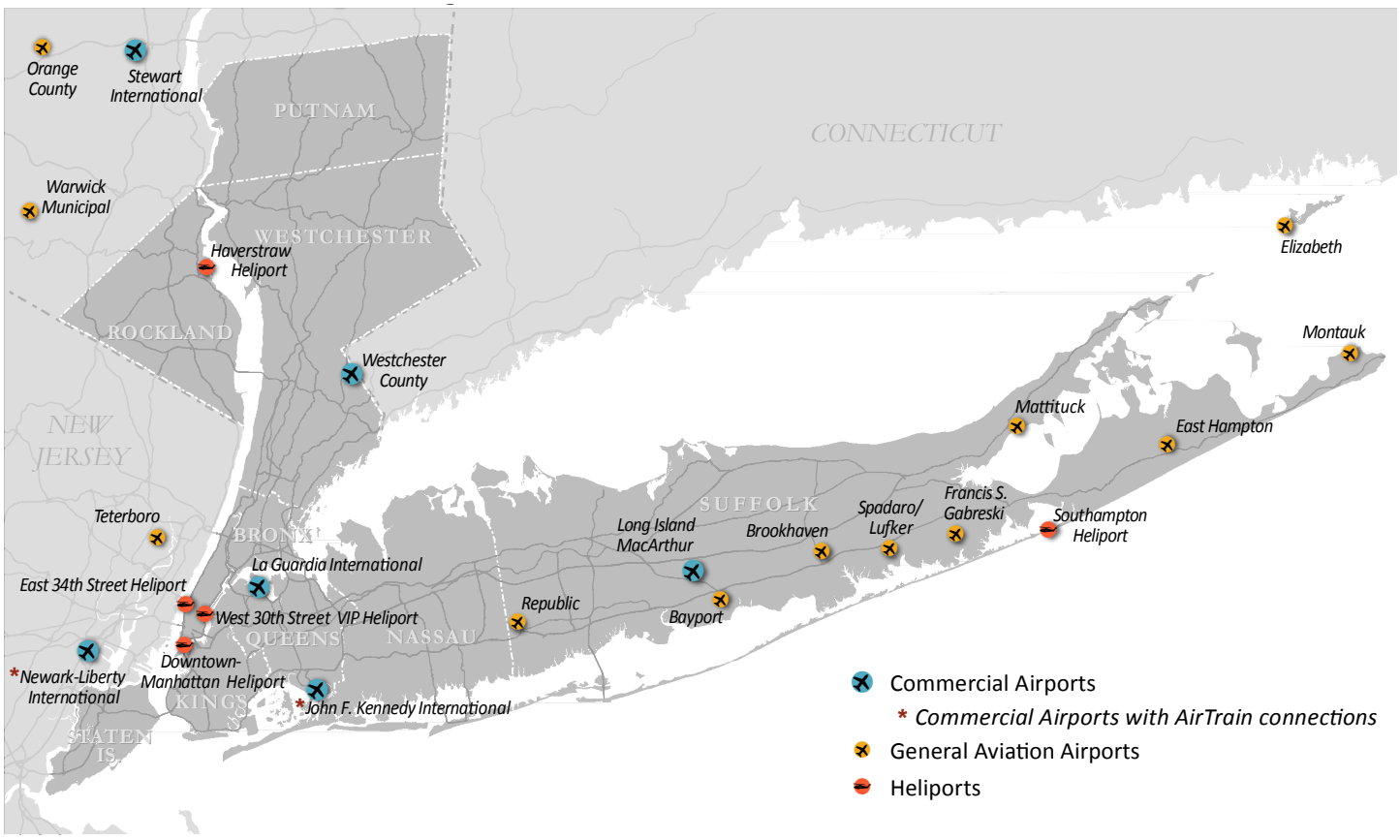
HELIPORTS

New York City has three main public heliports – Downtown Manhattan/Wall Street, East 34th Street owned by the New York City Economic Development Corporation (NYCEDC), and West 30th Street, owned by the Hudson River Park Trust, generating over 106,000 flights from fall 2011 to fall 2012.[98] The majority of these flights were for air-taxi service, followed by commercial, itinerant and military operations. There are also a number of heliports serving medical and police purposes.

Sightseeing in the city by helicopter is appealing to tourists. In April 2010 NYCEDC announced a new Helicopter Sightseeing Plan to minimize the noise and reduce the impact that sightseeing flights have on surrounding neighborhoods.[99] Helicopter sightseeing tours generate approximately $45 million each year for the City's economy and employ over 300 people.[100]

Several publicly- and privately-owned heliports are located throughout the NYMTC planning area. Some are connected with corporations such as IBM in Westchester and Cablevision in Suffolk, and others are for private and public use. The Haverstraw Heliport in Rockland County and the Southampton Heliport in Suffolk County are the only two public heliports outside of New York City, reporting nearly 2200 and 400 flights respectively during the 2009-2010 year.[101] Within the Nassau, Suffolk, Westchester, Rockland and Putnam counties there are over 50 heliports for private and public use.[102]

Air Travel Facilities in the NYMTC Planning Area



Bike share station in Lower Manhattan


Bike lane, downtown White Plains

6. Pedestrian and Bicycle

Walking and bicycling are among the most sustainable forms of transportation, providing residents in the area with the means for commuting and recreation. Nearly half of the commuters in the NYMTC planning area rely on walking or bicycling as a means of travel to work, in whole or in part.

USER VOLUMES

According to 2010 U.S. Census, the NYMTC planning area has a total population of 12,368,525 residents, an increase of 2.5 percent from 2000; with the total number of workers increasing by 8.6 percent. Table 3.11 shows the Means of Transportation data which are one-year estimates obtained through the American Community Survey (ACS). The ACS one-year estimates capture the most current data and analyzes populations of 65,000 or more. Bicycle commuting has seen substantial growth with a 73 percent increase (18,575 to 32,118) from 2000 to 2010, however, regional bicycle commuting is less than a half percent of all commuters. The number of people walking to work increased 8.7 percent (381,714 to 415,000) though as a percentage of workers, it remained the same at 7.5 percent

EXISTING FACILITIES

Long Island

There are 434 miles of existing on-road and off-road bicycle facilities on Long Island. The bicycle facilities fall under multiple jurisdictions and include NYSDOT Region 10, New York State Parks, Recreation, and Historic Preservation, the State University at Stony Brook, and local municipalities. Region 10 encompasses Nassau and Suffolk Counties.

Approximately 40 percent of Long Island's bicycle facilities are under NYSDOT Region 10's jurisdiction, which includes 159 miles of on-road bicycle facilities and 31 miles of off-road shared use paths. New York State Parks and Historic Preservation has another 20 miles of mostly off-road bicycle facilities which constitutes nearly 5 percent of Long Island's bicycle facilities. The State University of New York has 4.6 miles of shared use paths constituting 1 percent of the Long Island bicycle network. The local municipalities as identified above have a combined total of 199 miles of on-road facilities and 27 miles of off-road facilities, which comprise 51 percent of the bicycling facilities on Long Island.

In July of 2012 the City of Long Beach kicked-off a bicycle share program with the opening of at least 16 kiosks with 400 bicycles that can be rented. There is an estimated 47 miles of sidewalks along state roads in Nassau County and 188 miles of sidewalks along state roads in Suffolk County. This does not include sidewalks along local roads and str***eets.***

Lower Hudson Valley

NYSDOT has established approximately 338 miles of bicycle routes in Region 8 which consists of the Lower Hudson Valley and encompasses: Westchester, Ulster, Rockland, Putnam, Dutchess, Orange and Columbia counties.

Region 8 is developing several greenway/pathway extensions. NYSDOT continues to work with the East Coast Greenway effort to assist in extending a greenway from Florida to Maine through Westchester County. Rockland County has been actively working with the Hudson River Valley Greenway effort, and has dedicated over 34 miles of the Greenway Trail. Region 8 is also installing bicycle racks at park and ride locations where there is a significant bicycling community, and is also working to encourage multi-modal connections in the region.

The existing regional bicycle and pedestrian trailways and pathways in Westchester County consist of off-road paths, road shoulders and bicycle routes along selected roads. Most off-road paths are multi-use, though some are restricted for pedestrian only. Paths along major roads and corridors are primarily intended for bicycle use. Pedestrian facilities also include extensive sidewalk networks in many Westchester communities. In 2012, the City of White Plains designated a 1.6 mile one way pair of on-street bike lanes on Martin Luther King Boulevard and South Lexington Avenue, linking residential areas of the city with the downtown, Metro-North Railroad station and Bronx River pathway.

New York City

NYSDOT, Region 11 has established policies and procedures to ensure that pedestrian/bicycle needs are accommodated at the early stages of a project development. This strategy by NYSDOT has enhanced New York City's pedestrian/bicycle network over the years with for example the Bronx River Greenway and the Route 9A Walkway/Bikeway projects.

For over a decade, New York City has been expanding its network of bicycle lanes, shared lanes and on-and-off street bicycle paths. In June 2009, NYCDOT accomplished the goal of building 200 miles of bicycle facilities in all five boroughs within three years, nearly doubling the citywide on-street network. By the end of 2011, more than 539 lane miles of on-street and bridge bicycle facilities had been installed or upgraded throughout the city. Of this total, more than 21 lane miles are on-street bicycle paths physically separated from vehicular traffic. Currently in New York City there are over 160 miles of greenway paths.

In 2011, NYCDOT's CityRacks Program installed over 13,000 bicycle racks (26,000 parking spaces) since the program began. In addition, since 2007, 19 sheltered bicycle parking structures have been installed, which protect parked bicycles from the elements. New York City also launched Citi Bike, a bike share program, in the spring of 2013. It is a self-service transportation system that provides access to a network of 10,000 bicycles distributed in 600 stations in Manhattan, Brooklyn and Queens.

New York City is one of the nation's great walking cities, with its walking opportunities and robust transit system. Each year almost 2,000,000 square feet of sidewalk gets repaired by NYCDOT. In addition, many of the 787 bridge structures maintained by NYCDOT have amenities for pedestrians and bicyclists. Ongoing street furniture programs help enliven the city streets, such as the installation of 3,300 bus shelters throughout the five boroughs as part of the consolidated street furniture franchise contract; the construction of newsstands at no cost to the stand operator (funded by advertising panels); a bench program, which offers seating at bus stops and along retail corridors; a new wayfinding system that helps pedestrians navigate various neighborhoods; an art program that installs temporary creations on city streets; and streetlights that add to the illumination of the building facades along the city streets. In addition the New York City Department of Parks and Recreation has committed to planting 1 million trees and greatly expanding the number of street trees that bring shade and other environmental benefits to pedestrians.

A full discussion of pedestrian and bicycle initiatives appears in *Plan 2040: Appendix 2*.

Table 3.11

Means of Transportation to Work by County of Residence:
2000 Journey to Work Census Data and 2010 American Community Survey (ACS)
One-Year Estimates Data

Counties	*Walked*		*Bicycled*		*Total Workers*		*Percentage of Workers Walking*		*Percentage of Workers Bicycling*	
	2000	**2010**	**2000**	**2010**	**2000**	**2010**	**2000**	**2010**	**2000**	**2010**
Nassau	16,760	17,610	1,345	1,573	619,586	626,842	2.7	2.8	0.2	0.3
Suffolk	11,081	9,582	1,457	1,793	670,406	704,250	1.7	1.4	0.2	0.3
Total: Long Island	**27,841**	**27,192**	**2,802**	**3,366**	**1,289,992**	**1,331,092**	**2.2**	**2**	**0.2**	**0.3**
Westchester	17,180	19,383	472	739	425,052	444,428	4	4.4	0.1	0.2
Putnam	770	n/a	80	n/a	48,167	n/a	1.6	n/a	0.2	n/a
Rockland	3,659	4,152	197	96	132,302	137,430	2.8	3	0.1	0.1
Total: Lower Hudson Valley	**21,609**	**23,535**	**749**	**835**	**605,521**	**581,858**	**3.6**	**4**	**0.1**	**0.1**
Bronx	30,076	38,166	987	1,997	415,075	507,594	7.2	7.5	0.2	0.4
Kings	78,933	91,334	4,846	12,130	901,027	1,067,431	8.8	8.6	0.5	1.1
Queens	52,776	55,220	2,417	5,083	931,709	1,019,618	5.7	5.4	0.3	0.5
New York	164,934	173,499	6,410	8,707	753,114	823,612	21.9	21.1	0.9	1.1
Richmond	5,545	6,054	364	n/a	191,145	197,333	2.9	3.1	0.2	n/a
Total: NYC	**332,264**	**364,273**	**15,024**	**27,917**	**3,192,070**	**3,615,588**	**10.4**	**10.1**	**0.5**	**0.8**
TOTAL	**381,714**	**415,000**	**18,575**	**32,118**	**5,087,583**	**5,528,538**	**7.5**	**7.5**	**0.4**	**0.6**

The George Washington Bridge at night spanning the Hudson River from New Jersey to Upper Manhattan.

7. Automobile Travel

ROADWAYS

Functional classification is the process by which roads, streets, and highways are grouped into classes according to the character of service they provide. In New York State there are currently seven functional classifications which are further distinguished as urban and rural yielding fourteen distinct designations. All of the classifications are Federal Aid eligible except three: Urban Local, Rural Minor Collector, and Rural Local (codes 19, 08, and 09, respectively). The respective classes and codes are shown below (the FHWA codes do not contain the urban/rural distinction).

The NYMTC planning area has 32,172.6 lane-miles of arterials, collector roadways and local roadways that serve visitors and the 12 million residents of the region. Many of those roadways see heavy traffic daily, and are part of the aging infrastructure that the NYMTC region is dealing with as it works to upgrade and repair the system.

Local roadways are unique in that people use them by all modes – whether by bus, on foot, on bicycle, or in a vehicle. Local roadways make up 80 percent of the public space available in the NYMTC region, and adjacent land uses depend on parking, bus stops and foot and bicycle traffic to support commerce.

NYMTC member agencies work to meet multiple goals pertaining to the rights-of-way on local roadways in the region. The projects they fund with federal support reflect these multiple goals, such as reducing congestion, improving air quality, improving the quality of life, and increasing safety. In New York City for example, NYCDOT resurfaces 1,000 lane-miles of local roads each year, in addition to regularly maintaining all roadways in cooperation with the New York City Department of Sanitation. NYCDOT also inspects all pedestrian bridges regularly as part of its asset maintenance planning.

Fourteen Interstate highways serve the region, linking to major cities in all directions. In particular, I-95 connects the region to the rest of the eastern seaboard. I-80 and I-78 connect the New York metropolitan area to the Midwest, I-84 and the future I-86 connect the NYMTC region to New York's Southern Tier and northern Pennsylvania, and I-87 (the New York State Thruway) reaches north to upstate New York and Canada.

Table 3.12

Functional Classification Codes	NYS Codes Urban	NYS Codes Rural	FHWA Codes
Principal Arterial - Interstate	11	1	1
Principal Arterial - Other Freeway/Expressway	12	2	2
Principal Arterial - Other	14	4	3
Minor Arterial	16	6	4
Major Collector	17	7	5
Minor Collector	18	8	6
Local	19	9	7

These major highways are vital to the region's economy, providing access to both raw material producers and finished goods suppliers across the nation. Interstate highways also link the NYMTC region to foreign trading partners in Canada, Mexico, and the Pacific Rim (via West Coast ports). On a regional scale, these Interstate highways combine with 14 expressways and 36 parkways to support regional automobile and truck travel, including commuter trips by car and bus, shopping and recreational trips, business-related trips, and distribution of freight and consumer goods by trucks and delivery vans. High Occupancy Vehicle (HOV) lanes in the NYMTC

Dynamic message sign in Suffolk County.

region such as along I-278 in Staten Island and Brooklyn offer carpoolers travel time savings and help improve regional air quality by incentivizing a reduction in single-occupancy vehicles. A comprehensive local street network serves as the final link in long-distance and regional trips while supporting local travel by buses, trucks, bicycles, taxis, and private automobiles. I-287 has been undergoing a 10-year update by NYSDOT. Local traffic is being separated from highway traffic by means of service roads paralleling the highway, and exits 8 and 8E are also being reconfigured to improve traffic flow.

New signs have been installed on the Long Island Expressway (LIE) informing drivers of the estimated time it takes to get to the next exit, and whether or not to expect delays. The signs were added to 19 locations on the expressway. Meanwhile, a seven-mile stretch of the road between exits 35 and 41 averages between 169,000 and 222,000 drivers per day and, as a result, requires improved lighting, increased pull-off areas, and better conditions for police officers. Portions of the LIE within Suffolk County will also see the addition of steel cable barriers such as those being installed on an 11-mile stretch in Brookhaven. The town of Riverhead will receive them by 2015.

New York City received federal TIGER funds to study the 1.3-mile Sheridan Expressway in the Bronx. The multi-agency effort involves working with residents, elected officials, and area businesses to develop recommendations for a more viable relationship between vehicular access and the needs of the surrounding community. Results from the study will feed into NYSDOT's study of the state-owned expressway. In addition to analyzing the transportation network, New York City's study looks at potential land use development in the area. The goal of New York City's study is to chart a way forward with New York State that will balance the needs for community infrastructure, revitalization and open space with those for better commercial vehicle access and improved infrastructure for the Hunts Point Market and other businesses.

BRIDGES

Millions of vehicles per day within the NYMTC region travel on bridges, ranging from small crossings to larger bridges such as Tappan Zee Bridge, which connects Rockland and Westchester counties. None of the bridges in the 10-county region are rated among the worst in the country. Suffolk, Richmond and Nassau counties maintain the lowest percentage of deficient bridges in the state, while the Bronx has the highest in the region (18.5 percent).

Bringing both I-87 and I-287 over the Hudson River, the Tappan Zee Bridge is an important link on the New York State Thruway system. However, the bridge carries more traffic now than was expected when it was first built, while maintenance is becoming costly. To remedy these increasing costs, the bridge replacement was nominated for an expedited federal environmental review in 2011. Construction of the replacement bridge could start as soon as 2013 and will take about 4 years to complete.

The Henry Hudson Bridge, which connects the Bronx and Manhattan, is currently undergoing a three-year, $33 million replacement project. The project replaces steel curb stringers (longitudinal beams that support the bridge deck) on the upper roadway in several phases, allowing cars continuous use of the bridge. One side of the bridge will be done at a time, maintaining passenger movement; the pedestrian walkway will also stay open through construction. The construction is expected to be complete in 2015.

A new ramp between Randall's Island (which lies between East Harlem in Manhattan, the South Bronx, and Astoria in Queens) and the Robert F. Kennedy (Triborough) Bridge opened on April 5, 2010. The ramp is connected to the south- and eastbound lanes, allowing drivers from the Bronx access to the island. The goal is to reduce congestion on other parts of the bridge while improving overall traffic flow and providing increased access to parkland.

In order to improve traffic flow on the Throgs Neck Bridge, connecting Queens and the Bronx, a new traffic pattern was constructed on the Bronx-bound ramp. The new pattern is a trial project being tested as the $100 million approach roadway deck replacement project comes to a close. By adding a second lane and moving the merge point, the MTA hopes to reduce crashes as well as to keep traffic moving.

Four new designs have been released for the replacement of the Kosciuszko Bridge, which connects Brooklyn and Queens via the Brooklyn-Queens Expressway. The new bridge, no matter which design is chosen, will have greater capacity than the existing bridge by providing five Brooklyn-bound lanes and three Queens-bound lanes. The bridge will also include a pedestrian walkway and a bike path. Construction is expected to start in 2014, and may cost up to $1.7 billion.

The Alexander Hamilton Bridge Rehabilitation Project is the largest single-contract construction project in the history of the New York State Department of Transportation and is being funded almost entirely by federal funding. The bridge spans the Harlem River and connects Manhattan and the Bronx. Construction began in the spring of 2009 and is scheduled to continue until the end of 2013. The bridge rehabilitation involves many different elements of construction. The deck of the bridge will be completely replaced with a new concrete deck. The project also involves retrofitting (strengthening) the steel arch span and steel support beams that make up the substructure of the bridge. The steel will additionally be painted in order to protect it from the weather and the support piers and foundation will be replaced or repaired. Furthermore, park areas around the bridge will be redesigned and improved.

The Willis Avenue Bridge, which connects 1st Avenue at 125th Street in Manhattan with Willis Avenue in the Bronx, was completely replaced in July 2010 by NYCDOT. This marks the end of a $612 million project to replace the bridge, put out to bid in 2007. Replacement was necessary because of years of wear and tear due to the high volume of cars that use the bridge every day. The bridge was built near Albany and floated down the Hudson River before being set in place.

PRIVATE VEHICLE TRAVEL

The NYMTC region is home to approximately 6,371,000 licensed drivers, 4,749,000 registered private vehicles and over 204,000 commercial vehicles. Population and employment trends, as well as other socioeconomic conditions within the region play an important role in private vehicular travel. As population and employment grow, so does the need to facilitate the movement of people and goods.

NYMTC forecasts significant growth in employment for the year 2040, over 23 percent. The Lower Hudson Valley is expected to have the largest percentage of employment growth in the NYMTC planning area. Furthermore, New York City's strong economic output will produce an increase in commuting and transport of goods. Vehicular travel is

Table 3.12

Summary of Toll Rates at MTA Crossings, 2008-2013

		Before July 12, 2009	12-Jul-09	30-Dec-10	3-Mar-13
Verrazano-Narrows Bridge*	Cars	$10.00/$8.30	$11.00/$9.14	$13.00/$9.60	$15.00/$10.66
	Trucks	$20.00/$15.30	$22.00/$16.50	$26.00/$17.32	$30.00/$19.24
Major crossings	Cars	$5.00/$4.15	$5.50/$4.57	$6.50/$4.80	$7.50/$5.33
	Trucks	$10.00/$7.50	$11.00/$8.25	$13.00/$8.66	$15.00/$9.62
Henry Hudson Bridge	Cars	$2.75/$1.90	$3.00/$2.09	$4.00/$2.20	$NO CASH/$2.44
	Trucks	No Trucks Allowed	No Trucks Allowed	No Trucks Allowed	No Trucks Allowed
Rockaways bridges**	Cars	$2.50/$1.55	$2.75/$1.71	$3.25/$1.80	$3.75/$2.00
	Trucks	$5.00/$3.75	$5.50/$4.13	$6.50/$4.33	$7.50/$4.81

expected to rise throughout the region, with Putnam County and Staten Island seeing the greatest increases.

TOLLING

Transportation infrastructure funding has come under increasing pressure in recent years, leading to a search for new funding streams. One option, which has been proposed numerous times but never implemented, is to toll the NYCDOT-owned East River bridges.[103]

Two sets of toll increases at Port Authority crossings have occurred over the past 5 years. In March 2008, the E-ZPass toll on Port Authority crossings increased from $4.00 to $6.00 during off-peak hours and from $5.00 to $8.00 during peak hours. Low-emission vehicles, however, were able to register for a "GreenPass" which kept their tolls at $4.00. Faced with decreased revenue and a lengthy list of critical infrastructure needs, the Port Authority approved the following rate hikes: a $1.50 E-ZPass toll hike in September 2011, followed by an additional $0.75 increase each year through 2015; a $2.00 per axle toll increase for trucks in September 2011, followed by an additional $2.00 increase each year through 2015. (Additional surcharges applied to cash fares, but in February 2010 the Port Authority authorized buying new toll collection equipment which would accommodate cashless tolling in the future.) In 2013, the E-ZPass toll for cars is $8.25 during off-peak hours and $10.25 during peak hours, while the cash toll is $13.00.

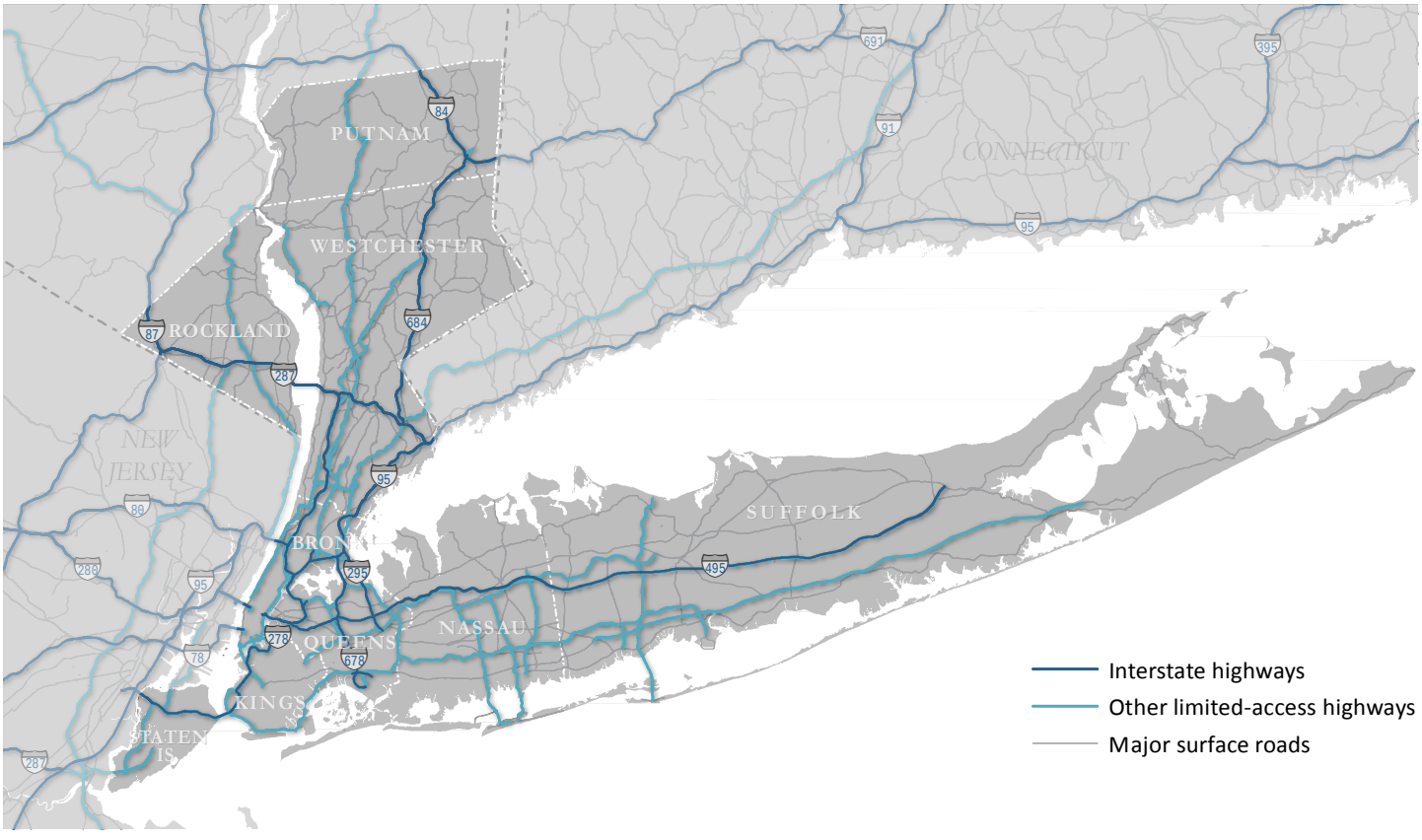
Toll increases on MTA crossings have occurred three times over the past 5 years. Exhibit 3-7 summarizes these changes below.

TAXICABS AND LIVERY CABS

Taxis and livery vehicles are an important part of the region's transportation system, both in Manhattan, where they are a primary mode of transportation for many trips, and in outlying areas where they provide important links to and from train stations and offer mobility to population segments that cannot or do not wish to drive such as the elderly. Recent developments related to taxis and livery cabs may reshape and expand their transportation roles within New York City. Taxis also operate outside New York City within the NYMTC region, although not with the same degree of frequency.

Present in great numbers throughout New York City, especially Manhattan, the yellow taxicab is a vital mode of intracity transportation. There are more than 13,000 taxicab medallions in New

Interstate and Limited-Access Highways in the NYMTC Planning Area



York City, providing service at all hours. Due to the consistent wear and tear on the taxis as a result of long hours of continuous driving, start-and-stop traffic and overall heavy usage, about 3,000 taxicabs are replaced every year.[104]

New York City's mayor announced a contest to design the "Taxicab of the Future," with three main manufacturers competing. The van-style taxi by Nissan (NV200 model) was selected and will begin to enter service in 2013. As part of the mayor's push for a "greener" city, these taxis are more fuel efficient, include better passenger safety features, and are expected to have a smoother ride for the passenger. Efforts are also being made to make taxis more ADA (Americans with Disabilities Act) compliant.

A recent a plan to launch new street-hail taxi service for northern Manhattan and the four other boroughs, by allowing livery cabs to be hailed as are traditional taxis, was halted in June 2012 by a New York State judge, who ruled that the city and state Legislature violated the so-called home rule provision of the state constitution. (The clause says the state may pass a law directly affecting the affairs of a single municipality only if that city's legislative body has voted to allow it.)[105]

This Genset train was purchased with CMAQ funds and is used by CSX out of the Oak Point Yard in the Bronx.

8. Rail Freight

History and geography have combined to limit rail freight access between the NYMTC planning area and points south and west (for more information on freight please see *Plan 2040: Appendix 8* for the Regional Freight Plan - Interim Plan Summary Report). Six of the 10 NYMTC counties are on islands east of the Hudson River and Arthur Kill; only Rockland lies west of the Hudson. While eight vehicular bridges and tunnels span the Kill Van Kull and the Hudson River within the NYMTC planning area, only the Arthur Kill Lift Bridge brings rail freight traffic to Staten Island from the national rail network in New Jersey and beyond and that rail service is limited to Staten Island. In 1974 a fire closed the Poughkeepsie railroad bridge which was the only rail crossing between New York City and Albany.[106] Since then, to reach anyplace in the NYMTC planning area except Staten Island, freight trains have traveled north up the West side of the Hudson, across the Hudson using the Castleton Cutoff, and then back down the East side of the Hudson (sharing commuter rail track), a detour of 240 miles.

East of the Hudson much the regional rail network is primarily dedicated to passenger service. This contributes to the NYMTC planning area shipping only approximately one percent of its freight by rail. However, the PANYNJ has taken steps to encourage more freight. In September 2008, PANYNJ bought New York New Jersey Rail LLC, a company that transfers rail cars by barge between the Greenville Yards in Jersey City and the 65th Street Yard in Brooklyn. The Port Authority also embarked upon a $118.1 million expansion of the facility to allow it to handle significantly higher volumes, including foodstuffs, lumber and construction materials, biodiesel, and plastics eastbound and scrap metals, autofluff, and municipal solid waste westbound. Planned improvements include new, larger carfloats, a replacement transfer bridge, new locomotives, new fendering in Greenville and Brooklyn, and new supporting track. The project is projected to take 360,000 trucks off the road annually, freeing up space in trans-Hudson tunnels and bridges.

Staten Island has also played a large part in converting truck freight to rail freight. Following the creation of ExpressRail at the New York Container Terminal in northwest Staten Island, the terminal saw an increase from 451 containers moved by rail per month in 2007 to more than 5,000 per month in 2008. Capacity for the new facility is 100,000 containers a year. Five tracks in the facility (with plans to expand to eleven) connect to the reactivated Staten Island Railroad, which connects to the Conrail Main Line in Elizabeth, NJ New York Economic Development Corporation, on behalf of the New York Container Terminal in Staten Island, also received $1.55 million in order to replace one locomotive with a new, environmentally friendly model.[107]

Less than one percent of freight on Long Island is shipped by rail.[108] However, ef-

forts are being undertaken to increase that percentage. In September 2011, Suffolk County saw its first new rail yard in Yaphank, called the Brookhaven Rail Terminal. The $40 million facility accepts rail freight, which is then transferred to trucks for local delivery. The goal of the facility is to reduce traffic and emissions from 40,000 trucks annually by reducing truck trips to short-haul and local trips originating at the terminal.[109] Space at the facility exists for expansion. A restored spur off the Long Island Rail Road Main Line to the western edge of Enterprise Park at Calverton also opened in September 2011. Future phases could bring the spur through the business park to connect to more businesses.[110]

Rail freight on Long Island is carried by the New York & Atlantic Railway, a subsidiary of Anacostia & Pacific Company, Inc., or trucks owned by LIRR.[111] In order to cut down on idling engines in Glendale, the New York & Atlantic Railway will spend $1 million to install devices that reduce emissions and make the trains quieter by cutting down on idling time.[112]

Meanwhile, a CSX Corporation freight train facility situated in Middle Village, Queens will be moved to a less residential area, which is several hundred feet southwest of 69th Street near All Faiths Cemetery. The trains carry municipal solid waste, and occasionally idle in the neighborhood. After complaints by residents about noise and odors, NYSDOT and CSX reached an agreement to move and divide the facility.[113] One staging area will be moved closer to the All Faiths Cemetery while the second staging area will be relocated less than 500 feet from its current location.

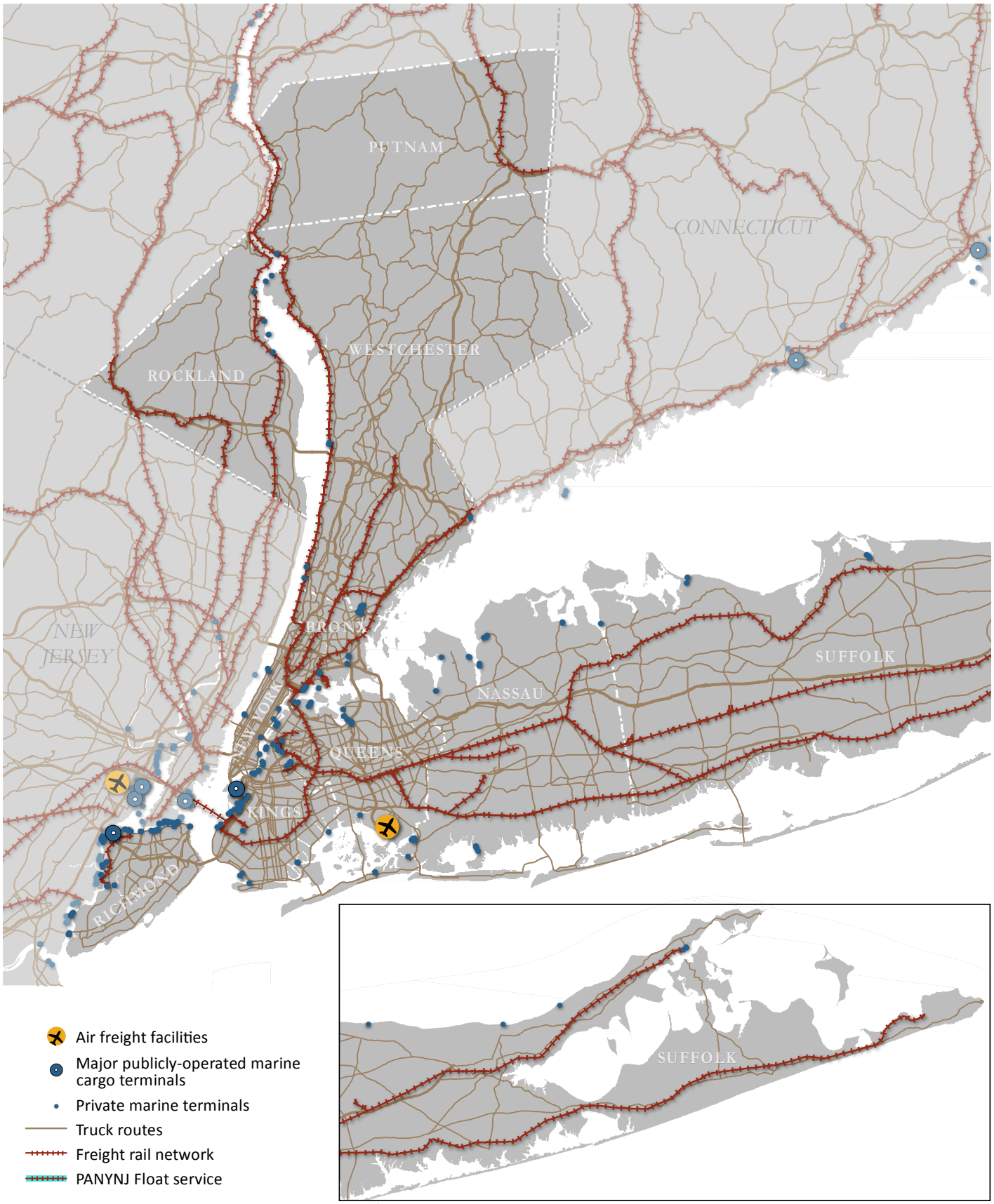
Fourteen grade crossings will be examined by CSX, New York State and Rockland County in order to improve safety. The $8 million project will install crossing gates and other safety measures to create a "Quiet Zone"; without these gates, CSX is required by law to sound its horns as it passes through the intersection. The goal of the project is to improve rail freight movement through the county, and also keep pedestrians and drivers safe while improving quality of life.[114]

Along with track improvements, CSX bought four Generator Set (gen-set) locomotives for its Oak Point Yard in the Bronx using NYMTC Congestion Mitigation Air Quality (CMAQ) funding. These locomotives reduce nitrous oxide and particulate matter emissions by 80 percent while also reducing carbon dioxide emissions.[115] This is part of a CSX systemwide locomotive upgrade. Also at the Oak Point Yard, CSX will rebuild track and increase clearances by using funds from NYSDOT.[116]

In June 2011, NYSDOT and the CUNY Institute for Urban Systems released its *Consideration of Potential Intermodal Sites for Long Island* report. The document considers various locations throughout Long Island for a rail/truck freight facility. Thirteen locations were studied in both Nassau and Suffolk counties. Criteria ranged from necessity to amount of free space to accessibility to the LIRR. Ultimately, the report recommends the Pilgrim State Hospital site due to its central location on Long Island, its connection to the LIRR, and its large size.[117]

Another notable project is the development of freight villages in the NYMTC planning area. As the volume of freight increases in the NYMTC planning area, efforts are being made to utilize existing older industrial sites as staging areas for improved and more efficient distribution areas. These areas, commonly referred to as freight villages, will include not only the more traditional distribution functions but also facilities for taking semi-finished goods and creating customized finished products. This complete approach to distribution and product development will promote the rational and efficient use of land, relieve traffic congestion among freight vehicles and promote economic development by increasing job opportunities.

Freight Transportation Networks in the NYMTC Planning Area



Brooklyn-Queens Expressway in Downtown Brooklyn

9. Trucking

Trucks carry the vast majority of freight in the NYMTC planning area, transporting up to 80 percent of all freight tonnage (please see *Plan 2040: Appendix 8* for the Regional Freight Plan - Interim Plan Summary Report). Truck traffic is expected to grow, with estimates ranging from a 39 percent increase by 2035 to a 47 percent increase from 1998 levels by 2025. Improving freight access across the region is a key initiative for NYCDOT and its regional partners. There are approximately 5,800 miles of streets within the five boroughs of New York City, including approximately 930 miles of truck routes. To help truck drivers navigate to their destinations in the City, NYCDOT produces a truck route map and a parkways guide which identify the legal routes for trucks in New York City. Additionally, regulatory and guidance signage are provided to direct trucks to these routes.

Trucks are restricted in many parts of the NYMTC planning area. For example, trucks are not allowed on most parkways in New York State, due to the relatively low clearance of the bridges and roadways. This restriction causes trucks to rely on already congested roads in the NYMTC planning area. In 2006, congestion was estimated to cost the New York City economy $13 billion annually as people and goods were stuck in slow-moving traffic. A lot of that daytime congestion is created by trucks utilizing the streets while making deliveries.

NEW YORK CITY SUSTAINABLE DELIVERY INITITIVES

To facilitate truck mobility by reducing the impact of goods movement during the most congested periods of the day, NYCDOT has implemented two programs to address congestion related to truck deliveries: Delivery Windows and NYC deliverEASE.

Delivery Windows establishes dedicated truck loading and unloading zones dur-

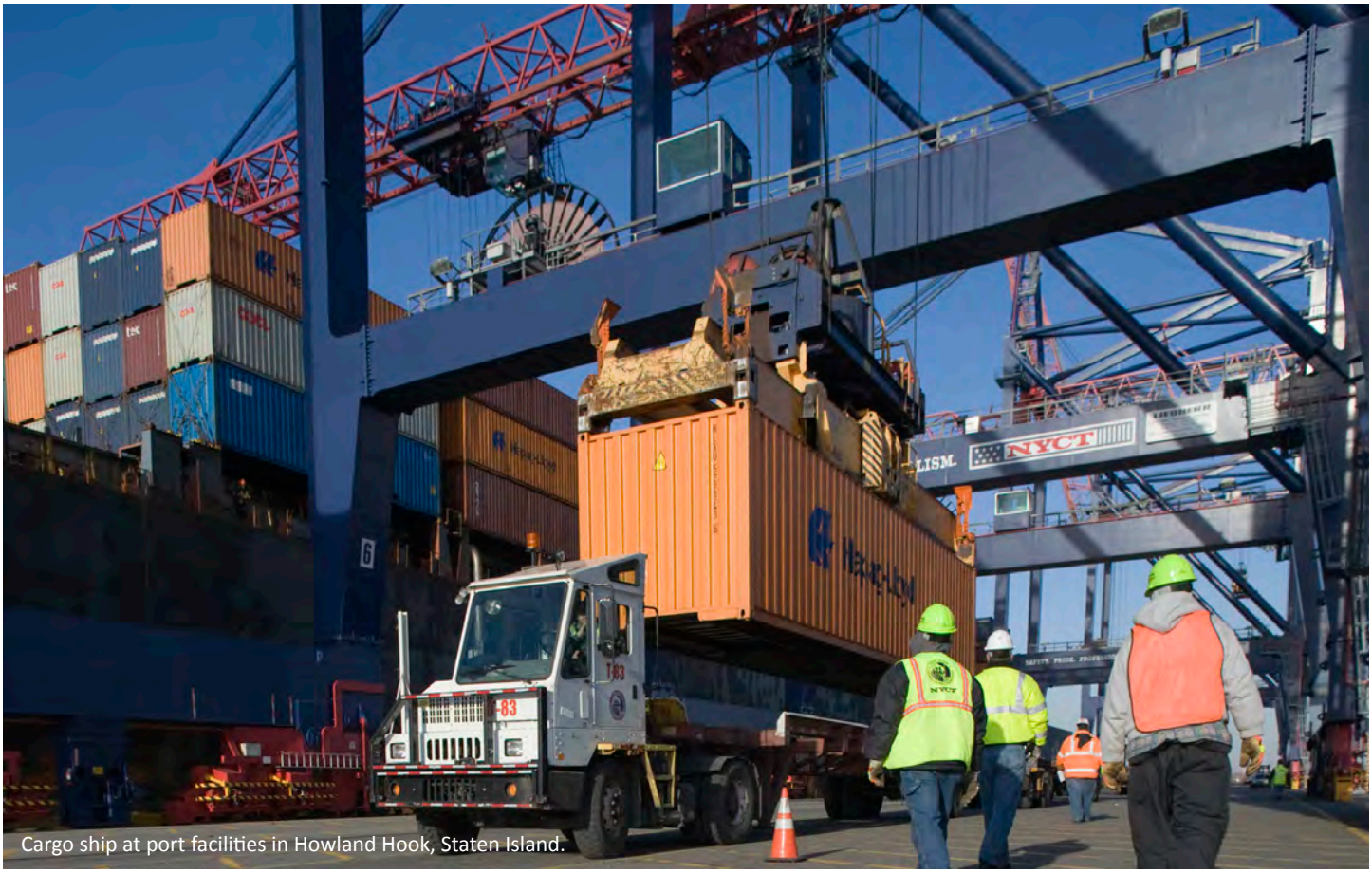
ing peak delivery hours in the morning and allows passenger vehicles to park outside of the Delivery Window hours. Delivery Windows are typically installed alongside other NYCDOT efforts to manage curb access and traffic congestion such as: bus rapid transit (i.e. Select Bus Service), curbside bike lanes, Park Smart peak-rate parking programs, and congested corridors programs. In 2010, a Delivery Windows program was implemented on a section of Church Avenue in Brooklyn to address congestion from double parking. Before the program was implemented, double parked trucks blocked traffic for more than three hours a day and travel speeds were less than 10 miles per hour along much of the corridor. The corridor experienced a 21 percent improvement in travel time within four months of the project being installed. The Delivery Windows program has also been implemented in locations in Manhattan and the Bronx and is being explored for congested corridors citywide.

NYC deliverEASE, a program funded by USDOT and initiated by NYCDOT and Rensselaer Polytechnic Institute (RPI), is an off-hour delivery program focused on reducing congestion during the day. By shifting deliveries to the off-hours, between 10:00pm and 6:00am, this program increases the competitiveness of the businesses located at the core of the city while also easing traffic congestion during the most congested hours of the day. In 2010, NYCDOT served as the lead coordinating agency for the USDOT Research and Innovative Technology Administration-funded Off-Hour Delivery Pilot. The Manhattan Off-Hour Delivery Pilot research team was led by RPI and included Rutgers University, the Rudin Center at New York University's Wagner School, and ALK Technologies. Participating businesses agreed to shift their deliveries to between 7:00pm and 6:00am. Businesses found that fewer deliveries during normal business hours allowed them to focus more on their customers, and improved staff productivity. Carriers found that their trucks could make more deliveries in the same amount of time, they saved money on fuel costs, they used a smaller fleet by balancing daytime and nighttime deliveries, and legal parking was more readily available. Their drivers reported feeling safer and less stressed. The pilot also demonstrated the viability for permanent implementation of off-hour deliveries on an expanded scale.

TRUCK PARKING

Truck parking is an important aspect of goods movement. A NYMTC study found that peak demand for truck parking often exceeds 100 percent of available capacity, meaning there are not enough spots for trucks within the region. If nothing is done to reduce parking demand, NYMTC anticipates that peak demand will more than double by 2030. When parking areas lack space, many trucks park along the shoulders of highways like I-84 or NY303 in Rockland County.

The same study found that nearly 60 percent of truck drivers interviewed had started their trips in New York and New Jersey, while 50 percent of their destinations were in either New York or New Jersey. The most cited starting points include Elizabeth and Newark, NJ; and the Bronx, and Farmingdale, while the most cited endpoints include Plattsburgh, the Bronx, Newburgh, and Brooklyn.



Cargo ship at port facilities in Howland Hook, Staten Island.

10. Waterborne Cargo

New York Harbor and its tributaries are home to one of the largest concentrations of public and private marine terminal facilities in the United States. These facilities serve containerized cargo, petroleum and chemicals, automobiles, and other critical commodities, as well as passengers utilizing the region's extensive ferry networks. Within this larger Port of New York/New Jersey (PONYNJ) district – which includes facilities in New York City, New York State, and Northern New Jersey –the Port Authority of New York & New Jersey (PANYNJ) and the City of New York are the main public facility operators, with private companies offering port services related to crude oil transport and passenger cruises (please see *Plan 2040: Appendix 8* for the Regional Freight Plan - Interim Plan Summary Report).

In New York City, there are three major publicly-owned port facilities, including the Howland Hook Marine Terminal (including the New York Container Terminal and Port Ivory rail yard), the Brooklyn-Port Authority Marine Terminal (including the Red Hook Container Terminal, Brooklyn Piers, and Brooklyn Cruise Terminal), and the South Brooklyn Marine Terminal. Hempstead in Nassau County and Port Jefferson in Suffolk County also handle significant volumes of freight, while several passenger ferry terminals mentioned above accommodate passenger traffic. Facilities outside the NYMTC planning area include the large terminals at Port Newark/Elizabeth as well as smaller niche and reliever ports at Port Jersey and The Peninsula at Bayonne Harbor in northern New Jersey; and the Ports of Stamford, Bridgeport, New Haven, and New London on Long Island Sound in Connecticut. In addition to these publicly-operated marine cargo terminals, a large number of private terminals operate along the waterfront in the region.

As economic conditions stabilized somewhat in 2010, the Port Authority reported a 16 percent increase in cargo traffic from 2009, bringing Port of New York and New Jersey activity nearly back to its record levels of 2007. Total cargo volume increased from 28.2 million metric tons in 2009 to 32.2 million metric tons in 2010. Twenty percent of the port's traffic is discretionary – that is, its cargo could be handled by other ports since its ultimate destination is not the New York metropolitan area.

The Port Authority has undertaken several initiatives to expand waterborne port

commerce and capacity. One major initiative in Staten Island was the June 2007 reactivation of the western portion of the Staten Island Railroad's North Shore Line under the name ExpressRail Staten Island. The rail link, which required rehabilitating the Arthur Kill Lift Bridge, connects the New York Container Terminal in Staten Island and the New Jersey's Chemical Coast Line, which in turn connects to the national rail network. By the end of its first year of operation, monthly container volume on ExpressRail Staten Island had grown from 451 to over 5,000, removing 70,000 trucks from the Goethals Bridge in its inaugural year. By 2009, the Port Authority was offering financial incentives to shippers using any of the ExpressRail network which includes trackage in Newark and Elizabeth, as well as Staten Island.

In late 2008, PANYNJ assumed responsibility for resuming the long-dormant Cross Harbor Freight Movement EIS, and also bought New York New Jersey Rail LLC and its rail carfloat assets. The agency secured FHWA approval to commit federal-earmark and PANYNJ matching funds to modernizing the service. Damage from Superstorm Sandy in late 2012 briefly set back steady progress in rebuilding car float volumes, but PANYNJ is advancing capital improvements in both states under a revised agreement with FHWA. In October 2009, PANYNJ extended its leases at the Howland Hook Marine Terminal (to 2058) and the Brooklyn cruise-ship terminal (for 20 years).

A more physical challenge faces the Port Authority at the Bayonne Bridge, which has a clearance of 151 to 156 feet above the Kill Van Kull. The next, taller generation of container ships, which are expected to access port facilities west of the bridge once an expansion of the Panama Canal is complete in 2014, would not be able to pass under the bridge. In September 2009, the Port Authority released a study by the U.S. Army Corps of Engineers, analyzing potential solutions to this problem. After a $1 billion commitment in September 2010, the authority announced that it had decided to increase the existing bridge's clearance to 215 feet by rebuilding the existing bridge deck, approaches and ramps at a higher elevation while preserving the span's iconic arch.

The Port Authority hopes to replace the existing span, which has four 10-foot-wide lanes, no shoulders, and no bicycle-pedestrian access, with a span that has six 12-foot-wide lanes, full shoulders, a sidewalk/bikeway, and separate room for a future transit service. A final environmental impact statement for the project was completed in August 2010, and the United States Coast Guard signed off on the project in January 2011.

Along with major expansion plans in New Jersey in 2008, the authority undertook several other port-related initiatives, many of them having to do with improving air quality. In 2008, the authority set an ambitious goal to be carbon-neutral by 2010 by making operational improvements and investing in low- or zero-emission energy-efficient infrastructure. Over the next two years, the authority provided financial incentives to freight operators who purchase new or retrofitted trucks with emission control technologies; replaced the most polluting older trucks; completed the dockside ExpressRail system; incentivized the use of low-sulfur fuel by oceangoing vessel operators, and provided onshore power for vessels docked at the Brooklyn Cruise Terminal.

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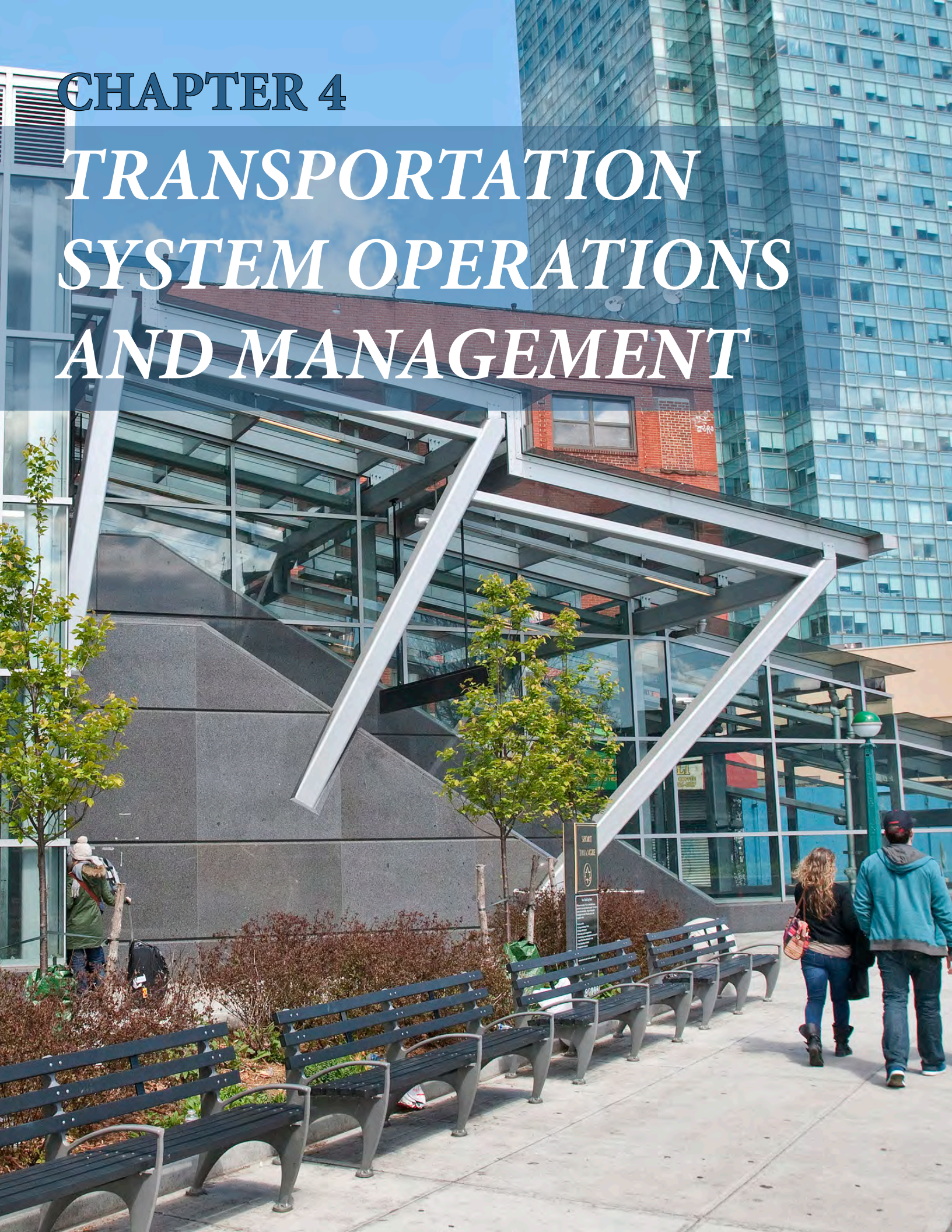
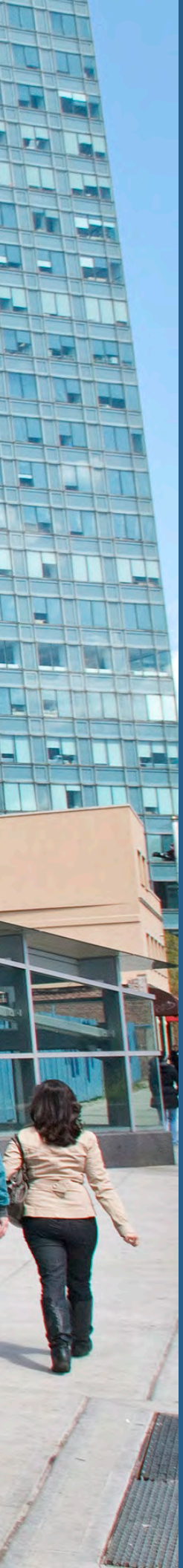
CHAPTER 4

TRANSPORTATION SYSTEM OPERATIONS AND MANAGEMENT





PLAN 2040
Chapter 4: Transportation System Operations and Management

MTA New York City Transit's new Court Square Station in Long Island City

NYCDOT Select Bus Service - pay before you board on the M15 on First and Second Avenues in Manhattan.

1. INTRODUCTION

Systems Management and Operations (SM&O) in the context of the regional transportation system outlined in Plan 2040, is an integrated program designed to optimize the performance of existing and future programmed transportation operational and physical infrastructure. The program involves implementing multimodal, intermodal, and often cross-jurisdictional systems, services, and projects intended to preserve capacity and improve security, safety and reliability. SM&O is to be distinguished from infrastructure "operations and maintenance," which focuses on maintaining and operating the transportation assets of operating agencies.

All of the SM&O improvements included in the following sections support the Shared Goals and Outcomes of Plan 2040 as described in Chapter 1. The management of traffic congestion within a safe transportation environment by Transportation Systems Management (TSM) and Transportation Demand Management (TDM) strategies aims to enhance air quality and the regional environment. Efficient transportation operations improve mobility and minimize travel times and travel costs, and support a highly competitive regional economy. The NYMTC planning area's transportation system is very extensive and includes all transportation modes. Enhancements to the multi-modal transportation system provide travelers with additional transportation choices in the region. These improvements, combined with convenient access and flexible options are intended to serve commuters and recreational travelers equally and help lead to higher-quality communities with improved quality of life. While rehabilitation and modernization of the existing transportation infrastructure requires continued investment, funding is not always available for implementing all of the needed improvements. Therefore, implementation of major projects needs to be prioritized through long-term planning and agency coordination. All transportation improvement strategies described in this chapter seek to provide a safe environment for the public and preserve the security of the entire transportation network.

NYMTC's members work to fully protect the region's investments in the transportation system and to support a platform for future investment through the management of day-to-day Operations and Maintenance (O&M) by ensuring the structural integrity and proper performance for all transportation assets.


George Washington Bridge Toll Plaza in New Jersey.

These assets consist of public transit equipment, roadways, bridges, and non-motorized transportation infrastructure such as walkways, trails, shared use paths, and greenways.

As a Transportation Management Area (TMA), NYMTC is required to develop a Congestion Management Process (CMP), which is a systematic approach for managing traffic congestion. The CMP provides information on transportation system performance and various strategies for alleviating congestion and enhancing the mobility of people and goods. The operation efficiency strategies outlined in this chapter are part of the multi-faceted CMP. These strategies include TSM, of which Intelligent Transportation Systems (ITS) is a major part, and TDM. The regional transportation network is difficult to expand because of the density, sprawl, current land use, and built environment of urban areas in the NYMTC planning area, so it is important to make use of management and operations strategies that maximize the use of existing infrastructure and the environment. An additional description of the CMP is found in Section 3 of this chapter and in the CMP 2014 Status Report (available at the NYMTC website, www.nymtc.org).

Along with optimizing operational system mobility, NYMTC members have collectively identified transportation safety and security for both motorized and non-motorized uses as prime concerns of the transportation planning process. The goal of NYMTC's members is to ensure safe and secure transportation operations at all times, which can be achieved by monitoring the safety and security performance of transportation networks and implementing necessary improvements. The effectiveness of the safety improvements can be measured by a reduction in annual transportation-related injuries and fatalities, a decrease in the number of crashes on roadways, and a reduction in the incidence of rail crashes and security issues. Safety improvements can also lead to economic benefits due to reduced transportation incident-related costs and delays.

To better address the complexity of transportation efficiency, safety, and security in the NYMTC planning area, enhanced multiagency coordination is necessary for sharing data and information regarding current needs and planned improvements. The integration of federal, state, and local emergency plans can be vital during emergency events and security procedures need to be addressed and updated periodically. Furthermore, all transportation improvements should include elements to provide information and education for the general public.

2. Transportation Systems Management & Transportation Demand Management

To move the NYMTC planning area beyond system preservation, TSM and TDM strategies are targeted to help alleviate congestion, improve safety, and improve the efficiency of the regional transportation system. The following section discusses TSM and TDM strategies and highlights the current and planned projects to be undertaken by the operating agencies in the NYMTC planning area.

With the use of TSM and TDM strategies, the regional transportation network will be better able to:

- Increase capacity, reduce congestion, and improve safety on existing roads and transit networks (TSM);
- Manage and reduce peak-hour automotive travel (TDM); and
- Improve and promote alternatives to driving (TDM).

TSM is a category of strategies that focuses on generally low-cost, small-scale projects that use new technologies and minor infrastructure changes to increase the capacity and efficiency of existing road and transit systems. TSM strategies tend to be effective, short-term solutions to congestion problems.[1]

TDM is a set of strategies that focuses on modifying travel behavior. TDM strategies encourage traveling on multimodal and high occupancy modes, as well as managing and reducing peak-hour congestion. TDM seeks to reduce the total number of automobile trips by directing attention to moving a higher volume of people and goods rather than vehicles.[3] These strategies can be implemented either voluntarily through carpools and other measures, enforced through regulations, or incentivized through pricing. By encouraging the use of carpools and mass transit and discouraging single occupancy vehicles (SOVs), TDM strategies can improve air quality and congestion, increase mobility on arterial roadways, and ease the morning and afternoon rush hours.[4]

As TSM strategies focus on improving efficiency and TDM strategies focus on modifying behavior, it is often beneficial to use both strategies simultaneously. [2]

TRANSPORTATION SYSTEMS MANAGEMENT

Transportation Systems Management strategies are intended to increase the safety, efficiency, and capacity of existing transportation networks by means of physical, operational, and regulatory improvements. TSM strategies are widely used in the NYMTC planning area because they are generally low-cost, localized modifications of existing infrastructure, and they generally take less time to implement than building new roads or new transit lines.[5] These strategies range from technology and information that help commuters make timely and wise transportation decisions to low-scale construction projects that expand the capacity of existing infrastructure.

Traditionally, TSM strategies were exclusively used as solutions for improving roadway congestion. However, with a growing population in the outer boroughs of New York City[6] that requires access to Manhattan's central business district[7] and declining federal and state investment in the transportation network,[8] TSM strategies are becoming increasingly applicable to improving transit capacity and efficiency. TSM strategies applied to transit are implemented in a similar fashion and for similar reasons as traditional usage, focusing primarily on transit priority improvements to increase transit speed,[9] automatic transit fare systems, and traveler information. Instead of spending billions to construct and plan new lines, applying small physical or operational improvements, can significantly improve efficiency relative to the amount of capital and time invested. Intelligent Transportation Systems (ITS) refer to systems that reduce congestion, improve safety, and mitigate environmental impact through the use of communication, control, electronic, and computer technologies. Due to constant improvements in technology along with the increasing use of ITS in monitoring and analyzing TSM strategies, the distinction between the two categories, ITS and TSM, becomes arbitrary. Consequently, this Chapter merges the discussion of ITS with TSM.

The various TSM strategies are grouped into seven categories: Intelligent Transportation Systems, Traveler Information, Incident Management, Work Zone Management, Access Management, Congestion Pricing, and Active Transit and Traffic Management. Each of these categories is discussed in the following section with examples of TSM strategies and methods currently underway or planned in the NYMTC planning area.

Intelligent Transportation Systems (ITS)

The ITS Integration Strategy, developed by NYMTC in 2009, represents a shared vision of how each of the three subregional ITS Architecture systems (New York City, Long Island, Hudson Valley) should work together to share information and resources. The NYMTC ITS Integration Strategy, which was developed out of the National ITS Architecture, has three major goals: 1) to identify opportunities where ITS investments can work together toward regional interoperability and provide the desired regional ITS services; 2) to enhance interagency cooperation in the management and development of ITS; and 3) to identify and target ITS projects and initiatives early in the planning process which will facilitate integration. The ITS Integration Strategy identifies various ITS transportation needs organized by functional area:

- Advanced traffic management;
- Advanced public transportation systems;
- Advanced traveler information systems;
- Archived data management systems;
- Commercial vehicle operations;
- Emergency management systems;
- Maintenance and construction operations.

The ITS Architecture is a set of information flow plans that outline how specific ITS technologies should be deployed to and integrated with all relevant stakeholders representing different jurisdictions and their missions. ITS Architectures are frameworks that guide the integration of Intelligent Transportation Systems to improve traffic flows and transit services over a specific geography. ITS Architectures allow for coordinated planning, defining, and integrating information and operations involved in ITS. Integrated technology systems allow for a quick response to emergencies and an overall more efficient flow of traffic.[10] The ITS Integrated Strategy is based on three subregional ITS architectures: the New York City ITS Architecture; the NYSDOT Region 10 ITS Architecture; and the Hudson Valley ITS Architecture, including NYSDOT Region 8.


NYCDOT's PARK Smart NYC program has variable rate pricing.

Each of the regional ITS architectures apply a particular method of operation to a specific region where various ITS systems are implemented, such as how operational agencies manage highway signals, respond to incidents, react to weather and road conditions, post variable message signs, meter ramps, and conduct other traffic and transit management operations. As ITS development expands to address regional and technological changes, all ITS architectures will require periodic updates in the future.

The New York City subregional ITS Architecture includes the five boroughs of New York City. It is a very large and complex ITS architecture and includes four major stakeholders and owners, the New York City Department of Transportation (NYCDOT), the New York State Department of Transportation (NYSDOT), the New York City Metropolitan Transit Authority (MTA), and the Port Authority of New York and New Jersey (PANYNJ). These agencies work closely with more than 70 other agencies to advance ITS integration and information sharing across New York City.[11] Its recent update began in 2007 and is currently near completion. Most traffic and some transit operations in the five NYC boroughs are managed by a joint Transportation Management Center (TMC) located in Long Island City, Queens, where advanced ITS systems control and monitor traffic conditions continuously. Transportation Management Centers focus on a holistic approach by using ITS to create a complete system integration by compiling data to distribute in an integrated format. Through electronic communication with field devices, TMCs can remotely monitor, control and disseminate

information related to transportation conditions. The TMC is operated by NYCDOT, NYSDOT Region 11, and the New York City Police Department and New York State Police. It is one of the largest and most complex transportation management centers in the nation. In addition to the joint TMC, the MTA and PANYNJ have various other operational centers to manage their bridges and tunnels and their operations by both rail and bus.

The Region 10 ITS Architecture encompasses the two most populated counties outside of New York City: Nassau and Suffolk. The ITS Architecture revolves around the program, INFORM (INformation FOR Motorists), that manages ITS operations in the region by its TMC located in Hauppauge in Suffolk county. The major ITS stakeholders in this region include the NYSDOT, MTA, and the police, fire, and public works departments, along with more than 20 other agencies.

The Hudson Valley ITS Architecture integrates ITS information in the Hudson Valley, including Rockland, Westchester, and Putnam counties. Traffic operations are managed by its TMC are located in Hawthorne in Westchester County. The major stakeholders involved include the NYSDOT, New York State Police (NYSP), Hudson Valley Police Department (HVPD), Westchester County Parkway Police Department, and the Westchester County Department of Public Works and Transportation.

In addition to the transportation operation agencies, the I-95 Corridor Coalition via its communication center TRANSCOM, has a major role in the development and maintenance of the regional ITS architecture. In the NYMTC planning area, the I-95 Corridor Coalition consists of 16 transportation and public safety agencies that cover New York State, New Jersey, and Connecticut. The I-95 Corridor Coalition provides a regional ITS coordination among its members through ITS infrastructure, which facilitates the sharing of live and archived data and video images for managing traffic operations, incidents, and traveler information.

Though TSM strategies vary in the level of technology involved, most strategies are dependent upon system monitoring, data sharing, and coordination between systems and agencies. Further, as ITS technologies expand, so too does the potential to improve efficiency. Previously fragmented information can currently be shared across agencies and aggregated to provide a complete view of problems in the road and transit networks. NYMTC members are committed to multi-agency cooperation and developing a seamless multi-modal transportation system in the region.

Traveler Information

Traveler Information strategies can broadly be defined as any system that provides road or transit condition information to travelers so that they will be aware of weather conditions, congestion and delays, alternative routes, and transit schedules. These strategies provide content on the overall system performance, such as daily congestion, incidents, and work zones, compiled from a variety of information sources. Based on the information that travelers receive, they are able to make more knowledgeable decisions about routes and travel modes, thereby increasing the efficiency of the road or transit network.

The two primary aspects of Traveler Information strategies are real-time statistics for traffic and transit and trip planning. The quality and effectiveness of these strategies are highly dependent on comprehensive and real-time data relating to system conditions and the information network that connects these data sources to a centralized location. A robust Traveler Information system allows users to trust that they are accessing the most current and comprehensive information possible. Different methods of reaching drivers used by Traveler Information systems range from low-tech radio broadcasts to the continuously expanding field of personal mobile communications.

The most common technologies used to communicate traffic conditions to motorists include public broadcasting on television or radio, variable message signs (VMS) posted on roadways alerting drivers to current and future conditions, portable navigation devices that combine GPS with remote traffic updates to reroute drivers, and trip planning services, such as trip routing, based on current or average travel conditions and user specified inputs. Various methods for getting information to motorists are accessible by almost any user regardless of available resources.

Compiling roadway information from a multitude of data sources is the most significant challenge that must be addressed by Traveler Information providers to ensure that users trust that they are accessing the most current and comprehensive information possible.

In the NYMTC planning area, real-time traveler information is available through systems like 511 New York (511NY), the state's official traffic and travel information source. This system covers the states of New York, New Jersey and Connecticut and is available via phone by dialing 511 or on the web at www.511ny.org. It provides information via text and maps regarding current traffic and transit conditions, transit route trip planning and rideshare services. 511NY also provides via additional links travel information related to specific modes of transporta-

tion, such as automobile, public transportation, bicycling and air travel. In addition, many agencies provide road closure, service interruption, and construction information through their websites and through social media outlets like Facebook and Twitter.

Incident Management

According to most traffic experts, nonrecurring traffic incidents such as vehicle breakdowns, crashes, or severe weather, are typically responsible for more than half of peak-hour traffic congestion in major US cities.[12] These incidents also increase the risk of secondary collisions between uninvolved motorists. In mass transit systems, incidents such as signal malfunctions or sick passengers can cause delays for riders. Incident Management is the response to such incidents, and it is defined by the Federal Highway Administration as any "planned and coordinated program to detect and remove incidents and restore traffic [and transit] capacity as safely and quickly as possible."[13] Though some Incident Management strategies involve using Traveler Information to warn travelers of delays and to suggest detours, there are numerous other measures that must be taken to clear incidents as efficiently as possible so that regular traffic flow can be restored.

Many emergency vehicles first responding at the scene of the incident are equipped with advanced in-vehicle communication devices, providing live voice, data, and video communications connected to appropriate TMCs. This technological capability assists TMC staff to efficiently recognize the type of incident and to dispatch appropriately emergency crews and equipment to address and clear the incident.

The majority of traffic incidents are vehicle breakdowns, most of which do not directly block road lanes.[14] A relatively small proportion of incidents involve serious crashes or spills from commercial trucks that block travel lanes however, these are responsible for the majority of delays on the road system. Still, Incident Managers must be able to effectively respond to incidents that range in severity. To do so, governmental and nongovernmental bodies work closely to coordinate operations and share information across jurisdictions. In the NYMTC planning area, various Incident Management systems are already in place, including transportation, public safety, and emergency agencies. These systems can effectively address transportation as well as security-related incidents.

Incident Management works by following these basic steps that apply to incidents on roadways as well as transit systems:

- Incidents are detected using a range of methods, many of which involve ITS technologies that monitor general system conditions. Automatic monitoring is supplemented by telephone hotlines or roadside/transit system telephones for travelers to use in reporting incidents. Detection can further occur on roads using patrol vehicles and in transit systems by train and bus operators.

- Appropriate responders are contacted and dispatched according to the type of incident.

- Drivers/passengers are diverted away from the incident if travel lanes/transit routes are expected to be blocked for a sufficiently long period of time.

- Data relating to past incidents are collected and evaluated to determine the effectiveness of different Incident Management techniques in varying circumstances.

In response to traffic incidents that occur on New York State highways, NYSDOT along with the New York State Police and NYMTC agencies have implemented the Highway Emergency Local Patrol (HELP) strategy. Using a designated fleet of vehicles patrolling major roadways, HELP can locate and assist in the clearance of traffic incidents. Expansion of the HELP system to cover a larger area would successfully reduce system delays in the NYMTC planning area.

Work Zone Management

Work Zone Management encompasses a range of techniques, typically planned prior to a project. These techniques aim to reduce delays, maintain worker and traveler safety, ensure that construction operates on schedule, and maintain access for businesses and residents over the course of the project. For instance, in Region 8 contractors may only close a specified number of travel lanes and Maintenance staff must report lane closures to TCM in advance. Work Zone Management on roadways and transit can impact congestion at various levels in regard to both space (local to regional effects) and time (projects that range from one day to several years).

The 'Drivers First' initiative is a new approach by NYSDOT to prioritize the convenience of motorists and ensure that disruptions are as minimal as possible to drivers at highway and bridge projects across the state. The vision is to review and analyze current best practices used regionally and determine how to implement these best practices across the State given regional budget, legal and traffic volume differences while not compromising safety. NYSDOT will utilize expanded communications options already available to New York State road travelers to provide up-to-date roadwork and travel time information that will enable travelers to make informed decisions

on departure time, alternate routes and mode choices.

From the perspective of a traveler, work zones and incidents have similar effects on travel time and the possible need for rerouting, which makes Traveler Information technologies important to Work Zone Management. However, from the perspective of TSM operators, mitigating congestion caused by construction is very different from managing incidents since work is planned in advance, allowing traffic and transit engineers to collaborate with construction personnel so that steps can be taken to mitigate anticipated effects of the work. Aside from notifying the public through Traveler Information strategies, the following additional methods may be employed as part of a comprehensive Work Zone Management plan:

- Modifying the network to reroute demand;
- Improving alternative routes of travel and advertising them;
- Providing temporary facilities to absorb demand for travel during facility closures;
- Staging work to occur in off-peak hours;
- Providing police officer control in case of unanticipated conditions; and
- Providing proper signage, safety devices, and lighting to ensure the safety of all travelers and construction workers.

Access Management

Access Management describes a set of physical design and regulatory roadway options aimed at limiting and managing conflict points along a corridor. It is typically considered when roads are reconstructed and as part of Highway work permit process for new or revised access to a state highway by a developer or property owner. It is typically considered when roads are reconstructed and as part of Highway work Permit process for new or revised access to a state highway by a developer or property owner. Access Management strategies can be applied to all road types, whether local, collector, arterial, or highway, and are implemented in order to balance mobility and access on a given roadway. Access Management strategies are effective on major roadways and on local roads. On arterial roads and highways which primarily facilitate long-distance through traffic, the strategies that limit access on interchanges and regulate on- and off-ramps can increase mobility and safety. On local roads, which primarily enable vehicles to access specific destinations, the strategies that regulate the placement of curb cuts and turning lanes can improve safety.

Techniques for Access Management, many of which are identified by the Federal Highway Administration (FHWA), include:

- *Access spacing*: Increasing the distance between traffic signals to improve the flow of traffic on major arterials.
- *Driveway spacing*: Permitting fewer driveways that are spaced further apart to allow for the more orderly merging of traffic and to present fewer challenges to drivers.
- *Safe turning lanes*: Creating dedicated left- and right-turn lanes, indirect left-turns and U-turns, and roundabouts to keep through traffic flowing.
- *Median treatments*: Creating two-way left-turn lanes and nontraversible, raised medians to regulate access and reduce crashes.
- *One-way streets*: Restricting traffic flow to one direction on a street to present fewer challenges to drivers and to reduce crashes.
- *Prohibit certain types of vehicles:* (i.e., commercial vehicles on parkways).

Value / Congestion Pricing

Congestion pricing, or value pricing, is a market-based strategy to manage traffic flows whereby motorists are charged a fee for access to and/or travel within a specified region, road, or road segment (lane, bridge, or tunnel). By pricing roads that experience severe congestion, especially during peak hours, congestion pricing seeks to reduce traffic by diverting discretionary rush hour vehicle travel to off-peak periods or less congested routes. The fees charged can be either flat, or set to vary according to the time of the day and the level of traffic. By dissuading a proportion of drivers from using highly traveled roadways during peak travel times, congestion pricing helps reduce traffic flow disruptions that otherwise would have occurred without pricing and as a result promotes a high level of vehicle throughput during rush hours.[15] Electronic toll collection technologies such as electronic "passes" and Global Positioning Systems (GPS) can enhance congestion pricing by making toll collection possible electronically without the need for toll booths or traffic interruption. The system may be complemented by automated enforcement, whereby video cameras are used to detect violators.[16] Congestion pricing exists under various forms:

- Variably priced lanes, such as high-occupancy toll (HOT) lanes;
- Variable tolls on entire roadways;

- Variable parking prices;

- Cordon charges: fixed or variable charges to drive within or into an area; and

- Area-wide charges: per-mile charges within an area or network that may vary by level of congestion.[17]

By reducing congestion and ensuring higher vehicle throughputs, congestion pricing can help increase vehicle speed and travel time predictability as well as reduce travel delays without the cost of road widening. Congestion pricing also has TDM implications in that it can help shift a portion of motorists to more sustainable travel modes such as carpooling, transit, or bicycling. In addition, congestion pricing can provide revenues that can be used to operate the system and to fund transit or road improvements.[18]

Two congestion- or value-pricing toll structures already have been implemented in the NYMTC planning area. In March of 2001, the Port Authority of New York and New Jersey implemented a toll structure that incorporated higher tolls during weekday AM and PM and weekend peak hours at all six of its bridges and tunnels between New York City and New Jersey. This system has been refined in subsequent toll actions, also including lower per-axle tolls for trucks during overnight hours. The initial implementation of time-of-day incentive tolling came at the Tappan Zee Bridge the preceding year where there is a higher toll rate on commercial vehicles during the morning rush hours (6:30 AM to 9:30 AM).

In New York City, a plan to implement a cordon charge system was revealed in 2007 as part of *PlaNYC 2030*. Under the plan, motorists entering, leaving, or driving within the Manhattan Central Business District would have been charged a flat rate between 6AM and 6PM on weekdays. Fee exemptions would have been provided for emergency and transit vehicles, automobiles with a handicapped license plate, and taxis. The fees would have been collected with a combination of existing EZ Pass readers and other technologies, and the revenues would have been dedicated to transportation investments.[19] In 2008, the New York State Legislature rejected New York City's cordon pricing plan.[20] Since then, discussions over congestion pricing have shifted to reviewing the pricing of the city's bridges and tunnels. For example, the Equitable Transportation Formula suggested in 2012 by Sam Schwartz Engineering called for a new pricing plan that would readjust existing tolls more equitably and would charge motorists for using the four remaining toll-free East River bridges. Under the plan, the fees collected from motorists would have been used to fund bus, truck, and highway improvements, as well as the construction of three new pedestrian and bicycling bridges to the Manhattan CBD across the East and Hudson rivers proposed in the plan.[21]

Active Traffic and Transit Management

Active Traffic and Transit Management is an emerging field that uses coordinated ITS technologies to monitor for and respond to congestion and delays. Unlike other TSM categories, which function mainly by preventing congestion, Active Traffic and Transit Management works by creating technologies embedded in the transportation network that can detect traffic and transit flow conditions and respond adaptively to ease congestion, without necessarily requiring input by human operators. In doing so, roadway or transit systems can immediately ease congestion by reactively changing access or signal settings in response to varying conditions.

In the past, traffic and transit management strategies were based on technology, such as signal control systems, that had limited capabilities and responded primarily to local operational conditions. With new emerging technologies, older systems are being phased out and replaced with advanced systems that have become the basis of Active Traffic and Transit Management strategies and the leading technology in the integration of traffic and transit systems. An example of this approach is Integrated Corridor Management (ICM). ICM development analyzes transportation information from a multimodal perspective, allowing where feasible technologies for traffic, transit, and other modes to work together in easing overall congestion.

Two elements must be in place before any Active Traffic and Transit Management system can be effective: 1) comprehensive and integrated electronic monitoring and control of major roadways via TMCs; and 2) traveler information systems. Once these two elements are deployed, the following Active Traffic and Transit Management strategies can be used:

Active Traffic Management strategies:

- *Temporary shoulder use*: Based on real-time traffic detection, dynamic roadside signs instruct drivers when using the shoulder as a travel lane is permitted to improve flow.

- *Self-adaptive and coordinated traffic signals*: Communication between traffic lights and traffic sensors allows signal systems to automatically optimize traffic flow.

- *Automated enforcement*: Surveillance systems record moving violations linked to a vehicle's license plate to enforce traffic laws remotely.

- *Dynamic message signs*: Roadside signs display information regarding real-time or planned downstream conditions so that drivers may ar-

range detours or be warned of upcoming congestion.

• *Queue warning*: Based on real-time traffic detection, dynamic roadside signs warn drivers of downstream congestion or hazards in order to reduce the risk of collisions.

• *Speed harmonization*: A specific type of queue warning in which dynamic speed limit signs post a lower speed limit to prepare drivers for traffic ahead.

• *Dynamic merge*: Traffic signals and signs are used to regulate or close lanes ahead of a merge point based on real-time traffic conditions to improve traffic flow and reduce merge conflicts.

• *Adaptive dynamic ramp metering*: Traffic signals are used to regulate entry onto limited-access highways depending on existing traffic volumes.

• *Dynamic rerouting*: Dynamic message signs are used to channel traffic from congested routes to parallel underutilized routes.

• *Dynamic lane markings*: Lights embedded in road pavement change the lane markings and the road layout in response to traffic conditions in order to improve flow.

Active Transit Management strategies:

• *Rail control centers*: By monitoring the locations of trains and by controlling train movements through track signals, centralized control centers are able to optimize train spacing and increase system capacity.

• *Bus automatic vehicle location (AVL)*: Real-time updates on fleet vehicle locations are collected by central software and used to improve the system performance by means of schedule adherence monitoring, onboard mobile data terminals, and/or real-time passenger information.

• *Transit priority*: Wireless communications between buses or streetcars and traffic signals allow transit vehicles to receive priority when passing through an intersection.

In the NYMTC planning area, many of these strategies are already in place and integrated with local TMCs, primarily network monitoring and control, incident management, traveler information and security. Multiagency coordination along with modernization, integration and expansion of all the technological systems that support these strategies are key elements for an efficient transportation system.

Table 4.1

Name	Description	Planned Future Expansion	TSM Category	Related NYMTC / Regional ITS Architecture Strategy
Traffic signal priority (TSP) for buses	To create a 100% wireless centrally-controlled TSP system which could be deployed anywhere in NYC. Within several years 100% of traffic signals will have state-of-the-art controllers connected through a wireless network to the central NYC traffic computer. The MTA will initially equip 200 buses to communicate with the central NYC traffic computer.	Initially 200 buses; ultimately the entire bus fleet.	Active Traffic and Transit Management	Advanced Traffic Management and Advanced Public Transportation Systems
Bus Security Cameras	Bus security camera systems are currently being installed in MTA buses. The purpose of these cameras is to serve as a deterrent to criminal activity, thereby improving the efficiency and safety of the bus system. In the event of an incident, the video recorded on the cameras can help to explain what transpired and serve as evidence. Bus security cameras have been installed on most of Westchester County's Bee-Line buses, and there are plans to equip the entire fleet.		Active Transit Management	Advanced Public Transportation
Bus lane enforcement cameras	This automated enforcement project will record the license plate number of vehicles that violate bus lane regulations, and send a summons which is not a moving violation to the owner. The cameras do not capture an image of the people in the vehicle, only the license plate number.	All SBS bus operations.	Active Transit Management	Advanced Public Transportation
Rail Control Center (RCC) & Automatic Train Supervision (ATS) *Communica-tions- Based Train Control (CBTC)*	Automatic Train Supervision to monitor service and route subway trains to the right tracks. The RCC also centralizes the management of subway maintenance disciplines and customer information systems in stations. Future infrastructure is intended through the installation of advanced signal systems like Communications-Based Train Control or through adoption of new service monitoring technologies. The computer-based Communications-Based Train Control allows subway trains to safely operate closer together and at higher speeds, resulting in an increase in maximum track capacity by approximately ten percent.	In the coming years, NYCT is looking to expand ATS-like capabilities to additional subway lines (lettered lines & the 7). CBTC is now under construction on the 7 and planned for additional lines as they come due for signal modernization.	Active Transit Management Active Transit Management	Advanced Public Transportation Advanced Public Transportation
Bus Time	Bus Time is a real-time bus information system for customers. The system can provide next bus information by bus stop or bus route, using computer, handheld or text message. It has the capability to be expanded to offer fixed displays at bus stops. Today the system informs customers where the next bus is (i.e. two stops away); currently there is no predictive algorithm to inform that a bus is three minutes away.	To be expanded system wide by the end of 2013. Also in development would be an expansion of the Bus Time system to offer customers on board a bus both a variable message sign and audio announcement of the next bus stop.	Automatic Vehicle location (AVL) and Traveler Information	Advanced Public Transportation
Automatic Train Supervision (ATS)	This system transmits train location information to the Central Rail Control Center. The ability to see where all trains in the system are located assists train dispatchers with identifying delays and managing incidents that impede train service.	The B-Division (lettered) subway lines and the 7 line.	Incident Management	Advanced Public Transportation and Emergency Management
Public Address/ Customer Information Screens (PACIS)	Building upon its ATS and CBTC systems, these are variable message signs which provide real-time train-arrival information to passengers waiting on station platforms and mezzanines.	PA/CIS will be installed on other segments of the system as they are outfitted with ATS, CBTC, or other technologies enabling real-time information.	Traveler Information	Advanced Traveler Information Systems

Table 4.1 continued

Name	Description	Planned Future Expansion	TSM Category	Related NYMTC / Regional ITS Architecture Strategy
Advanced Solid State Traffic Controllers	The new controllers support complex intersections with phase skipping and real-time traffic responsive operation. The new controllers are able to adapt to the variety of communication media and protocols (fiber, coaxial, twist pairs and wireless) in order to support federal NTCIP standards. The ASTC is capable of being computerized, controlled by the TMC and implementing all of the central system timing patterns, scheduled by time of day and as holiday's event. The new ASTC's are also capable of implementing various traffic patterns for different traffic situations.	Expansion to include all NYC 12580 traffic signals. NYSDOT has also a program to replace old traffic controllers.	Active Traffic Management	Advanced Traffic Management Systems
Midtown in Motion	This system optimizes traffic mobility in midtown Manhattan via a set of field sensors and software equipment, which communicate wirelessly (via NYCWiN) with the joint traffic managements center (JTMC) and adjust signal timing appropriately in real time. The system utilizes ASTC controllers and includes100 microwave sensors, 32 traffic video cameras and E-Z Pass readers at 23 intersections to measure traffic volumes, congestion, and travel times.	If necessary, future expansion of this system could include other areas in NYC.	Active Traffic Management	Advanced Traffic Management Systems
Regional Signal Timing and Coordination	This corridor based traffic signal retiming project improves traffic mobility and safety. It optimizes arterial traffic flow capacity, discourages speeding, and increases pedestrian walk times at crosswalks.	If necessary, it could be expanded to other arterials in the future.	Active Traffic Management	Advanced Traffic Management Systems
Smart Lights (Adaptive Control System)	This pilot project has been implemented at the entrance to the Staten Island College at Victory Blvd. This is a good signal timing option for improving traffic flow on limited size local areas, where traffic patterns are inconsistent and unpredictable. Smart lights are connected with field sensors to monitor changes in traffic flow and via wireless communication receive signal timing changes from the JTMC almost immediately.		Active Traffic Management	Advanced Traffic Management Systems
Highway Intelligent Transportation System (ITS)	This system uses traffic cameras and electronic message boards to monitor and improve traffic flows, as well as to inform drivers. The deployment includes fiber and wireless communication to support video traffic cameras, variable message signs (VMS), radio (RFID) readers and travel time signs. All NYC major construction projects require Mobil ITS deployment to support maintenance and protection of traffic management. Current implementation includes the Korean Veteran Parkway, Belt Parkway, FDR Dr., and the East River bridges. Construction projects using ITS deployment included all East River Bridges and the 2nd Avenue Subway and Lower Manhattan projects.	Future expansion could include other NYC areas.	Active traffic Management	Advanced Traffic Management Systems and Maintenance and Construction Operations
Freight Weight-In-Motion (WIM)	The goal of this research project is to quantify the damage and the corresponding cost to NYC's infrastructure caused by heavy vehicles, utilizing WIM sensors placed at strategic locations. The project also obtains data on existing axle weights of heavy vehicles and quantifies the annual damage caused by overweight vehicles using PaveDAT, a FHWA software. The project also examines using WIM and License Place Reader (LPR) technologies along with overview cameras for enforcement.	One permanent WIM site will be installed on the Alexander Hamilton Bridge. Three other temporary WIM sites will be established at selected locations on NYC through-truck routes.	Active traffic Management	Advanced Traffic Management Systems and Commercial Vehicle Operations Systems
511NY	This system is available via phone by dialing 511 or via the web. It provides information via text and maps for current traffic and transit conditions, transit route trip planning, rideshare and other services. http://www.511ny.org	The system would include additional travel information elements.	Traveler Information	Advanced Traveler Information Systems

Table 4.1 continued

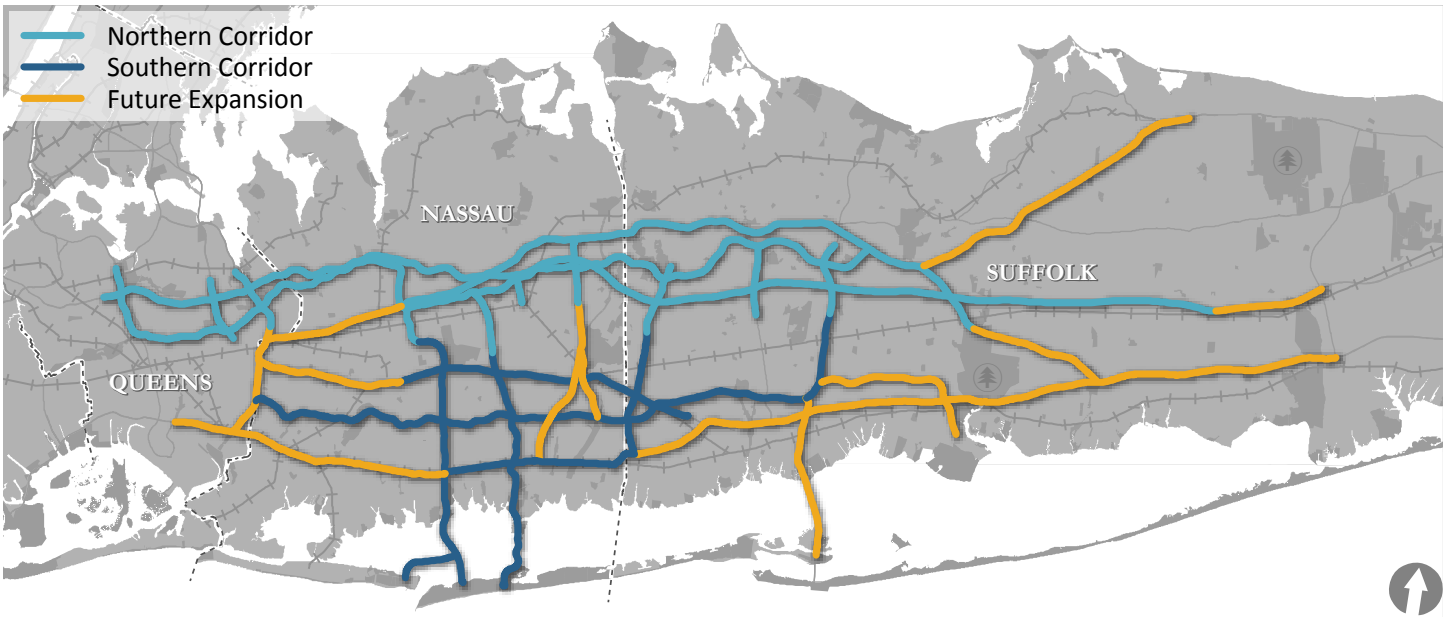
Name	Description	Planned Future Expansion	TSM Category	Related NYMTC / Regional ITS Architecture Strategy
INFORM (INformation FOR Motorists)	The system is one of the nation's largest and most advanced transportation management systems, and consists of electronic monitoring, communications, signing and control components, providing motorist information for warning and route diversion, ramp control, and signal control. All operations are monitored and controlled by the TMC in Hauppauge. It includes more than 4000 vehicle detectors, 206 overhead and 48 portable variable message signs, 1080 traffic signals (500 under central control), 91 ramp meters, 228 closed circuit television cameras, managed lanes, and other ITS features.	The Region intends on eventually having approximately 360 centerline miles of instrumented roadway. (see Figure 4-1)	Active Traffic Management	Advanced Traffic Management Systems
Highway Emergency Local Patrol (HELP)	Patrol Vehicles/Trucks on major roadways provide motorist assistance as necessary. They also communicate with local TMC to coordinate the response for roadway incidents.	The system would be expanded as necessary to include additional roadways.	Incident Management	Emergency Management Systems
NYSDOT R-11, Regional ITS Deployment	The ITS deployment covers all interstate highways in NYC, including partial coverage along many of the City's Parkways. It includes an extensive electronic monitoring and communications network that provides motorist information about traffic incidents, road construction, travel time, and other traffic conditions. It includes 76 variables message signs, 260 closed circuit television cameras, more than 600 vehicular detectors, 8 highway advisory radio frequencies, managed lanes, and other components.	The system would be expanded in Eastern Queens, Manhattan and southern Brooklyn. Improvements would also include integration via new technologies (i.e., cross-agency via TMCs and vehicle-infrastructure communications).	Active Traffic Management	Advanced Traffic Management Systems
E-ZPass Customer Service Center	This system includes several Customer Service Centers (CSC) linked with various Toll Collection subsystems. The centers manage toll transactions and interface with a Financial Institution.	The system could be expanded as necessary.	Active Traffic Management	Advanced Traffic Management Systems
Long Island Municipal/County Local Traffic Operation Center (TOC)	The center monitors, analyzes and stores traffic data and controls traffic conditions. The center exchanges highway-rail intersection information with rail operations centers. Its operations include regional traffic management, wide area alerts, and work zone management and coordination.	The system could be expanded as necessary.	Active Traffic Management, Incident Management	Advanced Traffic Management and Emergency Management Systems, Maintenance and Construction
Mid Hudson South Municipal/ County Local TMC (Hudson Valley TMC)	The TMC operations include incident dispatch, coordination and communication, and multimodal coordination, including signal coordination along a particular transit route.	The system could be expanded as necessary. Future ITS instrumentation would cover the I-84 from Route 17 in Middletown to I-684.	Active Traffic Management, Incident Management	Advanced Traffic Management and Emergency Management Systems, Maintenance and Construction Operations
MTA Bridges & Tunnels Facility Operation Centers	The center operations include traffic surveillance, commercial vehicle operations, emergency management, regional traffic management, environmental information management, work zone operations, etc.	The system could be expanded as necessary.	Active Traffic and Transit Management, Incident Management	Advanced Traffic Management, Advanced Public Transportation and Emergency Management Systems, Maintenance and Construction Operations

Table 4.1 continued

Name	Description	Planned Future Expansion	TSM Category	Related NYMTC / Regional ITS Architecture Strategy
MTA LIRR Operations Center Systems	The center operations include rail and bus dispatch operations, vehicle tracking and scheduling systems and emergency management.	The system could be expanded as necessary.	Active Transit Management and Incident Management	Advanced Public Transportation and Emergency Management Systems, Maintenance and Construction Operations
MTA Metro-North Operations Center Systems	The center operations include rail and bus dispatch operations, vehicle tracking and scheduling systems and emergency management.	The system could be expanded as necessary.	Active Transit Management and Incident Management	Advanced Public Transportation and Emergency Management Systems, Maintenance and Construction Operations
New York City Joint Transportation Management center (JTMC)	The center operations include traffic and transit network control and monitoring, emergency management, emissions management, and maintenance and construction management.	The system could be expanded as necessary.	Active Traffic, Transit Management, Incident Management	Advanced Traffic Management, Advanced Public Transportation and Emergency Management Systems, Maintenance and Construction Operations
NYC Office of Emergency Management (OEM) Watch Command Center	This is the emergency operations center for the City of New York. The command center is responsible for coordinating responses between the various agencies operating within New York City during major incidents and events.	The system could be expanded as necessary.	Incident Management	Emergency Management Systems
PANYNJ Airports Communication desk/ operations center	This includes central operations for coordination and communication systems as well as facility-based ITS servers. The functional areas include traffic surveillance, incident management, traffic and transit information services, multi-modal coordination, transit center security, work zone management, etc.	The system could be expanded as necessary.	Active traffic and transit management, and Incident Management	Advanced Traffic Management, Advanced Public Transportation and Emergency Management Systems, Maintenance and Construction Operations
TRANSCOM OpenReach Servers	The TRANSCOM regional architecture is a program. It coordinates the collection and redistribution of traffic flow, origin-destination, incident, construction, equipment status and special event information data between transportation management centers running the TRANSCOM regional architecture.	The system could be expanded as necessary.	Active traffic and transit management, Incident Management, and traveler information	Advanced Traffic Management, Public Transportation, Emergency Management and Traveler information Systems, Maintenance and Construction Operations

There are more than 260 categories of ITS operations In the NYMTC planning area that are included in the inventory of New York Sub-regional ITS Architecture: http://www.consystec.com/nycsraupdate/web/inventory.htm.

Figure 4.1: Current INFORM System with Planned Future Expansion (2040)



TRANSPORTATION DEMAND MANAGEMENT (TDM)

TDM strategies attempt to decrease the total number of auto trips, especially trips in single-occupant vehicles (SOVs), by encouraging high-occupant vehicle (HOV) travel such as carpools, public transportation, and active transportation which is any form of human-powered transportation such as walking and bicycling.[22] TDM is different from TSM in that it requires in most cases less funding or physical modifications of the transportation network. Instead, TDM relies on voluntary, regulatory, or incentivized use of public transportation and other alternative travel modes.[23] TDM strategies encompass a broad range of methods, such as employer provided pre-tax transportation vouchers, alternative work hours, and telecommuting to significantly reduce the number of rush-hour commuters. Pricing can also be used to manage congestion by charging different toll rates at different times of the day; variable pricing can consist of charging vehicle users for the use of parking facilities in order to discourage commuters from driving alone or from driving at all.

As TDM strategies rely on supplying alternative transit to individuals, there must be a range of choices available to the public so that the individual may choose a suitable option.[24] The TDM strategies are categorized into six groups: Parking Management, Bicycle and Pedestrian Enhancements, Transit Enhancements and Marketing, Vehicle Sharing, Paratransit Services, and Employer-Based Programs. Each of these categories is discussed in the following section with examples of TDM strategies and methods that are currently underway or planned for the NYMTC planning area. By implementing multiple strategies from the six categories, the NYMTC planning area could see an increase in commuter volume while at the same time experiencing a reduction in traffic congestion and air pollution.

Parking Management

Parking Management includes a range of strategies that aim to achieve a more economical use of parking resources and encourage more efficient travel patterns by regulating the demand for, and supply of, both on-and off-street parking. Parking management strategies can include various components including time of day and day of week regulations, parking pricing plans, regulations concerning the quantity of parking that should be provided at particular locations, recommendations of where shared parking would be appropriate and guidelines for parking design. Where it is deemed applicable to implement, the key to a successful parking management initiative is to have it formulated to meet the specific needs of the area where it is to be applied. Some strategies are more successful in high density population and employment areas while other strategies could be appropriate for a village center or suburban strip corridor.

Land and parking policies should balance the need for vehicle parking with development that encourages the use of alternate modes of travel such as taking transit, walking or bicycling. Studies

have shown that free and/or abundant parking is linked to a higher likelihood of driving alone due to the relationship between parking cost and availability and mode of choice. In that respect, parking management can be a tactic to reduce congestion and encourage travelers to switch to alternative travel modes.

Parking management can also be used to shape development patterns. As an example, strategies that include shared parking arrangements or flexibility regarding minimum parking requirements can reduce the amount of land dedicated to parking. Reducing the amount of parking that developers have to provide can lower the cost of development, and allow greater density of development, which can help foster a greater market for transit services. Less surface parking can also decrease the distance among developed sites, thereby encouraging a more walkable environment.

Parking pricing and other cost-based measures consist of charging vehicle users directly for the use of parking facilities. Optimizing parking availability and cost can reduce vehicle traffic by decreasing "circling" (vehicles searching for an available parking space), recovering parking facility costs, and generating revenues that can potentially be used to fund transportation improvement projects. Driving is still heavily subsidized in the form of free and underpriced parking at most locations.[28] The amount of available parking can affect commuters' choice of travel mode, and can contribute to single-occupancy driving and automobile congestion. In some areas, limiting the amount of free parking and increasing the cost of existing parking near highly solicited destinations may encourage motorists to consider alternative travel options that may be available in the area. Parking spaces near transit stations can also be priced strategically to encourage people to take the bus, bike, walk, carpool, car share, or vanpool to the station.

Variable rate pricing can be used to regulate parking demand based on time (weekday, peak hours, or evening), location (residential neighborhood or commercial street), and type of vehicles and/or users (commercial vehicles or owners of residential parking permits). Adjusting pricing to variations in parking demand increases turnover rates and the availability of parking spaces, thus reducing congestion, "circling" and emissions, especially in dense urban areas. Peak-rate pricing, also known as time-variable rate pricing, can be an effective strategy in areas where the demand for parking exceeds physical parking capacities.

Parking supply strategies regulate the availability of on- and off-street parking spaces. On-street parking management is addressed by a number of regulations, such as imposing time restrictions for on-street parking spaces, banning overnight parking, requiring permits for certain neighborhoods, or restricting daytime parking on alternate sides of the street and days. In addition to balancing parking supply and demand, on-street parking regulations are used to address aspects of transportation management such as traffic safety, vehicle speed and traffic volumes, street maintenance and cleaning, and the prioritization of certain types of vehicles. Additional parking supply management strategies as well as Smart Growth and Transit Oriented Development (TOD) are discussed in *Appendix 2: Pedestrians and Bicycles*.

Given the diversity of land use density, car ownership rates, travel patterns, and transit availability throughout the NYMTC planning area, it is key that parking policies are developed that are appropriate for the area in which they are implemented. Policies should vary based on the particular needs of each location, which may be urban, suburban, or rural. Evaluations of parking strategies on a local rather than general basis can identify unique strategies tailored to area conditions and needs that result in increased transit usage and reduced emissions and congestion.

Land use and building regulations, particularly local zoning ordinances, can be used to optimize the supply of off-street parking.[29] Parking standards can be adjusted or made more flexible to reflect contextual factors such as levels of car ownership and use, geographic location, availability of other transportation options, land use mix, building typology and function, residential and built density levels, and demographic and socioeconomic characteristics (income, age, and household structure).[30] New York City has made the commitment to evaluate appropriate off-street parking requirements based on these and other variables.[31] In areas with viable transit options or low car ownership rates, unbundling the costs of parking and housing can help eliminate unnecessary parking space and save on construction and housing costs.[32] Another way to limit the excess supply of parking spaces consists of using shared parking, whereby a parking facility is shared among several neighboring sites or uses, reducing the number of parking spaces needed in places where users have different peak parking demand periods.[33]

In Westchester County, individual municipalities have held parking management workshops to identify an appropriate quantity of parking and suitable parking fees for a particular area. The workshops have also looked at opportunities for shared and unbundled parking and alternatives to minimum parking requirements. On Long Island, where land use and transit are less densely distributed, the design of parking management strategies should consider the feasibility

of limiting parking when trip distances and the distribution of transit stops may preclude the use of human-powered transportation and require multi-modal journeys such as driving to a train or bus stop.

One particular parking supply management strategy consists of encouraging motorists commuting from peripheral areas to leave their vehicle in park-and-ride lots where they can transfer to public transportation, carpools, or vanpools to complete their journey. Park-and-ride lots are usually located next to regional transit stations and freeway on-ramps in urban fringes for easier intermodal transfers. When appropriately priced, park-and-ride lots can increase the use of transit and rideshare and moderate the number of single-occupancy vehicles entering the city center.[34] The NYMTC planning area and surrounding counties feature a number of park-and-ride locations, some of which require a parking permit.[35] Throughout the tri-state area, 511NY Rideshare provides information on park-and-ride lots and carpooling/vanpooling services. MTA Metro-North Railroad[37] and Staten Island Railway[38] also maintain a number of park-and-ride facilities adjacent to railway stations. Ancillary park-and-ride lots can be leased temporarily to meet excess demand for parking spaces near existing lots; ancillary lots are in use in various locations in Putnam County.

Pedestrian and Bicycle Enhancements

Bicycle and Pedestrian Enhancements encompass all strategies that improve the attractiveness, convenience, comfort, and safety of both bicycling and walking. These are often implemented in tandem with transit enhancements, streetscape improvements, traffic-calming measures, and initiatives which promote public health. For more information on specific pedestrian and bicycling improvement initiatives in *Plan 2040*, see *Appendix 2: Pedestrians and Bicycles*.

Strategies that affect land use, zoning, and urban design are not specifically transportation enhancement measures and their effects can only be measured in the long term, as opposed to most other TDM strategies. However, the combination of different land use factors, such as density, land use mix, street connectivity, accessibility to transit, and site design are very important determinants of walking and bicycling levels.[39] Strategies that promote compact mixed use neighborhoods, such as TOD and Smart Growth, are crucial tools to making a greater number of destinations within walking and biking distance of one another.

Improving the convenience and safety of walking and bicycling can be achieved by making more destinations accessible by bicyclists and pedestrians of all abilities, through measures such as: 1) improving the quantity, quality, and connectivity of sidewalks, bikeways, and greenways; 2) providing secure bicycle storage facilities and parking; 3) improving bicycle and disabled access to buildings and transit; 4) applying Complete Streets and Universal Design standards; 5) developing a pedestrian- and bicycle-friendly wayfinding system;[40] and, 6) providing greater access to bicycles through bike-sharing programs.

Bicycle sharing is a transit system that is run or authorized by government agencies or public-private partnerships and provides publicly available bicycles intended for commuting to and from work, or similar short-distance trips, as an alternative or complement to other forms of public transit or private vehicles. Bicycle sharing increases the convenience of bicycling and has been shown to increase ridership.[41]

Other measures that directly improve the safety of pedestrians and bicyclists include designing safer intersections, providing adequate pedestrian crossing time, installing physically protected bikeways, adding bike boxes before intersections, and improving traffic safety education and enforcement.[42] Making walking or bicycling to and from transit more convenient is an important way to promote both active transportation and transit ridership. For example, bicycle-transit integration can be improved by allowing bicycles on transit vehicles and by providing bicycle parking and lockers in or near stations. Planning for active transportation can also address equity issues by increasing mobility and accessibility options for those who do not have access to an automobile, and people with disabilities, the elderly, and children. Initiatives to reduce vehicle traffic level can also increase the safety of walking and bicycling.[43] Improvements to the visual attractiveness of public spaces through better landscaping and urban design can also help increase the appeal of walking and bicycling.

Transit Enhancements and Marketing

Many TSM strategies used to improve the efficiency and capacity of roads can also promote ridership, thereby increasing transit use. Transit enhancements and marketing help to reduce traffic congestion and increase transit ridership by improving the appeal of mass transit and by offering financial incentives to lower the cost of taking transit. Enhancing mass transit and attracting travelers to these modes is a fundamental step in reducing the number of vehicles on the road.

Transit riders are concerned with the reliability of public transportation, particularly waiting time and frequency of service.[44] Increasing and improving Rider Information Strategies at bus stops, station entrances, and on subway

or rail platforms could help to reduce travel stress and permit riders to make informed decisions about their travel options;[45] such as whether to walk, take the bus, ride a different train, or run additional errands before the next arrival. In addition to providing arrival time information, the following strategies help to foster a more comfortable experience for riders:

- *Improved payment methods*: Prepaid tickets for improved bus boarding speed and fare cards that work for all modes of transit;

- *Circulator services*:[46] Reduced fare transit that has localized service to popular destinations, e.g. downtown, universities, shopping centers;

- *Transit station improvements*: Comfortable, covered bus stations, temperature controlled stations, cell service and Wi-Fi access in stations, ramps and elevators for people with handicaps and bicyclists, easy pedestrian and bicycle access to stations, readable maps and clearly marked entrances;[47]

- *Passenger notifications:* Announcing upcoming stops on trains and buses and alerting passengers to any delays or service changes; and

- *Security systems*: Silent alarms, surveillance cameras, and automatic vehicle location (AVL) to bolster riders' sense of security on transit.[48]

An example of a Transit Enhancement and Marketing strategy to improve payment methods is Westchester County's introduction of MetroCard on the Bee-Line Bus System in 2007, which enabled free transfers between Bee-Line buses and between MTA New York City Transit buses and subways.

A study by the United States Public Interest Research Group (USPIRG) shows that, due to changes in lifestyle, technology, and policies, younger generations tend to prefer transit over driving.[49] Between 2001 and 2009, people aged 16 to 34 showed a 23 percent decline in vehicle miles traveled, from 10,300 miles to 7,900 miles per capita.[50] Communicating, whether in person or over text and social media, is easier and safer if done on transit as compared to vehicles.[51] Transit and communication companies are presented with an opportunity to capitalize off of this trend by installing cell towers underground and by offering wireless hotspots at stations and on buses. More riders will be attracted to transit and are prospective customers to the company offering these services. Various marketing strategies can also be employed to promote the use of transit instead of vehicles. Financial incentives, financial disincentives, branding, and social marketing are all helpful in discouraging vehicle use and encouraging transit use.

Using financial incentives to promote transit is another strategy often used to help manage road congestion and improve the appeal and use of alternative modes.[52] Offering incentives not only saves riders money, but also adds to transit's appeal as an affordable, accessible alternative. Examples of financial incentives are travel allowances, commuter tax benefits, and cash-out programs, which are all discussed further in the section under *Employer-Based Programs*. Financial disincentives to driving, such as a fuel tax, congestion pricing, parking management, etc., can also help to encourage transit use while improving transit infrastructure by reinvesting the gains back into the transit network.

Branding is another strategy that can help increase ridership and improve the rider experience. A study by the American Public Transit Association showed that improving the image of bus services and bus rapid transit (BRT) has the potential to increase ridership by 10 to 20 percent.[53] Strategies for branding are: finding the target demographic and assessing their concerns and needs, adjusting the physical image of the service (color and style), applying memorable names to the services and lines, scheduling logical routes and creating intuitive map design, and ensuring a proper station design that is comfortable, safe, and novel.[54] Social marketing is another strategy commonly used to inspire a sense of civic duty to minimize car-related pollution and encourage transit ridership. The social marketing strategy uses traditional commercial marketing techniques to influence individuals to commit actions that improve their personal welfare and that of society.[55] The DriveSmart program, initiated by NYCDOT, invites interested vendors to submit information about ways to provide driver customized information and benefits via in-vehicle communication technologies and help them make better use of the City's extensive multimodal transportation systems.[56]

Marketing strategies can also be targeted to different segments of the population. An example of this approach is Westchester County's Be Educated About Transit (B.E.A.T.) Program. B.E.A.T. is part of Westchester's overall SMART Commute Program, which provides outreach to commuters and employers regarding the benefits of transit and alternatives to driving. B.E.A.T. provides outreach to school-aged children to teach them about the Bee-Line System. Senior B.E.A.T. was launched in 2012, and is oriented towards encouraging seniors to ride the bus and sign up for reduced fare MetroCards.

Vehicle Sharing

Different types of vehicle sharing strat-

egies may help reduce congestion and demand for parking in some cases by decreasing the overall number of vehicles on the roads, vehicle miles traveled (VMT), single-occupancy vehicles (SOV), and in some instances automobile ownership. Ridesharing consists of driving with one or more passengers (as opposed to driving alone), either in a privately owned car (carpooling) or a van (vanpooling). Carpooling and vanpooling may also improve the mobility of travelers who do not drive or have convenient access to viable non-motorized travel options. Ridesharing can be enhanced by other TDM and TSM strategies such as high-occupancy vehicle (HOV) lanes, park-and-ride facilities, as well as rider-matching services and software.[57] Ridesharing and rider-matching can be complemented by certain employer-based programs like those coordinated by 511NY Rideshare. In addition, transportation agencies can offer incentives for ridesharing. The Port Authority of New York and New Jersey (PANYNJ) offers E-ZPass toll discounts for carpools on its bridges and tunnels, and the Tappan Zee Bridge Carpool Commuter Plan offers discounts to vehicles with three or more occupants.

Car-sharing is another type of vehicle sharing strategy that bears many similarities with bike-sharing in that a fleet of vehicles is made available for use by members on a short-term basis at unstaffed, self-serving locations. Vehicles are typically available 24 hours a day and geographically dispersed in proximity to existing members. Car-sharing services substitute for private vehicle ownership, enabling households that only occasionally need a vehicle to save on ownership costs and also reducing the overall demand for parking spaces and the vehicle ownership rate. In 2010, New York City adopted a car share zoning text amendment that allows car share vehicles to park in off-street parking facilities in appropriate locations.[58] Car sharing services are offered, for example, by educational institutions like SUNY Purchase in Westchester County and Hofstra University in Nassau County. Car sharing programs have been implemented at Metro-North stations for reverse commuters traveling from New York City to corporate parks in Westchester County);

Paratransit and Rideshare Services

A number of passenger transportation services consist of flexible or demand-responsive transportation options provided by using small buses, vans, or shared taxis, rather than fixed routes and schedules that characterize regular mass transit. These services, which can be grouped under the umbrella of paratransit, can complement regular transit when the latter would be too costly and inefficient to operate, such as in areas of low passenger demand or population density, or during off-peak hours. Paratransit can make alternatives to driving more viable in underserved areas. Although paratransit may usually refer to transportation for passengers with special mobility needs, such as the disabled and the elderly, in this discussion it includes a wide spectrum of transportation options that fill the gap between the private automobile/taxi and conventional buses that serve regular transit routes.[59] Depending on the type of service, vehicles are reserved and scheduled either in advance or on an ad hoc basis, run on predefined routes or provide door-to-door service, and cater to particular types of passengers (individuals with disabilities, company employees, or low-income commuters) or to the general public. Paratransit can exist in the form of:

- Local circulator buses and vans that provide local service to popular destinations such as universities, shopping centers, and dense concentrations of employment outside of urban centers;
- Reverse commute shuttles that offer access to jobs in areas not easily served by transit;
- Special mobility services using adapted vehicles to provide demand-response transportation for passengers with special needs such as the disabled and the elderly; and
- Privately operated bus lines, dial-a-ride vans, and shared-ride taxis.

511NY Rideshare

The most comprehensive source for rideshare services in the NYMTC planning area can be found in the 511NY traveler information system, under 511NY Rideshare. Many TDM strategies are implemented through the efforts of 511NY Rideshare, which is a regional, multi-agency partnership that offers a suite of programs, services and information for commuters, travelers and employers. 511NY Rideshare is fully supported and funded by NYMTC members. Even if members have their own commute alternatives program (i.e, Rockland and Westchester counties), they do leverage the work of 511NY Rideshare. By accessing this service, commuter and travelers can access a wealth of information on ride-matching services, transit, walking and bicycling options, educational material and other TDM information. 511NY Rideshare staff work with employers across the region to establish commuter benefit programs.

These programs include ride-matching services, vanpools, transit trip planning support, bike/walk-to-work programs, shuttles to/from nearby train stations, telework, flextime, compressed work week programs, relocation services, parking management and guaranteed ride home programs. They also provide technical assistance, with emergency preparedness planning, marketing, support,

and in some instances offer grant programs to eligible employers for implementing workplace commuter programs.

Employer-Based Programs

Employer-based programs encompass a variety of strategies that individual employers use to encourage employees to switch from driving alone to more efficient commuting alternatives, including adjusting work or delivery schedules (departure time strategies) or reevaluating their need to travel (trip reduction strategies).[60]

Several government programs allow employers to provide various financial incentives or tax-free transportation benefits to their employees to encourage the use of more efficient travel modes to and from work. With parking cash-out programs, employees are given the choice to accept a cash payment instead of a free or subsidized parking space at work if they use alternative travel modes instead of driving alone.[61] Travel allowances, a related employer based initiative, are financial incentives provided to employees instead of parking subsidies.[62] Employers may also use commuter tax benefits to encourage employees to use transit, vanpool, or bike, whereby the company either covers the full cost of the benefit, offers a "pre-tax" benefit, or shares transportation costs with the employee.[63]

Some employers who face problems of limited parking or congestion partner with vanpool and shuttle services to facilitate and establish vanpools or shuttles for employees who choose not to drive. For example, employers may use guaranteed ride home (GRH) programs, which consist of providing occasional employer-subsidized rides, usually by carpooling, shuttles, or taxi, for nondriving employees from their workplace in case of emergencies or unexpected circumstances.[64] Employer-paid vanpools and shuttles can also provide supplemental transportation and connections to transit on an everyday basis. For example, employer shuttles connect workplaces to Metro North stations in Westchester County and to LIRR stations in Nassau and Suffolk Counties.

Many employer programs are coordinated through 511NY discussed in the previous section. 511NY Rideshare coordinates with targeted employers to facilitate and establish vanpool, shuttle, and rideshare services for employees. 511NY Rideshare's Employer Education Program promotes and educates employers about pre-tax commuter benefit options.

Other employer-based transportation demand management measures consist of departure time and trip reduction strategies. Firms can adopt alternative or variable work schedules in the form of flextime (allowing more flexibility in arrival and departure times to and from work), staggered shifts, and compressed workweeks (working fewer but longer days). These measures aim at redistributing a portion of peak-hour trips to off-peak periods to reduce costly delays associated with rush hour road and/or transit congestion and help accommodate ridesharing and transit use.[65] A related measure to fight peak-hour road congestion is to encourage businesses to shift truck deliveries to off-peak hours, which can also help reduce the costs associated with delivery delays.[66] Strategies also exist to reduce the number of work-related trips altogether through telework or telecommuting whereby work is conducted from home or a location other than the employer's usual work site and information technology is used to substitute communication and accessing information for physical travel.[67] Several companies in the region, including IBM and Empire Blue Cross Blue Shield, offer telework programs. Other trip reduction strategies include distance learning, video conferencing and internet-shopping.[68]

Table 4.2

Name	Description/Aim	TDM Category	Website
Access-A-Ride	Special mobility services: adapted vehicles provide demand-response transportation for passengers with special needs such as the disabled and the elderly.	Paratransit	http://www.mta.info/nyct/paratran/
Guaranteed Ride Home	Non-driving employees are provided with a transportation back-up option in case they need to leave work outside of regular hours in areas served by MetroNorth. This program is funded by NYSDOT-Region 8 and is offered via 511 NY Rideshare for usage for up to four times in a year.	Employer Program Vehicle Sharing	http://www.mta.info/mnr/html/guaranteed/guaranteed.htm
MTA Transit Oriented Development Office	"To promote and coordinate TOD initiatives among its operating agencies, to work closely with local land use jurisdictions and to support initiatives at the regional scale to coordinate land use and transportation planning."	Bike/Pedestrian Enhancement	http://www.mta.info/sustainability/pdf/MTA%20Smart%20Growth-TOD%2010%2029%2008.pdf
Employer Preferred Parking	Several employers in Long Island, Westchester and Putnam counties provide parking benefits for their staff.	Employer Programs	
Westchester SMART Commute Program	This program informs commuters and employers of various strategies to increase the use of transit alternatives in order to reduce congestion and improve air quality.	Marketing/ Employer Programs	http://transportation.westchestergov.com/commuter-services/smart-commute
PARK Smart Pilot	Performance-based parking pricing (pilot project). Parking prices have been increased. The goal is to optimize parking availability, increase turnover rates, and reduce "cruising" in order to reduce traffic volumes. Currently in 2-3 NYC neighborhoods.	Parking Management	http://www.nyc.gov/html/dot/html/motorist/parksmart.shtml
Parking Availability Technology Pilot	Sensors embedded into parking space enables wireless real-time transmission of information on parking availability, rates, and rules. 177 parking spots on Arthur Avenue and East 187th Street in the Bronx.	Parking Management	http://www.nyc.gov/html/dot/html/motorist/prkintro.shtml
Ancillary Park&Ride Lots	In Putnam County, Temple Beth Elohim and Carmel Bowl&Temple Beth Shalom lease parking spaces to supplement parking supply near existing Park&Ride lots.	Parking management	
511 NY Rideshare	Outreach program to demonstrate the benefits of rideshares and promote alternative travel choices. Outreach to promote and educate employers about pre-tax commuter benefit options.	Paratransit/ Marketing/ Employer Programs	www.511nyrideshare.org
Regional Commuter Choice Program (RCCP)	A program that delivers benefits to travelers who use TDM services in the NYMTC planning area.	Paratransit	
Bicycle Racks	Bike racks exist throughout the NYMTC planning area, including train stations, business centers, and areas with significant share of bicycle use.	Bike/ped enhancement	http://www.mta.info/bike/ http://www.nyc.gov/html/dot/html/bicyclists/cityrack-suggest.shtml
Bicycle Locker Program	Provision of secure bicycle lockers. Currently at 20 LIRR stations in Long Island, SUNY Stony Brook, Suffolk State Office Building in Brookhaven, Riverhead Town Hall. Seven locations administered by NYSDOT, seventeen are municipally owned. Bike lockers also exist at selected Metro-North stations.	Bike/ped enhancement	http://www.511ny.org/rideshare/ridesharesub.aspx?contentID=238 http://www.mta.info/bike/
Vanpool and shuttle services	511 NY Rideshare TDM team coordinates with targeted employers to facilitate and establish rideshare services for employees. NYSDOT-Region 8 coordinates with Rockland and Westchester counties to facilitate rideshare and other transportation services for employees. Over 20 Metro-North station shuttles are supported by employers in Westchester County. Several employers in Long Island and Westchester provide employer paid vanpools and shuttles to LIRR and Metro-North stations. SUNY Purchase, Hofstra University, Bard, Marist and Vassar colleges offer ridesharing programs.	Paratransit/ Marketing/ Vehicle sharing/ Employer programs	

Table 4.2 continued

Name	Description/Aim	TDM Category	Website
Telework	Many employers across the NYMTC planning area offer formal and informal telework programs. Some of the large programs include IBM in Westchester and Putnam counties and Empire Blue Cross&Blue Shield, CA Technologies, and Aer Lingus in Long Island.	Employer Programs	
Other employer related financial incentives	The New York City Commute Enhancement Grant (NYCCE) is available to organizations in NYC to help fund work site transportation related projects designed to reduce congestion and improve air quality. The Long Island Region Improving Commuting Grant (LIRIC) is a public service to help employers in LI to promote commuting alternatives to driving alone, including carpooling, teleworking, etc.	Employer Programs	
Toll Pricing	The Port Authority of New York and New Jersey offers E-Z Pass toll discounts for carpools on its bridges and tunnels. Overnight toll discounts area also offered for trucks.	Marketing/ Vehicle Sharing	
Complete Streets Legislation	To "accommodate and facilitate safe travel by pedestrians, bicyclists, and motorists of all ages and abilities and allow pedestrian and motor traffic to easily coexist."	Bike/ Pedestrian Enhancement	http://www.nysenate.gov/press-release/senate-passes-complete-streets-legislation
Commuter Tax Benefit	Many employers across the NYMTC planning area provide various financial incentives or tax-free transportation benefits to their employees to encourage the use of more efficient travel modes to and from work.	Employer Program Incentives	
Bike Share Programs	Bicycles are made available for shared use to individuals on a short term basis in to supplement public transit and automobile transport. CitiBike, the New York City Bike Share program, launched in May of 2013 with 6,000 bikes at 330 locations throughout the city. On Long Island, the City of Long Beach and SUNY Stony Brook have already launched bike share programs.	Bike/ Pedestrian Enhancement	http://decobikelbny.com/ http://www.stonybrook.edu/sustainability/green-map/details/bike-share-program.shtml http://www.citibikenyc.com/
Ferry services to Metro-North stations	Region 8 and Metro-North finance ferry companies that provide ferry services to Ossining and Beacon Metro-North stations.	Paratransit	
Suburban Express Bus	Region 8 Express Bus routes include OWL (Middletown - White Plains), Tappan Zee Express, Poughkeepsie-White Plains Express, IBus (Stamford – White Plains), Route 77 (Putnam – White Plains). The Suffolk County Clipper provides express bus service between the Long Island Expressway Park & Ride lots at exit 63, exit 58, the Hauppauge Industrial Park, exit 49 Park & Ride lot, the Route 110 corridor and SUNY Farmingdale.	Paratransit/ Marketing/ Vehicle Sharing/ Employer programs	
Railroad Station Shuttles	Danbury, CT to Brewster, NY; Ridgefield CT to Katonah, NY; Mahopac, NY to Croton Falls, NY; White Plains, NY to Westchester Ave; Newburgh, NY to Beacon, NY	Paratransit/ Marketing/ Vehicle Sharing/ Employer programs	

E-Z Pass is an electronic toll system in the NYMTC planning area.

3. Congestion Management Process

As defined in federal regulations, the Congestion Management Process (CMP) is intended to serve as a systematic process that provides for safe and integrated management and operation of the multimodal transportation system. It is required in metropolitan areas such as the NYMTC planning area and is considered an integrated part of the metropolitan transportation planning process. The CMP is the application of strategies to improve transportation system performance and reliability by reducing the adverse impacts of congestion on the movement of people and goods.

The need to address traffic congestion throughout the NYMTC planning area is a significant transportation issue given that the region's transportation network is considered one of the largest in the world. It includes more than 50,000 lane-miles of roads, streets and highways, 34 major bridges and vehicular tunnels over/under navigable waters, 480 route-miles of commuter rail, 225 route-miles of subway lines, hundreds of miles of various bus service, more than 1,100 miles of bicycle route facilities, ferry service, and an aerial tramway. This transportation network is vital for the movement of people and goods in the region.

As contained in NYMTC's Congestion Management Process procedures, the objectives of the CMP are to:

- Improve the mobility of people and goods by reducing vehicle hours of delay and person hours of delay;
- Improve the reliability and convenience of the transportation system, ensuring ease of use, acceptable travel times, and reasonable costs;
- Manage the transportation system efficiently to accommodate existing and anticipated demand for movement of people and goods; and
- Provide information on system performance and alternative strategies for alleviating congestion.

The procedures also include a toolbox of strategies to address congestion including Transportation System Management (TSM) and Transportation Demand Management (TDM). The NYMTC planning area benefits from a broad range of these TSM and TDM strategies; through the CMP process, members are able to consider a variety of alternative transportation options as described in the TSM and TDM sections above, when planning and implementing projects that are congestion-related. Examples include:

- Highway Strategies: Increasing the number of lanes without highway widening, creation of more HOV lanes;
- Transit Strategies: Encouraging transit use by making transit service more attractive, such as reducing fares, increasing bus route coverage and/or frequencies, establishing intelligent bus stops that provide riders with real-time information regarding the location of buses and their arrival times and other enhancements;
- Pedestrian and Bicycle Strategies:

Roadway and sidewalk enhancements aimed at increasing pedestrian and bicycle safety and accessibility;

• Transportation Demand Management Strategies: Alternative work hours, telecommuting, ridesharing and other programs reduce driving;

• Intelligent Transportation Systems and Transportation System Management Strategies: A series of technology based strategies/projects that assist in vehicular and pedestrian mobility;

• Access Management Strategies: Vehicular movement restrictions, interchange modifications, and other roadway design changes;

• Land Use Strategies Mixed-Use and Transit-Oriented Development;

• Parking Strategies: Various parking policy plans that aim to decrease VMT and increase the use of non vehicular transportation modes;

• Regulatory Strategies: A trip reduction ordinance, congestion pricing, and truck restrictions.

Several of the above strategies were described in the previous section, Transportation System Management and Transportation Demand Management, and are related to the same Shared Vision goals and outcomes.

PERFORMANCE MEASURES

The CMP procedures contain a performance measures framework that is reported in a CMP Status Report prepared with each RTP cycle. Traffic congestion on the region's roadways results when the vehicle volumes carried by the roadways exceeds the capacity which the roadways were designed to accommodate. Traffic congestion can be categorized as recurring, caused by predictable increases in daily traffic, or non-recurring, caused occasionally by traffic accidents, road closures, weather conditions and other atypical events.

Performance measures are used in the CMP to assess the effectiveness and efficiency of the roadway system. When measuring congestion, it is important to consider several performance measures that assist in quantifying and providing an overview of the level of congestion. Some of the most commonly used measures are:

• Demand-to-Capacity Ratio (a ratio that reflects the quality of travel of a roadway section)

• Vehicle Hours of Delay (the sum total of delay experienced by all vehicles on the network)

• Person Hours of Delay (vehicle hours of delay multiplied by the average person occupancy rate per vehicle)

• Average Travel Speed (miles per hour)

• Lane-Miles of Congestion (length of roadway lanes that functions at less than acceptable speeds during the peak travel hours)

• Travel Time Index (a ratio of peak period travel time to free-flow travel time)

To measure existing and future congestion within the NYMTC planning area, the New York Best Practice Model (BPM) and a CMP Post-Processor are used as the analysis tools. Two types of analysis are performed to forecast traffic congestion within the planning area: a regional level analysis and a county-borough level analysis. The regional level analysis is performed to assess traffic congestion and the performance of the entire transportation system on a regional scale. It allows a means for assessing the effectiveness of major transportation improvements in addressing regional traffic congestion. The county-borough analysis is a subset of the regional analysis, which focuses on congestion and system performance in each county-borough in the planning area. The county-borough analysis can identify in more detail local areas of congestion within each of the region's ten counties, as well as the effect of local transportation improvements for addressing local congestion.

Based on NYMTC's most recent CMP analysis results (2014 Status Report), it was estimated that in the year 2014, 176.9 million vehicle miles of travel (VMT) would take place daily on the roadway network. This daily VMT is projected to increase by 12.3 percent, to 198.8 million by the year 2040. Comparing other results from the same report between 2014 and 2040, the travel time index for the AM and PM peak periods will remain stable at 1.3 and 1.1 respectively; the lanes miles of congestion would increase from 4,130 to 5,299 for the AM peak period and from 2,140 to 3,021 for the PM peak period. Similarly, the daily vehicle hour of delay would increase from 4.4 million hours to 6.1 million hours.

Population and employment growth in the NYMTC planning area may also contribute to higher congestion on the roadway network. Apart from capital initiatives, congestion improvement strategies and policy programs should be implemented in advance to prevent this from happening. These strategies previously mentioned in this chapter, can di-

rectly improve the operation and management of the congested segments of the transportation system. They can also improve congestion indirectly by promoting and directing travel demand to non vehicular transportation modes. The improvements could range from major regional capital projects to local roadway enhancements and include all modes of transportation, as well as other land use and marketing strategies.

At a later date NYMTC will be working to address the performance measures requirements included in MAP-21 as discussed below.

MAP-21 PERFORMANCE MEASURES AND STANDARDS

The current federal legislation, Moving Ahead for Progress in the 21st Century Act (MAP-21) contains major changes to the metropolitan transportation planning process including the establishment of a performance-based planning and performance management for both highways and public transportation. MPOs and States are required to establish performance targets that address national performance measures established by the Secretary based on seven national goals. These targets must be set in coordination with the state and public transportation providers, within 180 days after the relevant state or public transportation provider sets performance targets.

The national goals and performance measures outlined in MAP-21 are to:

1. Safety: Achieve reduction in fatalities and serious injuries on all public roads.

2. Infrastructure Condition: Maintain highway infrastructure assets in state of good repair.

3. Congestion Reduction: Achieve reduction in congestion on the National Highway System.

4. System Reliability: Improve the efficiency of the surface transportation system.

5. Freight Movement and Economic Vitality: Improve freight networks, strengthen the ability of rural communities to access national and international trade markets, and support regional economic development.

6. Environmental Sustainability: Enhance the performance of the transportation system while protecting and enhancing the environment.

7. Reduced Project Delivery Delays: Reduce project costs, promote jobs and the economy, and expedite the movement of people and goods by accelerating project completion through eliminating delays in the project development and delivery process, including reducing regulatory burdens and improving agencies' work practices.

Performance Measures/Standards:

- Minimum standards for bridge and pavement management systems to be used by states
- Performance measures for pavement condition on the Interstate system
- Performance measures for pavement condition on the non-Interstate
- Performance measures for bridge conditions on the NHS
- Performance measures for the performance of the Interstate System
- Performance measures for performance of the non-Interstate NHS
- Minimum levels for pavement conditions on the Interstate System (which may be differentiated by geographic regions of the United States)
- Performance measures to assess serious injuries and fatalities per VMT
- Performance measures to assess the number for serious injuries and fatalities
- Performance measures for traffic congestion
- Performance measures for on-road mobile source emissions, and
- Performance measures to assess freight movement on the Interstate System

The performance measures and standards are based on the national goals and aligned to various program and policy areas including the National Highway Performance Program (NHPP), Highway Safety Improvement Program (HSIP), and the Congestion Mitigation and Air Quality Improvement Program (CMAQ), and Freight Policy.

Pedestrian safety is the first priority for the Safety Advisory Working Group (SAWG) and the NYMTC planning area.

4. Transportation Safety

INTRODUCTION

Safety is a key measure of the quality of the region's transportation system. In 2005, the federal legislation "Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users" (SAFETEA-LU) elevated transportation safety to a national priority by requiring safety to be a separate planning factor in the transportation planning process and establishing the Highway Safety Improvement Program (HSIP) and other safety-related programs. The emphasis on safety in federal transportation guidance continued with MAP-21, which was signed into law in 2012. In keeping with this legislation, NYMTC continues to promote a safe and secure transportation system as an integral part of its transportation planning process. NYMTC and its member agencies seek to go beyond the fulfillment of federal safety requirements to work constantly to ensure the overall safety of highway infrastructure and transit systems. The Council's safety planning work is guided by its Safety Advisory Working Group (SAWG). NYMTC's safety planning is also influenced by other federal, state and local plans, policies and guidelines, which are discussed later in this section. *Plan 2040* establishes a new goal for the NYMTC planning area: to enhance the safety and security of the transportation system for both motorized and non-motorized users. The following outcomes have been identified to meet this goal:

- Reduced rate of annual injuries and fatalities on the region's transportation systems;
- Promulgation of advanced safety and security measures throughout the region;
- Enhanced coordination, data, and information sharing among members and other stakeholders; and
- Promotion of safety and security improvements in all aspects of transportation planning and implementation.

These outcomes guide the core concepts of *Plan 2040*'s safety element. They are designed to help NYMTC and its member agencies target safety programs and funding priorities. The measures and strategies outlined in this section are also incorporated into NYMTC's annual priorities, the Transportation Improvement Program (TIP), and will be carried forward into future Regional Transportation Plans (RTPs).

SAFETY DATA EVALUATION

Transportation safety data is at the center of the evaluation of safety issues and the planning and implementation of safety programs. Federal transportation legislation emphasizes a data-driven approach to safety planning. This approach involves gathering and analyzing data, identifying needs, and investing safety funds accordingly. The Highway Safety Improvement Program (HSIP) directs funds as the data suggests.

To further incorporate a data-driven approach into its transportation safety planning, NYMTC continues to support New York State's ongoing efforts to collect timely and accurate electronic data. In addition to accuracy, the state's

data collection goal includes real-time data transmission. The cooperation of enforcement agencies is important to gathering timely and accurate crash information. A goal of NYMTC's incorporation of a data-driven approach is to transition enforcement agencies to the electronic transmission of crash data from paper copies. The benefit to police agencies of electronic data collection may become more clear as data analysis becomes streamlined and resources such as ALIS are made available to participating agencies. Data dissemination is part of NYMTC's strategy to improve data collection.

Crash data and reports of roadway crashes are maintained by appropriate state agencies such as the Department of Motor Vehicles. The primary source of safety data is the crash report, which includes contributing factors, crash location, and driver and vehicle characteristics. This information is very useful in identifying the characteristics of crashes. All fatal crashes are reported to the National Highway Traffic Safety Administration, another key data source. In the NYMTC planning area, the major sources of data on transit accidents are the transit operators.

Further planning and research is needed to support local governments in prioritizing safety work. Additionally, local governments need information on their roads' traffic volumes in order to compute crash rates so that locations with statistically significant safety issues can be readily identified. There is a need to prioritize region-wide access to information including crash history and traffic volumes. Empirical data should support transportation projects and programs and safety improvement investments.

TRANSPORTATION SAFETY TRENDS

The National Highway Traffic Safety Administration (NHTSA) reports that in 2011, 32,367 people died in motor vehicle traffic crashes in the United States, the lowest number of fatalities since 1949, and a 1.9 percent reduction in such fatalities from 2010 (32,999). There was also a 1 percent reduction in injuries from motor vehicle crashes, from 2.24 million in 2012 to 2.22 million in 2011. Motorcyclist fatalities increased from 4,518 in 2010 to 4,612 in 2011, or 2.1 percent. Pedestrian fatalities also increased 3 percent, from 4,302 to 4,432, and bicyclist fatalities increased 8.7 percent, from 623 in 2012 to 677 in 2011. Motorcyclist, pedestrian, and bicyclist injuries decreased by 1.2 percent, 1.4 percent, and 7.7 percent, respectively, over the same time period.

Table 4.3: Crashes in the NYMTC Planning Area, 2009-2011

Category	2009	2010	2011
Total Number of Crashes	163,377	163,348	161,489
Total Fatal Crashes	529	544	534
Total Number of Motor Vehicle only Crashes*	144,042	142,501	141,245
Motor Vehicles Fatalities - Driver	231	238	212
Motor Vehicle Fatalities - Passenger	76	81	87
Motor Vehicle Injuries - Driver	70,249	69,382	66,384
Motor Vehicle Injuries - Passenger	34,993	36,381	33,330
Total Number of Pedestrian/ Motor Vehicle Crashes	12,974	13,576	13,157
Pedestrian Fatalities	235	225	222
Pedestrian Injuries	12,655	13,365	12,986
Total Number of Bicycle/ Motor Vehicle Crashes	4,036	4,649	4,592
Bicycle Fatalities	22	26	43
Bicycle Injuries	3,879	4,478	4,452
Total Number of Motorcycle Crashes	2,325	2,622	2,495
Motorcycle Fatalities	57	75	63
Motorcycle Injuries	2,042	2,292	2,190

Source: New York State Department of Motor Vehicles (NYSDMV).
* These crashes do not not include pedestrians, bicyclists, or motorcycles.

The crash records show that the number of traffic crashes did not vary significantly between the years 2009 and 2011. However, comparing the number of crashes for the year 2011 and the average of 2009 and 2010, the total number of crashes decreased slightly, by 1.1 percent, but there was a 5.7 percent increase in bicycle crashes.

Both New York State and the NYMTC planning area followed the same safety trends from 2010 to 2011, although at varying rates. Given the size and importance of the transit system in the NYMTC planning area, transit safety is also of great importance to NYMTC members. Table 4.4 shows accident data for the Metropolitan Transportation Authority (MTA) system for the period 2009-2011.

Table 4.4: MTA Transit Accidents, 2009-2011

		2009	2010	2011
Bus Transit†	*Total*	41	40	53
	Fatalities	6	9	3
	Injuries	143	114	155
Rail Rapid Transit‡	*Total*	122	153	165
	Fatalities	51	51	54
	Injuries	65	90	88
Suburban Rail§	*Total*	21	7	35
	Fatalities	6	0	26
	Injuries	11	2	1
Total Transit Accidents*		184	200	253

Source: New York State Public Transportation Safety Board
† MTA/NYCT, MTA Long Island Bus, and MTA Bus
‡ MTA/NYCT and MTA/Staten Island Railway
§ MTA/Metro-North Railroad and MTA/Long Island Railroad
* Includes bus, rapid transit and suburban rail.

TRANSPORTATION SAFETY EFFORTS

Engineering and Planning Initiatives

Modern traffic engineering and planning techniques are available to counties, regions, and municipalities to inform their road management and planning decisions. These techniques, which include location prioritization, road safety audits, and the use of crash reduction factors, can help inform design decisions and improve evaluations of past projects based on post-completion safety and operational data.

Accident Location Information System (ALIS)

NYMTC member agencies need improved access to data. Currently, accessing data is time-consuming and requires navigating several hurdles. The NYSDOT has developed ALIS and is working through the New York State Association of Metropolitan Planning Organizations (NYSMPO) Safety Working Group to expand MPO use of this web-based system that visually displays a crash data query in a GIS format. Feedback from the initial users of ALIS indicates it is a powerful tool for safety analysis. NYMTC will continue to support the use of ALIS and to ensure member agency access and training.

Traffic Safety Data Viewer

The NYCDOT developed the Traffic Safety Data Viewer to allow easy access to detailed data by planners, analysts, and project managers, in a user-friendly interactive map format. NYCDOT hopes to make this tool accessible to more NYMTC member and NYC agencies in the future.

Complete Streets Design Principles

Complete Streets design principles are roadway design features that accommodate and facilitate safe travel by pedestrians, bicyclists, and motorists of all ages and abilities. These features include sidewalks, paved shoulders suitable for use by bicyclists, bicycle lanes, share-the-road signage, crosswalks, pedestrian control signalization, bus pull-outs, curb cuts, raised crosswalks, ramps, and traffic calming measures designed to allow pedestrian and motor traffic to easily coexist. Several municipalities within the NYMTC planning area adopted complete streets policies prior to the passage into law of New York's Complete Streets Act in August 2011.[69] NYMTC agencies must consider complete streets design principles on all future projects which receive both federal and state funding.

Safe Streets for Seniors

NYC Safe Streets for Seniors is a mayoral pedestrian safety initiative for the elderly population in New York City. Along with the office of the Mayor of New York City, the NYCDOT and the Department for the Aging launched this program to improve elderly pedestrian safety. Through crash data analysis, 25 city neighborhoods were identified that have both a high density of senior citizens and a high number of crashes involving pedestrians. The Safe Streets for Seniors program identifies the main contributing factors to senior fatalities and injuries and implements appropriate safety improvements.

The SafeSeniors, a NYSDOT Pilot Program expanded targeted senior pedestrian initiatives to two areas in Nassau and Suffolk counties. The program focused on improvements for pedestrian safety that could be implemented quickly and at low cost. The intent of the program is to incorporate feedback to improve the program and expand statewide.

As part of its Livable Communities Program, Westchester County is actively involved in the AARP pedestrian needs program. A survey was launched in New York State by AARP to bring attention to the safety issues that pedestrians face and what needs to be improved in the pedestrian infrastructure. The survey evaluated 530 intersections across more than 30 counties throughout the state in the spring of 2011. The results of the survey highlighted several poor pedestrian conditions and driving behaviors which are listed in Appendix 2: Pedestrians and Bicycles.

Safe Routes to School (SRTS)

Safe Routes to School (SRTS) originated in New York City and was adopted nationally as a federally-funded program. SRTS is administered by NYSDOT and guides local projects throughout the state that relate to providing a safe environment for students to walk or cycle to school. Through SRTS, some agencies have identified "priority schools" and created safety improvement recommendations. In New York City, programs like Safety Town and Safety City that teach students about bicycle and pedestrian safety were noted as model programs. In Westchester County and in Long Island, SRTS workshops have been held in many communities and schools. NYMTC members should continue to focus safety improvements on schools with the highest crash rate and educational programs.

New York City Safe Routes to Transit

Safe Routes to Transit is a New York City initiative to improve pedestrian and motor vehicle movement around subway entrances and bus stops in order to increase the accessibility and convenience of mass transit. The three programs comprising the Safe Routes to Transit initiative are Bus Stops under elevated subways structures, Subway-Sidewalk Interface, and Sidewalks to Buses.

Safety Studies

NYMTC member agencies are currently investigating intersections and roadway segments within their respective jurisdictions with statistically significant above-average crash rates. The identified locations will be further studied by in-house safety investigators and/or consultant engineers to determine the cause of the safety problems so that appropriate improvements can be implemented. The highway safety investigations will first evaluate implementation of low cost improvements, such as improved signage, minor paving, sight distance improvements, guiderails, improved pavement markings, adding countdown pedestrian heads, changed signal timing, and others. However, in certain cases, capital investments may be necessary and could be included in large-scale capital projects. Where crashes tend to be randomly dispersed, a systemic approach should be utilized at locations that have specific safety issues. Roadway treatments such as chevrons, wet reflective pavement marking, rumble strips, and wider shoulders, can decrease unsafe lane departures. Other similar low-cost systemic treatments should be evaluated for intersection and pedestrian safety. In addition to locations identified by crash statistics, safety investigations may also be completed at locations with perceived safety concerns identified by the public and elected officials.

High Crash Corridor Programs

Consistent with newly enacted Complete Streets legislation, NYSDOT considers the entire transportation network when planning projects. NYSDOT also makes efforts to incorporate the Federal Highway Administration's philosophy that data driven analysis should be used when deciding where to target limited funds. The "corridor approach" identifies systemic improvements to be implemented throughout the study corridor. Current corridor approach projects in the Long Island area include the Hempstead Turnpike Pedestrian Safety Study, the Sunrise Highway Pedestrian Safety Study, and the Southern Parkway Nassau County Lane Departure Crash Analysis.

NYCDOT's High Crash Corridors program, established by the 2010 NYC Pedestrian Safety Study & Action Plan, includes redesigns of at least 20 miles of High Crash Corridors annually, and upgrades (e.g. with signals or markings) of at least 40 additional miles of High Crash Corridors. High Crash Corridors are defined as the highest-ranked 1/3 of street mileage in each borough, in persons killed or severely injured (KSI) per

mile. The program's objectives have been exceeded in both years since it was initiated. The agency's goal, to which the program contributes, is a 50 percent reduction in citywide traffic fatalities from 2007 to 2030.

New York City's high crash corridor programs complement NYSDOT's network screening process. NYSDOT performs an analysis each year to identify locations where an unusually high number of crashes occur. Each year a portion of these sites, called Priority Investigation Locations, or PILs, are studied to identify cost-effective safety measures. Improvements are implemented by maintenance forces or through capital construction projects.

Education

The FHWA's Pedestrian Safety Campaign is a comprehensive set of materials for local communities to use in implementing their own Pedestrian Safety Campaign. It includes materials designed for use in television, radio, cinema, and print advertising. Forums and other targeted educational programs are used to reach specific groups such as children and seniors. Public Information and Education (PI&E) initiatives in the region include the Safe Routes to Schools and Transit initiatives, as well as ongoing safety education forums focused primarily on children and seniors.

Enforcement

STOP DWI is an important program implemented in the NYMTC planning area that addresses impaired driving. The comprehensive program consists of five areas: education/public information; enforcement; court-related; rehabilitation; and probation. In addition, several other programs address aggressive driving behavior and occupant protection, including Selective Traffic Enforcement Program (STEP), Buckle Up New York (BUNY), and Child Passenger Safety. STEP encourages jurisdictions to use local data to identify problem areas and to develop enforcement countermeasures that reduce crashes, injuries and fatalities. BUNY grants are for seat belt enforcement and compliance. Child Passenger Safety grants support child passenger fitting stations, training, and child restraint education. NYMTC will continue to monitor new trends and participate in emerging focus areas.

PRIORITY AREAS AND STRATEGIES

Priority Areas

The Council has identified several transportation safety issues to monitor and address across the region. One of the major guiding forces in identifying these issue areas is the available data. It is a NYMTC priority to cooperatively implement an electronic crash data system among enforcement and transportation agencies to seamlessly provide access to recent crash data.

Pedestrians

Pedestrian safety is the first priority for the Safety Advisory Working Group (SAWG) and the NYMTC planning area. A disproportionate number of the crashes involving pedestrians occur in the NYMTC planning area: based on 2010 Census and the three-year average (2009-2011) New York State Department of Motor Vehicles (NYSDMV) data, while only 64 percent of the state residents live in the NYMTC planning area, 83 percent of pedestrian injuries and 73 percent of pedestrian fatalities occur in the region. However, the NYMTC planning area is one of the safest places in the United States to walk. Among 52 metropolitan areas with populations over one million, New York-Long Island-Northern New Jersey was the third-safest in pedestrian fatality rates, controlling for walk-to-work rates.[70] Although New York City accounts for a large share of the NYMTC planning area's pedestrian activity, every community within the region has a central area with commercial and community uses, where walking is the primary mode of transportation.

In the NYMTC planning area, according to the U.S. Census, the population aged 65 and older increased by 7.8 percent from 2000 to 2010, from 1,478,220 to 1,593,012. Between 2005 and 2007, 255 pedestrians aged 65 years and older were killed on the NYMTC area roads. Though they comprised less than 12 percent of the area's population, people aged 65 and older accounted for 30 percent of the total pedestrian fatalities during the three-year period.[71] While the older adult population continues to be a vibrant and productive part of the society, its walking ability due to age is more challenging compared to other adults. Therefore, providing safe mobility for older adults is a priority in the region. The key components to safety and mobility would be to eliminate barriers to pedestrian activity for all ages and to prioritize a list of short- and long-term pro-pedestrian safety improvements.

In addition to seniors, child pedestrians are a priority area for safety. Each week in New York State, 20 children age five to nine years are treated at a hospital because of a pedestrian-related injury;[72] four of them are injured severely enough to require hospitalization. These injuries are the second leading cause of unintentional injury hospitalization and death among this age group.[73]

Motor Vehicles

Intersections are a planned point of conflict in the roadway system. A typical

two-way road intersection has 56 potential conflicts: 32 vehicle-to-vehicle conflicts and 24 vehicle-to-pedestrian conflicts. With different crossing and entering movements by drivers, pedestrians and bicycles, an intersection is one of the most complex traffic situations encountered by motorists. Dangers are compounded by speeding and distracted motorists who disregard traffic controls. Despite increased emphasis on intersection safety with improved intersection design and more sophisticated applications of traffic engineering measures, the annual toll of human loss due to motor vehicle crashes has not substantially decreased in more than 10 years (from 1998 to 2007).[74]

FHWA has identified roadway departures as one of the three major safety areas (along with intersections and pedestrians) that require a special focus. Nationally, most highway fatalities occur in roadway departure crashes (53 percent), intersection-related crashes (21 percent), and pedestrian crashes (11 percent).[75]

The New York State Strategic Highway Safety Plan (SHSP) states that lane departures and intersections represent the highest fatality areas in the state. Lane departures represent 34 percent of all the state's fatal crashes, while 36 percent of the state's fatal crashes occurred at intersections.

Distracted driving continues to be a national problem. In 2011, 3,331 people were killed in crashes involving a distracted driver and 387,000 people were injured.[76] While 39 states have recently banned text messaging for all drivers,[77] there is a continuing need to better educate and train drivers, bicyclists, and pedestrians to develop better safety awareness and skills. As personal devices continue to increase distraction in pedestrians and drivers alike, inattention and/or distraction are also significant human factors contributing to crashes.

The 2011 NYSDMV crash data show that more than 77 percent of crashes in New York State are related to human factors.[78] Safety issues related to driver behavior include impaired driving or driving under the influence,[79] speeding and aggressive driving, and occupant protection. Most issues in this area are addressed through education and/or enforcement and are currently well-managed by the Traffic Safety Boards within the NYMTC planning area.

While there are many active and alert senior drivers (age 65 and above), according to NYSDMV, in 2011, senior drivers comprised 10 percent of all drivers in New York State but were involved in 13.6 percent of all fatality crashes. As the senior age group grows, senior drivers emerge as an important issue requiring safety planning attention. Just as senior pedestrians can be the victims of many pedestrian crashes, senior drivers can potentially be a hazard to other pedestrians and motorists. Aging can impact a person's visual, cognitive and physical health. Due to medical and technological advances, recent population forecasts predict an increase in the national elderly population, which could lead to higher percentages of senior drivers on the roads. Currently, federal agencies are promulgating guidelines to address this growing segment of the population. These new guidelines will help states develop plans to address the particular needs of older drivers and to address the emerging challenges posed by an increasing population of older drivers.

Motorcycles

Over the past decade, motorcycling has become increasingly popular in the NYMTC planning area. Along with the dramatic increase in the number of motorcycle licenses and registrations in the region, the number of motorcycle crashes involving fatalities or injuries has also increased. With more motorcycles on the road than ever before and increasing crash rates this mode of transportation requires a special focus in relation to roadway safety.

Bicycles

A livable community provides safe and convenient transportation choices to all, including walking, bicycling, transit, or driving. Bicycle safety is a major concern in the NYMTC planning area. Bicycle safety improvements depend on an integrated approach that involves education, planning, design, and maintenance. NYMTC member agencies use street design, such as traffic calming and Complete Streets, to improve safety for bicyclists and all roadway users. Educational programs for drivers, bicyclists, and pedestrians, like Coexist New York States, Share the Road, and Bike Smart Campaigns, also improve safety. Additional information about bicycle safety is in *Appendix 2: Pedestrians and Bicycles.*

Intermodal Connectivity

Safe pedestrian connections at intermodal transfer points, such as bus to rail transfers, are a crucial component of regional intermodal planning. Improved roadway design and wayfinding can greatly improve both safety and connectivity. Intermodal connectivity areas include interface areas between subway and sidewalks, parking lots connecting to commuter rail stations, ferry terminals or airports, and pedestrian paths connecting bus stops with major trip generators, like residential or offices complexes, malls, and hospitals.

Transit

Various transit systems in the NYMTC

planning area have established safety programs to achieve the highest practical level of safety for all modes of transit. In order to protect passengers, employees, revenues, and property, all transit systems are encouraged to develop and implement a proactive system safety program plan. The Federal Transit Administration (FTA) supports these efforts by developing guidelines and best practices, providing training and by performing system safety analyses and reviews. One program developed and implemented by the FTA is the Safety Management Systems (SMS) and Safety Performance Measurement Systems (SPMS). SMS offer the most promising means of preventing public transportation crashes by integrating safety into all aspects of a transit system's activities, including planning, design, construction, operations, and maintenance.

Although the above areas are elevated in importance, the transportation planning process addresses other safety issues as well. These include motor carrier safety for large trucks, emergency medical vehicles (these issues are addressed by other agencies), and trucks mistakenly driving onto onto parkways and striking overpasses with low height clearance.

Strategies

Several strategies will be used together to address the transportation safety issues described in this section. These include the continuation of those strategies that are currently in place and those described below. The outcomes related to *Plan 2040*'s safety goal, as described in this section's introduction, will likely be improved through implementation of these strategies. One of the focuses of the safety goal is to develop comprehensive access to safety-related data, including an electronic crash data system that will provide vital crash data between enforcement and transportation agencies.

Build Partnerships between Agencies and Stakeholders

All transportation operating agencies in the NYMTC planning area have formed partnerships with other public agencies, including police departments and Community Boards, to address all aspects of transportation safety, including safety engineering, enforcement, education, and emergency and medical services. Traffic Safety Boards focus on safety education and enforcement in local areas, while other statewide partnerships focus on statewide road safety issues. Agency coordination is especially necessary in multi-jurisdictional areas of the roadway network, such as roadway segments operated by different transportation agencies that connect highway ramps, bridges, and tunnels with the local street network, in order to ensure continuity for roadway safety. NYMTC and its members will continue to foster relationships with other public organizations in order to broaden its approach to improving the safety and efficiency of the entire transportation system.

Integrate Safety at All Levels of Planning

Safety should be integrated into all of the agencies within the transportation planning processes. This entails both dedicating funding to safety-specific research on key safety issues and facilitating multi-agency communication by sharing information and collaboratively generating strategies. Each NYMTC member agency participates in the Safety Advisory Working Group (SAWG) which identifies issues, barriers, and opportunities related to safety integration. In addition to participation in SAWG, each agency could appoint Pedestrian-Bicycle Coordinators or identify specific staff as needed to assist with pedestrian and bicycle safety issues. Additionally, many regional issues mirror statewide issues. NYMTC should continue to participate in the New York State Association of Metropolitan Planning Organizations (NYSMPO) Safety Working Group, where statewide issues are addressed and future issues are identified.

Continue Education and Training

Promoting an awareness of safety strategies for all road users, along with improving roadway geometry, are vital components of safety planning. Education and outreach is needed for the public as well as for those who implement improvements to the transportation network. NYMTC agencies will work with their Traffic Safety Boards, who have educational programs in place, to address many issues, such as distracted or impaired driving. Drivers, bicyclists, and pedestrians must understand the traffic regulations and yield to each other appropriately.

NYMTC recognizes that community-based workshops have been particularly effective at bringing together stakeholders around common issues. With continued federal and state programming support, NYMTC will continue to sponsor training workshops on Complete Streets, Walkable Communities, Safe Routes to School, Designing Streets for Pedestrian Safety, and Road Safety Audits.

Continue a Focused Approach to Safety (FHWA Focus State Program)

FHWA's Focus State program recognizes that three focus areas account for 85 percent of traffic fatalities: intersections, roadway departure, and pedestrian safety. The purpose of the Focus State program is to further decrease the number of fatalities and serious injuries on the nation's highways through the targeted delivery of technical assistance and resources. The program also calls for the transportation community to think beyond traditional approaches and to consider low cost,

comprehensive, and/or systematic safety solutions. This approach allows Focus States to demonstrate results and to take advantage of lessons learned across the country by states and localities that have implemented safety improvements on their highways. Studies show a 12 percent to 19 percent fatality reduction in Focus State areas from 2002 to 2008.[80]

Road Safety Audits

A Road Safety Audit or Safety Assessment is a proactive, low cost safety tool to assist agencies in addressing problematic locations. Similar processes are used by many agencies under different names. In a safety assessment, an independent multi-disciplinary audit team examines a site and offers solutions. The assessment process emphasizes the connection between the transportation planning process, multimodal considerations, enforcement activities, safety education, and engineering solutions. NYMTC agencies should consider this tool in its efforts to systematically address safety issues.

Crash Reduction / Crash Modification Factor (CRF / CMF)

A crash reduction factor or crash modification factor (CRF or CMF) is the percentage reduction in traffic crashes that might be expected after implementing a given countermeasure at a specific site. CRFs are available for roadway improvements as well as pedestrian measures. Not only can CRFs be used in cost-benefit analysis, they can also serve as a tool in the investment decision-making process.

Establish Asset Preservation Programs

Safety appurtenances such as guiderails, signs, and pavement markings are critical elements in highway safety design. In order to keep these elements functioning as designed, an asset management program must be in place to provide ongoing routine maintenance. Asset preservation may be accomplished through both capital and maintenance efforts.

Explore and Expand Emerging Strategies

Explore emerging strategies such as "Vision Zero" and expand Automated Enforcement. The Swedish Parliament introduced a new approach to road safety called "Vision Zero" in 1997 that focuses on prioritizing human life and health over mobility through speed reduction and design. Vision Zero is based on a refusal to accept human deaths or lifelong suffering as a result of road traffic accidents. Sweden reduced fatalities and serious injuries by nearly 50 percent since 1997. Included in the reduction are the decrease in the number of overall deaths from 541 in 1997 to 319 in 2011; a decrease in pedestrian deaths from 72 in 1997 to 53 in 2011, and a decrease in cyclist deaths from 42 in 1997 to 21 in 2011.

Although red light cameras have been in use for some years, an expansion of automated enforcement strategies would place additional cameras and explore the use of speed cameras. Cameras are currently placed in a few counties throughout the region; the installation of additional cameras or of speed cameras would require changes in legislation. Studies indicate that the fatality rate drops to 45 percent when a person is struck by a car going 30 miles per hour compared to higher speeds and to 5 percent at 20 miles per hour or less.[81]

OTHER PROGRAMS AND PLANS IMPACTING TRANSPORTATION SAFETY PLANNING

Strategic Highway Safety Plan (SHSP)

The Strategic Highway Safety Plan (SHSP) is New York State's plan that establishes highway safety goal areas.[82] NYMTC is working with other New York State stakeholders toward achieving the statewide goals and efforts promulgated within the SHSP. The SHSP feeds into the safety element of *Plan 2040*, which provides input back into the SHSP.

The Governor's Traffic Safety Committee's (GTSC) Highway Safety Strategic Plan (HSSP)

The Governor's Traffic Safety Committee (GTSC) administers the National Highway Traffic Safety Administration's (NHTSA) Section 402 funds. These federal funds are used to support State and Community Highway Safety programs to reduce deaths and injuries. The GTSC's Highway Safety Strategic Plan (HSSP) is the principal document for setting priorities, directing program efforts, and assigning resources in New York State.

New York City Pedestrian Safety Study and Action Plan

The first *New York City Pedestrian Safety Report and Action Plan* examined over 7,000 records of crashes that have caused serious injuries or fatalities to pedestrians, identified underlying crash causes, and recommended safety improvements. NYCDOT used this data to inform the public about the agency's work to reduce traffic fatalities and make New York City

streets safe for everyone. The report concludes that pedestrian fatalities occur disproportionately along multi-lane streets and avenues, and that speeding, driver inattention, and failure to yield are the major underlying factors behind most of pedestrian fatalities or serious injury crashes. The report recommends a series of actions to continue to reduce pedestrian crashes, including pilot programs to reduce speed limits to 20 mph and street redesigns to increase pedestrian safety. The Action Plan also called for NYCDOT to launch an anti-speeding ad campaign to improve safety for pedestrians, motorists, and cyclists throughout the city.

Complete Streets Programs

NYSDOT is currently applying Complete Street provisions on a statewide basis in its project planning, programming, and delivery processes. The applicability of Complete Street features is considered at each stage of project development. A framework has been developed to guide this process for state- and federally-funded projects. An important component of this framework is the Pedestrian Generator Checklist, which is routinely used by planners and designers to identify a need for current or future pedestrian accommodations in a given project. Guidelines are also being developed for projects funded by municipalities. Because NYSDOT and local agencies share the responsibility of implementing Complete Streets, the ability of municipalities to identify opportunities for Complete Street features, and ultimately to install them, will be critical to achieving safer and more sustainable communities.

Highway Safety Improvement Program (HSIP)

NYSDOT manages the Highway Safety Improvement Program (HSIP) using a collaborative approach. In addition to administering regional transportation safety projects, NYSDOT solicits proposals for safety projects through initiatives selected by the Statewide Safety and System Optimization Team. This centrally managed portion of the program allows NYSDOT to support safety-specific projects that direct safety funds to locations, corridors, and areas that demonstrate the highest benefit-cost ratios to reduce fatal and severe injury crashes. Funding is awarded based on an evaluation in order to maximize investment in the most cost-effective safety projects statewide. Selected projects must be consistent with the strategies and emphasis areas identified in the New York State Strategic Highway Safety Plan (SHSP). Both targeted and systematic projects are eligible for HSIP funding. NYMTC will continue to work with New York State to identify future projects appropriate for this program.

PANYNY's command center during Hurricane Sandy.

5. Transportation Security

NYMTC members adhere to the guidelines of federal and state emergency plans, such as the Federal Transit Administration (FTA) *Safety & Security Plan*, *State Homeland Security Strategy*, and *New York's State Preparedness Report*, to create their own emergency procedures as they see fit. They also participate in meetings with other agencies and regional authorities to periodically review their planning, response and mitigation measures and to make refinements as necessary. The regional agencies, led by the NYS Division of Homeland Security & Emergency and the NYC Office of Emergency Management, take responsibility for educating residents in their areas in emergency procedures before, during and after an event. Furthermore, these agencies devise plans for disaster preparedness and emergency relief for all possible situations, e.g., coastal storms, flash floods, snow storms, as well as planning for the distribution of commodities, continuity of operation, evacuation, sheltering and mass fatalities.

Emergency events, whether natural or man-made, can impact the entire environment of an area thereby affecting land based and in-water infrastructure. Securing transportation systems in the New York City metropolitan area continues to be a primary concern for state and federal transportation agencies as well as for each of NYMTC's member agencies. Following recent events, specifically Hurricane Sandy, NYMTC members have been working diligently on understanding and implementing measures to address vulnerabilities in the regional transportation system. The recent extreme weather events have only strengthened NYMTC's commitment to the planning and implementation of security procedures and infrastructure improvements appropriate for each county.

During an emergency, multi-level coordination is necessary. Depending on the severity and scale of the event, the federal, state and local agencies coordinate their response efforts. Emergency coordination is usually conducted via the emergency operation centers that exist in he NYMTC planning area. For major emergencies, coordination with media (i.e., television, radio, and the internet) is used to inform and give instructions to the public. A recent example of an effective large-scale emergency coordination effort was that which occurred during Hurricane Sandy in October, 2012. The coordination for this disaster involved federal agencies working closely with multiple state and local agencies along with media and many volunteers to address effectively the response efforts. However, Sandy also highlighted the need for NYMTC members to focus efforts on adapting the transportation system to order to increase resiliency to the impacts of climate change and weather.

Looking forward, their planning processes will be expanded in the following ways:

• The MTA will re-examine its infrastructure to try to prevent the kind of damage that Sandy inflicted. For example, MTA New York City Transit is well underway with plans to enhance operations planning response; coordinate with federal, state and city agencies and the real estate community to protect vulnerable zones; investigate concepts to harden assets; and capture lessons learned across the organization for better information sharing.

• The Port Authority is undertaking a wide range of initiatives: intensive review of facility systems to control flooding and anticipate other incidents with potentially dramatic impact, and lessons-learned reviews for improving communication with the traveling public and other transportation operators. The agency is redoubling its efforts to apply investment strategies that will reduce the vulnerability of critical infrastructure connections – notably the multi-modal Hoboken transit hub – and improve the resilience of the overall regional transportation network through availability of ferry resources, working closely with both states, federal and regional partners, and host communities.

• The New York State Department of Transportation (NYSDOT) is undertaking additional efforts to identify critical transportation infrastructure within the region vulnerable to extreme weather events, storm surge, sea level rise and seismic events, and to develop a risk assessment of transportation infrastructure that will assist in future capital and emergency mobility planning. This more detailed assessment will help define critical facilities, corridors, systems, or routes that must remain functional during a crisis or be restored most rapidly. A recent synthesis study undertaken by the agency entitled "*Mainstreaming Climate Change Adaptation Strategies Into New York State Department of Transportation's Operations*," suggests that the agency integrate adaptation to climate change considerations into all aspects of its decision-making. As a result, climate resiliency will be considered a factor for long-term planning and investigated as a criterion for future project selection. In addition, NYSDOT will continue to improve communication among agencies, and is developing plans for system upgrades to improve outreach to the public. Further, the department is developing an asset management planning and replacement schedule for ITS equipment, infrastructure and devices to ensure resiliency and redundancy; plans for integrated corridor management and enhanced signal systems would facilitate potential evacuation.

• New York City is applying lessons learned from the storm recovery to better prepare and respond to any similar disasters in the future. In terms of immediate recovery of travel options within the city, pedestrian and bicycle access across major bridges was critical. Over 18,000 people crossed the four East River bridges on foot or bicycle after the storm, an increase of more than 13,000 above everyday numbers. The temporarty ferry service to southern Staten Island gave planners a sense of latent demand for such a service in the future. The East River Ferry and the "bus bridge" from Atlantic Station to Manhattan also formed critical parts of the connection between Manhattan, Brooklyn, and Queens in the immediate days after the storm.

• Westchester County is undertaking various initiatives to adapt services and infrastructure to address the increasing severity and frequency of storms such as Sandy, including identifying detours for bus routes and developing flood mitigation plans to minimize roadway closures. The county will continue to make full use of its Emergency Operations Center to facilitate up-to-date communication among transportation agencies, first responders and utility companies, and work with them to direct resources to the areas of greatest need.

• Rockland County plans to step-up efforts to work more closely with utility companies and other agencies to continue establishing a more organized approach to restoring the transportation infrastructure in a timely manner. This will include pursuing more direct communication links between transportation agencies, responders and utilities, as well as more basic efforts like further encouraging that main power lines be secured underground and implementing more vigorous tree monitoring programs to limit future exposure to outages. Plans to define more specific staging areas, improve resources, establish more widespread power redundancies, increase supply levels before a storm and continuing to call for all service stations and food stores to have generators will improve response and recovery time. Continued use and refinement of the county's new GIS tool will also ensure Rockland County's ability during future weather events to monitor fast changing conditions and to direct emergency crews more efficiently and effectively.

• In Suffolk County, initial lessons of Sandy underscore the urgency of some of the plans already being pursued, including an initiative to Connect Long Island through innovative mass transit – Bus Rapid Transit – that will help reduce dependence on automobiles. A

less auto-dependent Suffolk County will be less vulnerable to disruptions in the availability of fuel; and innovative transit will enhance Suffolk's resiliency and economy. Suffolk County also seeks to reinvigorate hazard mitigation plans and go beyond previous paradigms to create comprehensive, state-of-the-art flood protection systems that balance "bricks and mortar" such as buildings, roads, waste-water infrastructure and power grids with Suffolk's natural water systems of ocean, bay, sound, rivers and creeks.

• In Nassau County, lessons learned from Sandy include the need for its Department of Public Works to bid new contracts that fully comply with federal requirements to ensure recovery work is eligible for federal reimbursement, and to establish an Emergency Operations plan related to traffic control infrastructure that addresses roles and responsibilities of personnel and includes emergency procedures for a variety of scenarios. The county will also implement mitigation measures to backup generation and the motor control centers at its two drawbridges, the Long Beach and the Bayville bridges. Backup generation is also being analyzed for traffic control equipment. Additionally, the county will look at hardening measures related to all transportation infrastructure, including tide flex valves on drainage systems in low lying areas, shoreline and bridge scour protection and the types and locations for curbside trees. Finally, the county will look at ways to expand use of its Traffic Management Center cameras and signals to its evacuation routes and tie those routes to the Center.

Climate change increases the likelihood of passenger discomfort, service disruptions, and pavement damage. While preparation is essential to the security of our regions, it is also important to reduce our contributions to climate change by decreasing the production of greenhouse gas emissions caused by the transportation sector. Hurricane Sandy illustrated the importance of a resilient transit system within the NYMTC planning area; assessing the aftermath will be key to developing plans for the future. By educating both the residents who depend on a secured transportation system and the operations and maintenance staff on whom the network relies, NYMTC members are working to develop a transportation network that is safer and better prepared for emergencies. NYMTC's involvement in these activities is described below at the federal, state and regional levels.

FEDERAL LEVEL

At the Federal level, the U.S. Department of Homeland Security (DHS) is an overarching agency whose responsibilities include critical infrastructure protection, and emergency preparedness and response, as well as providing a set of requirements of safety measures to state and regional agencies. The National Incident Management System (NIMS) is an emergency management doctrine used as a guide to facilitate emergency preparation, management and mitigation for public and private sectors nationwide. The provision of transportation security rests with the Transportation Security Administration (TSA) with the mission to protect the nation's transportation systems, ensuring the freedom of movement for people and commerce. FTA and TSA have developed a list of Security and Emergency Management Action Items to elevate security readiness throughout the public transportation industry. Among the other agencies operating under DHS is the Federal Emergency Management Agency (FEMA), which is responsible for coordinating efforts with state and local governments in order to manage all hazards including natural and man-made disasters. It should also be noted that each administration within the U.S. Department of Transportation is involved with different aspects of transportation security.

STATE LEVEL

New York State Executive Law, Article 2B, enacted in 1978, created the Disaster Preparedness Commission (DPC) and required the development of a statewide Emergency Management Plan. The DPC comprised of the commissioners, directors or chairpersons of 23 state agencies and one volunteer organization – the American Red Cross. The responsibilities of the Commission include: the preparation of state disaster plans; the direction of state disaster operations and coordination with local government operations; and the coordination of federal, state, and local recovery efforts. The New York State Office of Emergency Management provides administrative and program support to the DPC and plans and coordinates the responses of the state in times of emergency or disaster. The New York State Office of Homeland Security was created after the September 11, 2001 terrorist attacks and by law coordinates the policies, protocols, and counter-terrorism strategies for New York State government agencies. NYMTC members refer to the *State Homeland Security Strategy* and *New York's State Preparedness Report* to establish goals and initiatives appropriate to their respective counties.

The New York State Department of Transportation (NYSDOT)

NYSDOT created the Emergency Transportation Operations (ETO) Program, which is the foundation for preparation, response and recovery for major emergency incidents that occur in New York State. New York State is broken into different regions, each of which has an

Emergency Manager who has oversight in the ETO Program, allowing for statewide coordination during emergency events. In the event of a major emergency, NYSDOT responds by implementing the Incident Command System, the command and control system used by state and federal responders.

NYSDOT works with the state Office of Emergency Management (OEM) to create emergency plans that prepare for possible and probable natural or manmade disasters that directly affect the transportation system. One example is the Transportation Infrastructure Branch Annex of the *State Comprehensive Emergency Management Plan*. This annex describes how NYSDOT will respond to emergency events that disable the use of the transportation system, particularly how to restore the system for local customers. Coordination with federal agencies and standards is also outlined in this annex, but the actual coordinating is handled by the state OEM.

At the local level, NYSDOT coordinates with county Emergency Management plans through training and exercises that foster relationships and coordination prior to the occurrence of a disaster. On the state level, NYSDOT works with the New York State Disaster Preparedness Commission, which is a commission of agencies that helps during state wide disaster and disaster recovery.

REGIONAL LEVEL

Security planning for the NYMTC planning area and for the region-wide transportation system is the responsibility of many agencies and institutions. Since security depends on extensive communication and coordination, planning and execution (of security measures) are interrelated and responsibilities overlap in some instances. NYMTC members are involved in ongoing and coordinated efforts to protect the overall transportation system and to respond as required to unforeseen natural events and disasters. These efforts include yearly participation in simulation exercises of emergency situations to train personnel for such events. At the regional and local levels, disaster preparedness and emergency response planning is led by county, municipal and local governments that are responsible for developing their own Emergency Management plans for their respective areas.

One regional preparedness and emergency response planning effort by the Department of Homeland Security is the Regional Transit Security Working Group, whose members include various transit operators: the MTA, NYCDOT, Westchester County, NJTransit, PA-NYNJ, Amtrak, Connecticut DOT, and CTTransit.

The Department of Homeland Security also funds a regional catastrophic planning initiative across New York, New Jersey, Connecticut, and Pennsylvania. This program is led by the Regional Catastrophic Planning Team (RCPT), which directs the work of its operational arm, the Regional Integration Center (RIC). The focus of this initiative is to improve regional security and resilience through a "fix, build, and resource" process and includes fixing shortcomings in existing plans, building regional planning processes and planning communities, and linking operational needs identified in plans to resource allocation.

Nassau County

In preparing for disaster and emergency relief, Nassau County relies on its Office of Emergency Management (OEM), mandated by the Nassau County Charter. The Nassau County OEM is responsible for preparing plans for possible emergency situations. In addition, since emergency response overlaps the jurisdiction of multiple agencies, the Nassau County OEM plans the coordination for multi-department response situations. The county-specific plans are developed based on the probability of occurrence (moderate to high probability is a priority). These plans are periodically reviewed and updated when necessary. The following is a non-exhaustive list of emergency plans that have been prepared by the Nassau County OEM:

- A general, comprehensive county emergency plan.
- Hurricane Relief: Strategies and an implementation timeline, along with actions that must be taken and resources that will be needed.
- Coastal Evacuation: Routes and contra flow plans for coastal flooding.
- Sheltering: Shelter locations, implementation strategies, and needed resources emergencies.
- Hazard Mitigation: Strategies and guidelines to deal with specifically identified hazards and risks that are probable within the county infrastructure.
- Debris Management: Debris mitigation and staging and removal plans for large scale incidents.
- Mass Fatalities: Strategies to deal with incidents that usually involve numerous deaths.
- Interoperable Communications: Communication plans to coordinate disparate radio systems.

To ensure rapid response and coordination during emergency events, the Nassau County OEM has formed many

Memoranda of Understanding (MOUs) with other local non-county agencies in Nassau County. The NYC Urban Area Work Group and the Regional Catastrophic Planning Team are just two examples of MOUs formed within Nassau County. On the State level, Nassau County ensures coordination with state strategies by following the goals and objectives included in the *State Homeland Security Strategy* and in the *New York's State Preparedness Report*. Additionally, Nassau County follows federal security strategies for disaster preparedness by managing a local Citizen Emergency Response Team (CERT). CERT is a community-based organization based on the federal "whole community" approach, where volunteer members are trained in emergency preparations and response. These volunteers are vital resources during and after emergency incidents.

Nassau County's coordination strategies were effectively applied during the recent hurricanes Irene and Sandy. MOUs between county and non-county agencies, along with 71 volunteer fire departments and other emergency crews make Nassau County's OEM a successful example of a county, non-county, state, and federal agency coordinated response to a regional disaster.

Rockland County

A Comprehensive Emergency Management Plan (CEMP) is a framework, developed by Rockland County, for coordinating agency responses to all types of emergencies that occur within Rockland County. The CEMP combines all operation efforts, regional, state wide, and federal, to ensure efficient and effective responses to emergencies.

The CEMP currently has comprehensive strategies and guidelines for the occurrence of the following disasters: hurricane and coastal storms; winter storms; radiological emergency response; bio-terrorism; and hazardous material response. In an effort to coordinate regionally, Rockland County has established partnerships with the surrounding five townships, 19 villages, and private sectors. With these relationships Rockland County serves as a key player in emergency preparedness, mitigation, response, and recovery. On the state level, Rockland County's Office of Fire and Emergency Services works closely with the New York State Office of Emergency Management to review and improve county preparedness plans on a monthly basis. The current County Plan for Emergency Preparedness is in accord with federal standards and policies, such as the National Response Framework, the New York State Emergency Operations Plan, the National Incident Management System, the Robert T. Stafford Disaster Relief and Emergency Assistance Act, and the Title III Superfund Amendment and Re-authorization Act of 1986.

Putnam County

The plans for disaster preparedness in Putnam County are mandated and instituted by the county, but carried out by Transit First, the operator of Putnam Transit. Putnam County follows the Federal Transit Administration's Triennial Review, which details the measures to be taken to ensure a safely operated and prepared transit network. As for general emergency preparedness, Putnam County OEM formulates plans for all large-scale emergencies within the county. The OEM of Putnam County is in charge of the following emergency preparations:

- Emergency Equipment Stockpile: The OEM can gain access to state emergency equipment, when needed.
- Weather Alerts: Sends weather alerts for use by schools and public officials.
- Emergency Management Personnel Training: Trains those involved with Radiological Emergency Response, relating to the Indian Point nuclear plant.[83]

With regards to regional emergency coordination, Putnam County works with the Putnam County Bureau of Emergency Services, which also coordinates with state disaster strategies, and the Sheriff's Office. Putnam County also works with the Putnam Emergency and Amateur Repeater League (PEARL), the non-county public emergency and information radio station that cooperates with Putnam County during emergencies and exercises.[84] Similar to Rockland County, Putnam County facilitates a coordinated framework on the federal level by following the FTA's Triennial Review requirements and using these requirements to update the FTA Safety and Security Plan.

Westchester County

Westchester County's preparedness and relief plans and activities are managed by the Westchester County Office of Emergency Management (OEM), which works with local, county, state, federal and private sector partners in emergency management to plan and prepare for large-scale, multi-jurisdictional responses to all natural or man-made disasters. The Westchester County Department of Public Works & Transportation (WCDPW&T) participates regularly in activities coordinated by the County OEM including:

- Meetings, training, drills and exercises coordinated by the OEM. Other participating agencies include nearly all departments of county government, local government and many non-governmental organizations.

• Westchester County Emergency Preparedness Group – Chaired by the County OEM, all departments of County government participate. Monthly meetings focus on current, relevant topics related to County preparedness for future disaster events, and includes analysis of the management of past events.

• Meetings and other activities of the U.S. Department of Homeland Security Regional Transit Security Working Group. Other participating agencies include the MTA, NYCDOT, NJTransit, PANYNJ, Amtrak, Connecticut DOT and CTTransit.

The Westchester County Department of Public Works & Transportation also adheres to procedures in following countywide plans:

• *Westchester County Comprehensive Emergency Management Plan*. Managed by the County OEM, this plan provides an overarching framework for the County's preparedness response in relation to all types of hazards and their associated recovery efforts.

• *Indian Point Radiological Emergency Preparedness (REP) Plan and Procedures for Westchester County.* A plan maintained, updated and coordinated by the County OEM, involving the participation of nearly every department of county government, as well as of thousands of potential emergency responders. Most of the resources and expertise developed to deal with an emergency at Indian Point can be readily applied to respond to most other major emergencies. The Indian Point REP Plan is exercised annually and evaluated alternately by the Federal Emergency Management Agency (FEMA) or by the New York State Emergency Management Office.

• *Coastal Storm Annex Plan.* Delineates Westchester County's preparedness, response and recovery efforts before, during and after hurricanes or other coastal storms. In the event of a hurricane or coastal storm threat, it is the goal of the County to support local jurisdictions in protecting lives and minimizing property losses; coordinating the rapid resumption of operations and services; and facilitating post-disaster cost recovery activities.

The Westchester County Department of Public Works & Transportation has been and continues to be involved in the following emergency related planning efforts and in any ongoing updates as needed:

• Security Assessment of Westchester County's Bee-Line Bus System – Includes security risk assessments for all components of the Bee-Line System and recommended security policies, procedures and measures to be undertaken.

• Security Emergency Preparedness Plan for the Bee-Line System – Outlines a program of standard procedures for the Bee-Line System and its operators to have in place to protect against terrorist attack.

• Transit Strike Plan - Outlines Bee-Line System procedures in relation to a union strike against the Bee-Line System.

• Emergency Operating Procedures for the Bee-Line System including: a Snow Emergency Plan; Service Plan in the Event of the Interruption of Service on MTA Metro-North Railroad; and Indian Point Emergency Procedures and Plan.

On the federal level, WCDPW&T is involved with the National Incident Management System (NIMS). NIMS standardizes processes, procedures, and systems when addressing a major incident that requires help from neighboring counties, states, or the federal government. NIM'S standards allow for the efficient integration of resources and strategies during an emergency. FEMA, the FBI, TSA, and NRC (National Response Center) are partners in the planning, training and exercises for a large-scale disaster in Westchester County.

Suffolk County

In preparing for emergencies, Suffolk County relies on the Office of Emergency Management (OEM) to coordinate the county's response to natural and man-made disasters. OEM personnel are responsible for development of the Comprehensive All-Hazards Emergency Management Plan, the operation of the county's Emergency Operation Center (EOC) and work with local, state, and federal officials in all aspects of shelter management, planning, resource management, and emergency response and recovery activities.

Long Island's southern coastline faces the open waters of the Atlantic Ocean and is vulnerable to numerous coastal hazards, especially the unobstructed path of southern storms traveling up the coast. Eastern Long Island is listed in the top ten areas in the U.S. most vulnerable to hurricanes. Because of this unique geographic location, exposure, and vulnerability, the 1.5 million residents of Suffolk County are susceptible to a variety of coastal events and natural disasters.

The following is a non-exhaustive list of

emergency plans and directions that were prepared by the Suffolk County OEM:

- A general, comprehensive county emergency plan.

- Hurricane Preparedness: Includes information on hurricanes in general, hazards connected with them, how to stay informed and a Family Emergency Plan.

- Mitigation for Natural Disasters: Included among the natural disasters are extreme heat, fires, floods, hurricanes, lightning storm safety, tornado preparedness, winter storms and extreme cold, wild fires and rip current safety.

- Special Needs Registry and Joint Emergency Evacuation Program (JEEP): JEEP is a database of individuals who require emergency evacuation and special assistance during evacuations. The data base is maintained by the Suffolk County Office of Emergency Management and is activated prior to an impending disaster. Services provided will be based on need and availability.

Included on the Suffolk County Government website is a shelter and storm surge zone mapping tool. The tool was developed by Suffolk County through the efforts of the Department of Information Technology and Fire, Rescue and Emergency Services, to assist with preparations when emergency situations and storm flooding conditions or potential evacuations may occur.

New York City Department of Transportation (NYCDOT)

To plan for disaster preparedness and emergency relief, the NYCDOT and New York City Office of Emergency Management meet monthly with various city, state regional and federal agencies, non-profit organizations, and public utility companies to discuss the mitigation, planning, response and recovery for New York City before, during and after an emergency. A large number of agencies and other public associations meet on a regular basis to accomplish these tasks including: American Red Cross, Community Affairs Unit, Con Edison, NYC Department of Citywide Administrative Services, US Department of Environmental Protection, NYC Department for the Aging, US Department of Energy, US Coast Guard, Verizon, NYC Department of Information Technology and Telecommunications, NYC Department of Sanitation, Fire Department of NY, Greater New York Hospital Association, NYC Health and Hospitals Corporation, NYC Department of Correction, NYC Department of Homeless Services, NYC Department of Buildings, New York Police Department, NYC Office of the Chief Medical Examiner, NYC Department of Parks and Recreation, New York State Emergency Management Office, NYC Department of Housing Preservation and Development, NYC Human Resources Administration and Long Island Power Authority.

In preparation for any disaster, NYCDOT has worked with multiple agencies to create the following preparedness plans:

- Citywide Health and Safety Plan: A coordinated multi-agency plan that ensures the health and safety of NYC response and recovery teams.

- Coastal Storm Plan: Strategies focused on sheltering NYC evacuees in case of a major hurricane. This plan targets at risk coastal communities.

- Commodity Distribution Plan: Guidance to distribute life sustaining commodities to up to 1.2 million New Yorkers in 59 different Community Districts.

- Continuity of Operations Plans: An overall, all-hazard plan that manages a framework of preparation in the event of a disruption.

- Evacuation Plan: Regionally situational plan that facilitates rapid, safe, and efficient evacuation of threatened areas.

- Flash Flood Plan: Entails a coordinated response to flash floods in NYC and pre/post flood mitigation strategies.

- Maritime Emergency Plan: Coordinates mass maritime transit in the event of an unforeseen surge in demand for over water travel. This could be caused by manmade or natural disasters or a disruption in the transit system.

- Snow Storm Plan: Planned response to snow advisories issued by the National Weather Service.

- Transit Strike Plan: Staffing plan of essential personnel, authorized travel advisories, city contingency plans and emergency proclamations from the Mayor and DOT Commissioner.

To further prepare the NYCDOT for an emergency event, tabletop exercises and full scale exercises are held yearly. Tabletop exercises are city and state wide emergency exercises that take place in an informal meeting setting. Full scale exercises are operational exercises that are as close to a real event as possible, involving personnel, equipment and a specified location.

NYCDOT meets semi-annually and monthly with different city and regional agencies and authorities to update, discuss and coordinate current plans. Four times a year, NYCDOT meets with the city and state OEMs to coordinate on a larger scale, in case of a state wide emergency. By following the National Incident Management System (NIMS), the standardized federal emergency management plan, NYCDOT is prepared to coordinate on the federal level.

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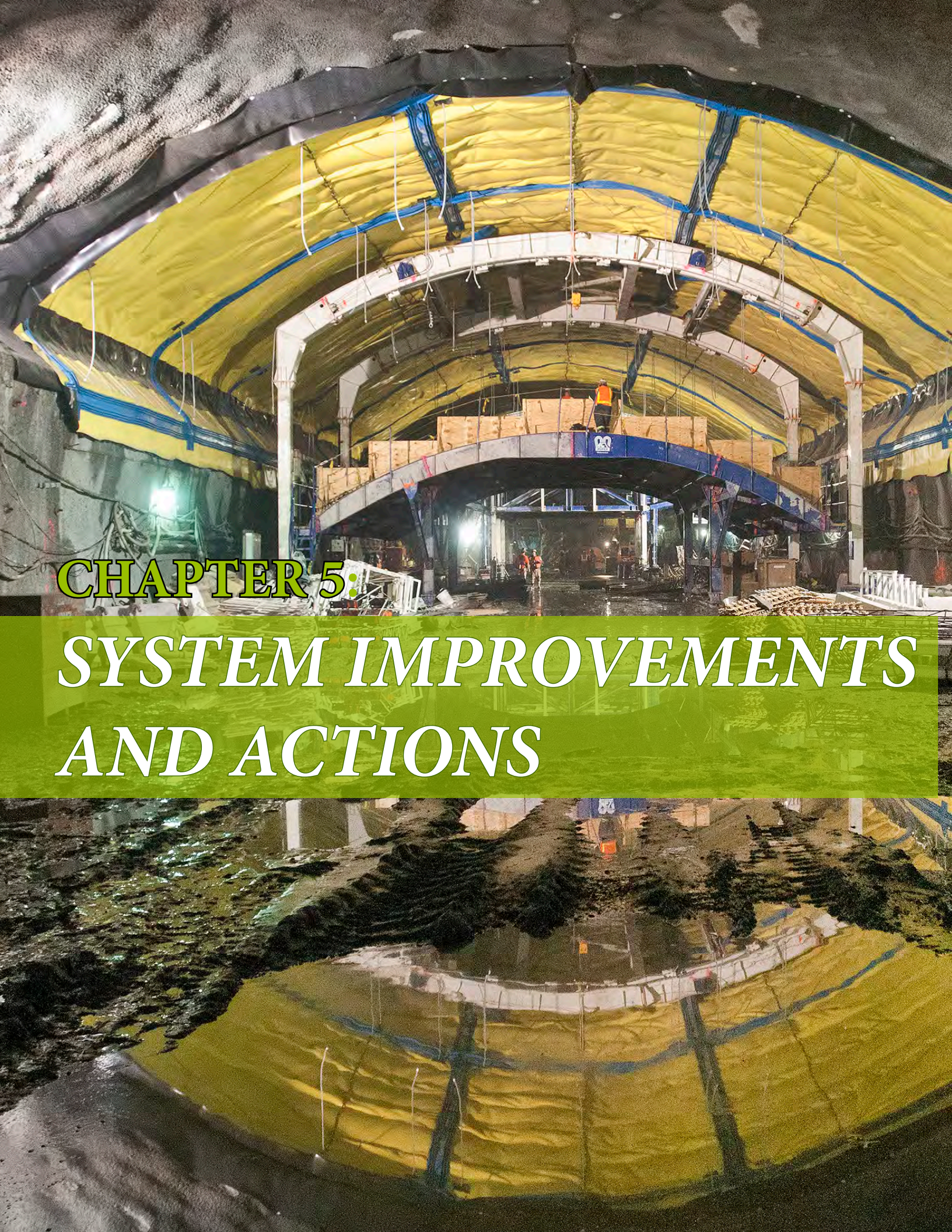
84 www.pcbes.org/emergencymanagement/index.htm



CHAPTER 5:

SYSTEM IMPROVEMENTS AND ACTIONS

Plan 2040
Chapter 5: System Improvements and Actions

East Side Access, New York City

1. Introduction

The first two chapters of *Plan 2040* described the goals, needs and expected growth of one of the largest metropolitan areas in the country. The third and fourth chapters outlined the extensive transportation network and how the system is managed and operated to optimize the performance of existing and future transportation infrastructure. Chapter 5: System Improvements and Actions, presents an implementation strategy with specific steps and projects that were developed by NYMTC's members. These projects are in various stages: some have been developed through planning work, design, or engineering, while others are purely conceptual or vision projects. All require additional planning, design, or engineering work before the costs can be ascertained in sufficient detail to begin program funding for their implementation. These short-, medium-, and long-term transportation improvement projects proposed in *Plan 2040* will support the expanding, dynamic NYMTC planning area and transportation network.

Protected bicycle path at Grand Army Plaza in Brooklyn.

This Chapter describes more fully components of the Council's shared vision in Chapter 1 including the Strategic Transportation Initiatives and Investments which are critical to support the sustainable growth outlined in *Plan 2040*. In addition to describing the linkages between investments and initiatives and the shared goals, the chapter also outlines which of these (investments and initiatives) will help to: preserve the system; enhance the system, and grow the system.

Connecting the Improvements and Actions to the Shared Vision

The identification, planning, and implementation of the strategic land use designations, transportation investments, conceptual and environmental studies, and planning for pedestrians, bicyclists and special needs individuals are guided by NYMTC's shared goals. The paragraphs that follow highlight the connections between the shared goals, and types of investments and initiatives that are programmed, planned and proposed and discussed later in the Chapter.

The shared goal to enhance the regional environment will be supported by actions and strategies that will reduce congestion, decrease greenhouse gas emissions, improve air and water quality, and preserve open space. Among the transportation investments and initiatives that will support this goal are: encouraging safe and convenient pedestrian and bicycle travel; managing rail and auto congestion; encouraging mass transit use by increasing capacity, integration, and accessibility; modernizing infrastructure through replacements and rehabilitations that maximize efficiency and useful life; and the ongoing consideration of environmental issues and impacts in planning and evaluation studies

Improving the regional economy, could bring sustainable growth and improve the mobility of people and goods in the NYMTC planning area. There are planned and programmed projects that will increase transportation connectivity and efficiency, including modernizing or replacing bridges and other linking facilities; encouraging transit-oriented development and complementary land-use policies; optimizing the movement of freight within, to, and from the region through rail and roadway improvements; and expanding transportation to Manhattan's West Side to reduce commuting times and promote mixed-use development.


Span replacement of MTA LIRR Atlantic Avenue Viaduct in Brooklyn

There are investments and projects that will be implemented to achieve the goal of improving the regional quality of life so as to achieve better mobility, safety, and accessibility and vibrant communities, among other outcomes. These include: rehabilitating or replacing facilities, and managing traffic flows and congestion to mitigate security and safety risks; coordinated planning to address the special needs of pedestrians, bicyclists, disabled people, low-income people, and older adults; conducting impact studies in dialogue with the public and community stakeholders; improving transportation experiences, including travel times, ease of connectivity, and accessibility, through modernization and expansion projects; and consideration of negative externalities, community needs, and environmental impacts throughout the planning process.

The goal of providing convenient and flexible transportation will be supported by actions and strategies that will increase the regional transportation system's connectivity, reliability, and ridership. This Chapter outlines how *Plan 2040* will address this goal by: modernizing infrastructure through replacements and rehabilitations that maximize efficiency, safety, and ease of access; increasing multi-modal, inter-regional, and intra-regional transit choices, expanding the capacity and reach of passenger and freight transportation infrastructure; and considering special needs individuals and underserved communities throughout the planning process.

The goal of building the case for obtaining resources to implement regional investments, will be aided by transportation planning actions and strategies that enhance the region's ability to finance coordinated, prioritized projects with strategic funding methods, including but not limited to state and federal sources. This Chapter emphasizes the collaborative identification by NYMTC members of investments which represent the region's best transportation strategy and whose benefits are beyond immediate regional impact.

This Chapter addresses the goal of enhancing transportation safety and security, by outlining actions and strategies that will promote coordinated, ongoing safety and security measures to reduce accidents, injuries, and damages. The investments and projects relating to this goal include: consideration of pedestrian and bicyclist safety in roadway planning; rehabilitating or replacing outdated facilities through modernizations and improvements to mitigate safety and security risks; managing traffic flows and congestion; and careful study of safety and security concerns throughout the planning process and enhancing regional data collaboration.

Finally, the goal to improve the resiliency of the transportation system is now receiving a heightened focus after the recent disruptions to the transportation network from Hurricane Sandy. This Chapter outlines projects that will focus on hurricane recovery and creating new partnerships other government agencies to improve resiliency to mitigate adverse weather impacts on the movement of goods and people.

2. Programs, Projects, and Fiscal Constraint

In keeping with the shared vision, NYMTC members have collaboratively identified major regional and local projects and other strategic investments that will expand regional transportation capacity and improve the efficiency, accessibility, integration, and sustainability of existing transportation facilities. The transportation investments outlined in this Chapter are varied in scale, but all impact the region's ability to grow in the future. The strategic improvements outlined in this Chapter represent the region's best strategic view of meeting needs of the transportation system over *Plan 2040*'s planning period.

PLAN 2040

Plan 2040 contains two distinct lists: fiscally constrained projects and unconstrained or vision projects, proposals and studies. The time frames for these are short-, medium-, and long-term. Constrained projects are those projects that are fully defined and funded by a combination of currently available and reasonably expected new revenue sources that for which funding has been identified. The unconstrained or vision projects are those projects, proposals, and studies that are priorities for the region but they have not been fully defined nor do they have an identified source of funding.

The full list of fiscally constrained projects and vision projects can be found in Appendix 1: Maps and Lists of Projects, Proposals, and Studies. The financial considerations for all programs and projects, including System Preservation, and Operations and Maintenance, are located in Chapter 6: Financing Plan 2040.

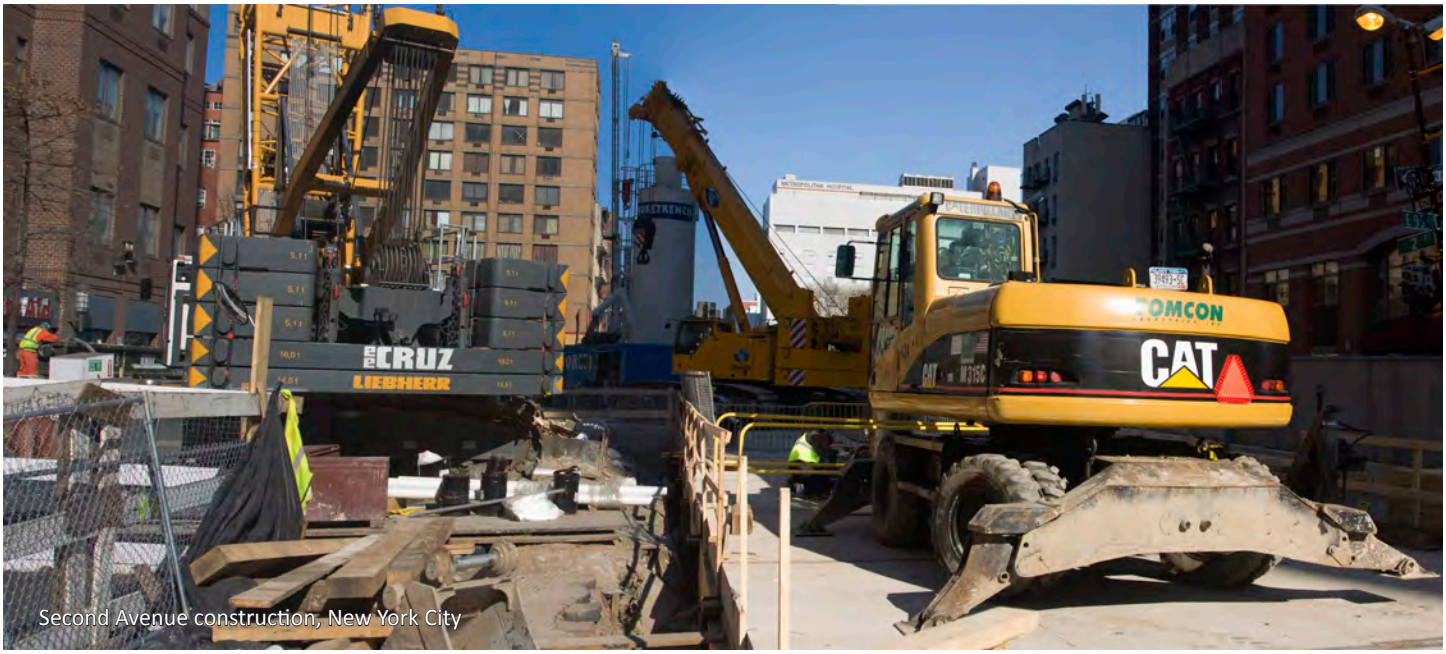
TRANSPORTATION IMPROVEMENT PLAN (TIP)

The TIP documents the short-term transportation improvements that will strengthen and enhance the region. The TIP is a list of prioritized transportation improvements identified by NYMTC members to be developed over a five year period along with the anticipated schedule and cost of each improvement. As the TIP represents the first five years of the *Plan 2040* planning period, it is consistent with its goals, objectives and policies. Like *Plan 2040*, the TIP complies with all federal laws including the previous surface transportation legislation, SAFETEA-LU, and the current legislation, MAP-21, as well as the National Environmental Policy Act (NEPA) and subsequent Clean Air Amendments. Additionally, the TIP is incorporated into New York State's Transportation Improvement Program to ensure continued federal funding.

NYMTC's TIP includes projects and programs eligible for federal funding, as well as programs funded by or eligible for local and state resources in order to acknowledge the full spectrum of transportation requirements and improvement activities taking place in the NYMTC planning area. The majority of TIP projects are geared towards system preservation. Part of the Shared Vision outlined in Chapter 1 is to advance the TIP projects listed in the near-term actions in Category C (page 1-21). The TIP is linked to the financial analysis in Chapter 6, but the projects are not included in the lists of projects in Appendix 1 of this Plan. The complete TIP document and the associated list of projects are available on the NYMTC website and by contacting NYMTC.

UNITED PLANNING WORK PROGRAM (UPWP)

The NYMTC UPWP is developed annually and is one of the mandatory products of the metropolitan planning process. It defines the planning priorities in the NYMTC planning area and describes all transportation-related planning activities anticipated within a given program year. The work program also indicates which of these planning activities will receive federal funding. The core work and special studies included in the work program have their origins in the RTP and so they will help to set the stage for the implementation of *Plan 2040* over the years.



Second Avenue construction, New York City

3. Preserving, Enhancing, and Growing the Transportation System: Strategic Investments, Initiatives, and Major Projects

Strategic investments and initiatives in the NYMTC planning area are focused on preserving the transportation system, enhancing the capacity and accessibility of the system, and expanding the reach and integration of the system. The following list of strategic investments and initiatives are categorized as either preserving, enhancing, or growing the system, and each is important to the region as a whole and to the shared vision of sustainable regional growth. NYMTC is committed to securing all necessary funding for these projects and to seeing them through to their ultimate completion. The implementation timeframe for many of the investments are shown in Chapter 1, Section 4.

PRESERVING THE SYSTEM

Capital investments in the NYMTC planning area are primarily focused on preservation of the region's relatively old and extensive transportation system. System preservation is critical part of the region's shared vision. NYMTC works to fully protect the region's past investments in this system and support a platform for future investment through management of day-to-day Operations and Maintenance (O&M) and System Preservation for all transportation assets. These assets consist of public transit equipment, roadways, bridges, and non-motorized transportation infrastructure such as walkways, trails, shared use paths, and greenways.

NYMTC's role as the overseer of the financial plan for transportation needs in the downstate New York region makes its assessment of System Preservation, including O&M, both prime and central. Infrastructure investments designed to sustain and preserve the system produce innovations that have resulted in longer-lived assets at lower costs. Replacement and maintenance of transportation machinery and facilities is one of the region's greatest needs, as a well maintained infrastructure maintains mobility, increases safety, encourages efficiency, supports economic growth, and sustains mass transit ridership. In addition to those projects in the TIP, the following strategic investments, initiatives and major projects are geared towards preservation of the existing transportation system. Some of these projects are contained in the TIP.

Bronx River Parkway Bridge Replacement, New York City

The purpose of this bridge replacement project is to rehabilitate and replace existing structures, to eliminate existing substandard geometric features, and to provide structural redundancy. Deteriorated bridges on the existing alignment of Bronx River Parkway will be replaced, namely, a two span bridge over Amtrak/

CSX, a single span bridge over East Tremont Avenue, and a seventeen-span viaduct over East 180th St / Morris Park Avenue and the New York City Transit Authority railroad yard. The roadway geometry will be improved, structural deficiencies will be eliminated, standard travel lanes and shoulders will be provided, a shared-use path on the structures will be made fully ADA compliant, and a new exit ramp structure spanning over Amtrak/CSX tracks will be built in order to improve traffic flow. The sponsor of this project is NYSDOT. The projected year of completion is 2022 and the projected cost is $286.35 million. Additional details are found in Appendix 9.

Cross Bronx Expressway Bridge Rehabilitation, New York City

This project will repair deteriorated bridge structures along the Cross Bronx Expressway between the Boston Post Road exit and the Bronx River Parkway exit in order to address structural deficiency issues. The project is sponsored by NYSDOT. The projected year of completion is 2026 and the project is projected to cost $125 million. Additional details are found in Appendix 9.

East 153rd Street Bridge Reconstruction, New York City

With the demolition of the original East 153rd Street Bridge in 1992, a vital transportation link was removed from the traffic network. Constructing a new bridge in its place will provide an additional corridor in an area that has limited east/west routes and is prone to traffic congestions during peak hours. The new bridge will significantly reduce current congestion on the other main east-west corridors in the South Bronx, namely East 149th and East 161st Streets, and will provide the transportation infrastructure required to satisfy the travel demand and trips generated by the newly constructed and planned developments. The project is sponsored by NYCDOT, 2026 is the projected year of completion. The project cost is projected at $143.75 million. Additional details are found in Appendix 9.

City Island Road Bridge Replacement, New York City

The existing City Island Road Bridge was built in 1901 as a seven-span bridge. Spans 2 and 3 were swing spans, which were made fixed in 1963. Since its construction in 1901, many repairs have been completed to provide safe passage for traffic. However, the bridge has outlived its useful life. The goals of the project are to maintain safe, reliable access for vehicular, bicycle and pedestrian traffic to and from City Island, to improve geometric deficiencies of the bridge, and to improve the condition rating of the facility to five or greater. The project involves the replacement of the City Island Road Bridge over Eastchester Bay in Bronx County with a single-span cable-stayed structure. The project is sponsored by NYCDOT. The projected year of completion is 2017 and the projected project cost is $127.032 million. Additional details are found in Appendix 9.

Shore Road Bridge Rehabilitation, New York City

The rehabilitation of the Shore Road Bridge, which crosses over the Hutchinson River, will improve the structural integrity of the bridge, provide effective and safe transportation service on the bridge, and maximize benefits while minimizing impacts of the bridge. This project involves the construction of a new bridge at a location adjacent to the existing structure. The existing bridge will be demolished after the completion of new bridge. The project sponsor is NYCDOT. The projected year of completion is 2026 and the projected cost is $300 million. Additional details are found in Appendix 9.

Major Deegan Expressway Rehabilitation, New York City

The concrete roadway deck along the portion of the Major Deegan Expressway from 138th Street to 161st Street—Macombs Dam Bridge Interchange is in need of replacement, as since it exhibits advanced deterioration and spalling. Some structural and sub-structural steel repairs are also needed across approximately one mile of the expressway due to fatigue cracking. The project is sponsored by NYCDOT and is expected to be completed in 2018. The projected cost is $246.058 million. Additional details are found in Appendix 9.

Replacement and Rehabilitation of I-678 Van Wyck Expressway Bridges, New York City

The purpose of this project is to address operational issues and structural deficiencies on the Van Wyck Expressway Bridges. The project entails replacement with operational improvements, rehabilitation in kind, rehabilitation with operational improvements and null alternate. The project is sponsored by NYSDOT, and he project is expected to be completed in 2016. The projected cost is $112.98 million. Additional details are found in Appendix 9.

Belt Shore Parkway—Fresh Creek Bridge Rehabilitation, New York City

The project replaces the existing bridge with an entirely new structure to address the structural and safety deficiencies associated with the existing bridge. The existing bridge is a deteriorating structure that requires frequent maintenance and repairs. This project is part of the improvement to the structural integrity of 10 bridges, providing effective and safe transportation service on the bridges, and maximizing benefits while minimizing adverse impacts. The project sponsor is NYCDOT, the projected

completion year is 2018 and the projected cost is $113 million. Additional details are found in Appendix 9.

Belt Parkway Bridge Rehabilitation, Paerdegat Basin, New York City

The replacement of the section of the Belt Parkway Bridge over Paerdegat Basin with an entirely new structure will address the structural and safety deficiencies associated with the existing bridge, which requires frequent maintenance and repairs. The project sponsor is NYCDOT. The projected completion year is 2014 and the projected cost is $204.341 million. Additional details are found in Appendix 9.

Belt Parkway Bridge Rehabilitation, Gerritson Inlet, New York City

The replacement of the section of the Belt Parkway Bridge over Gerritson Inlet will address the structural and safety deficiencies associated with the existing bridge, which is deteriorating and requires frequent maintenance and repairs. The project sponsor is NYCDOT and the projected completion year is 2017. The projected cost is $115.743 million. Additional details are in Appendix 9.

Belt Parkway Bridge Rehabilitation, Mill Basin, New York City

The replacement of the section of the Belt Parkway Bridge over Mill Basin with an entirely new structure will address the structural and safety deficiencies associated with the existing bridge. The existing bridge is a deteriorating structure that requires frequent maintenance and repairs. The project sponsor is NYCDOT. The projected completion year is 2018 and the projected cost is $216.183 million. Additional details are found in Appendix 9.

Manhattan Bridge Lead-Removal Rehabilitation, New York City

Part of NYCDOT's regular bridge and maintenance program, this project will entail maintenance operations to provide for the safety of pedestrian and vehicular movement. Specifically, the project involves the removal of lead-based paint from cable bands and main cables and the replacement with non-lead-based materials. The expected year of completion is 2014 and the projected cost is $153.215 million. Additional details are found in Appendix 9.

Brooklyn-Queens Expressway – Grand Central Parkway Interchange Reconstruction, East Leg, New York City

This reconstruction project aims to reduce accidents and relieve congestion on the roadway network at the BQE/GCP east leg interchange. This portion of the BQE will be redesigned and reconstructed. The project is sponsored by NYSDOT. The expected year of completion is 2023 and the projected cost is $115.448 million. Additional details are found in Appendix 9.

Brooklyn-Queens Expressway – Grand Central Parkway Interchange Reconstruction, West Leg, New York City

This reconstruction project aims to reduce accidents and relieve congestion on the roadway network at the BQE/GCP east leg interchange. This portion of the BQE will be redesigned and reconstructed. The project is sponsored by NYSDOT, and the expected year of completion is 2023. The projected cost is $115.448 million. Additional details are found in Appendix 9.

Rikers Island Bridge Reconstruction, New York City

The project involves replacing the superstructure of this rapidly deteriorating bridge. The coming expiration of the bridge's estimated useful life makes rehabilitation necessary. The salty environment of the channel significantly affects superstructure, and this continued deterioration could also negatively impact the structural integrity of the bridge. The project is sponsored by NYCDOT. The expected year of completion is 2025 and the projected cost is $100 million. Additional details are found in Appendix 9.

Kew Gardens Interchange Reconstruction of Parkways and Expressways, New York City

The Kew Gardens Interchange is at the confluence of the Grand Central Parkway, the Van Wyck Expressway, the Jackie Robinson Parkway and Union Turnpike. Phase 1 of the begun in the summer of 2010, and is reconstructing a half-mile section of the Van Wyck Expressway just south of the interchange, between Union Turnpike and Hillside Avenue, as well as a quarter-mile section of Queens Boulevard over the Van Wyck Expressway. Work includes the construction of auxiliary lanes on the Van Wyck Expressway to ease the flow of traffic in both directions at the interchange with the Grand Central Parkway. This phase is expected to be completed by the beginning of 2016. The second phase, which got underway in the spring of 2012, continues the reconstruction of the Van Wyck Expressway north to 72nd Avenue, an additional three-quarters of a mile. The contract will replace the northbound Van Wyck Expressway two-lane viaduct with a three-lane version that includes shoulders. It will also replace the ramp connecting the westbound Jackie Robinson Parkway and Union Turnpike with the northbound Van Wyck, widening it from one lane to two. This project is slated for completion in the beginning of 2017. The project is sponsored by NYSDOT and the total cost projected is $262.78 million.

Port Authority Trans-Hudson (PATH) Rail System Modernization, New York City

This project includes the signal system replacement program which will allow PATH trains to safely run closer together and thus increase the number of trains operated during peak times, increasing capacity. The other component of this project is the World Trade Center Transportation Hub which will restore and greatly enhance the level of services that existed prior to September 11, 2001. The Hub will feature advanced signal systems, state-of-the-art fare collection equipment, and climate-controlled platforms and mezzanines with superior lighting and finishes. This project is sponsored by the PANYNJ with phased opening of permanent improvements beginning in 2014.

Staten Island Ferry Terminals and Vessels upgrade, New York City

Over the period 2014-2018 NYCDOT plans to upgrade existing Staten Island Ferry vessels.

NY 347 Corridor Reconstruction and Green Route Implementation, Long Island

A green route along the NY 347 Corridor from Terry Road (CR16) to Route 25A will increase safety and efficiency for the traveling public. The planning, development and selection of a Preferred Alternative in the NY Route 347 Safety and Mobility Improvement Project Final Environmental Impact Statement (FEIS)/Final Section 4(f) Evaluation were guided by the following goals: increase safety and efficiency for the traveling public; improve capacity, mobility and travel time reliability by developing an efficient highway improvement that provides congestion relief while standards or standard design and environmental criteria; and provide a transportation system that fits within project constraints identified through public involvement activities and meets current engineering standards or standard design and environmental criteria. The project is sponsored by NYSDOT, the project is expected to be conducted between 2020 and 2040 and the projected cost is $470 million. Additional details are found in Appendix 9.

Cross County Parkway - Saw Mill Parkway Interchange Reconstruction, Lower Hudson Valley

The interchange between these two parkways is scheduled to be rebuilt starting in 2020 at a cost of approximately $38.7 million. Safety improvements will also be incorporated into the reconstruction.

ENHANCING THE SYSTEM

The following strategic investments and projects address the need to enhance capacity and accessibility of transportation in the NYMTC planning area. In strategically enhancing the regional transportation system these investments will create a framework that will support growth in a more sustainable fashion; help to bring together local land use decisions and regional transportation investment decisions; and focus transportation and development projects to produce complementary and more sustainable outcomes.

Kosciuszko Bridge Replacement, New York City

This replacement project addresses the structural, safety and operational deficiencies associated with the Kosciuszko Bridge. The existing bridge, which spans Newtown Creek from Morgan Avenue in Brooklyn to the Long Island Expressway and Brooklyn-Queens Expressway Interchange in Queens, is a deteriorating structure that requires frequent maintenance and repairs. The bridge contains several non-standard geometric elements, including an existing vertical profile that is not in compliance with modern standards for an interstate highway, resulting in unacceptably high accident rates and excessive delays to traffic. This project entails a replacement of the bridge to provide operational improvements and address structural integrity issues and motorists safety. The project is sponsored by NYSDOT and will occur in phases. Phase one is expected to be completed in 2016, with a projected cost of $536.705 million. Phase two is expected to be completed in 2018, with a projected cost of $96.2 million. Phase three is expected to be completed in 2020, with a projected cost of $242.1 million. Additional details are found in Appendix 9.

Goethals Bridge Replacement, New York City

In April 2013, the PANYNJ Board of Commissioners authorized a major project to replace the functionally obsolete Goethals Bridge between Staten Island and Elizabeth, NJ, on the I-278 Corridor. The existing bridge is functionally and physically deficient, with narrow lanes, no emergency shoulders, and a pronounced bend in the alignment of the approach span in New Jersey. These characteristics reduce traffic service, safety conditions, and the ability to quickly clear accidents. Increasing auto and truck volumes across the Bridge combine with the bridge's deficiencies to further impair traffic conditions and increase accident levels. The bridge, which was opened to traffic in 1928, requires ongoing repairs, maintenance, and rehabilitation at escalating costs. Furthermore, the bridge's layout limits the extent to which the

widespread use of E-ZPass toll collection systems and technology improvements can be used to improve traffic flows. The existing layout cannot accommodate future transit service or priority-lane treatments that would require dedicated space on the bridge. The deficiencies in the facility reduce its utility and dependability for truck-based movement of cargo and make it undependable for diversion of traffic from another transportation facility in the event of regional emergency. The project is sponsored by the PANYNJ and is expected to be completed in 2018. The total project cost is $1.5 billion. Additional details are found in Appendix 9.

Bayonne Bridge Navigational Clearance Project, New York City

The purpose of the project is to increase the navigational clearance over the main New York-New Jersey harbor shipping channel through the Kill Van Kull by raising the roadway deck of the Bayonne Bridge. In addition, the project will extend the service life of the bridge, improve substandard features, and incorporate seismic protection. This investment will improve the economic efficiency and sustainability of the PANYNJ. The project entails construction of a new roadway deck within the constraints of the existing arch structure, to raise the air draft of the structure from 151' to 215'. The completed replacement deck will not change the number of traffic lanes (2 in each direction). It will include safety enhancements and a widened pedestrian way accommodating walkers and cyclists. It is sponsored by the PANYNJ and is expected to be completed in 2017. The projected cost is $1.3 billion. Additional details are found in Appendix 9.

Select Bus Service / Bus Rapid Transit Projects, New York City

Select Bus Service (SBS)/Bus Rapid Transit (BRT) projects are being planned and implemented in New York City will improve the speed, reliability, and appeal of bus transit. The projects are jointly managed by New York City Transit (NYCT), in conjunction with New York City Department of Transportation (NYCDOT). The routes currently implemented or about to be implemented are:

- Nostrand Avenue, Brooklyn
- 34th Street, Manhattan
- First & Second Avenues, Manhattan
- Hylan Boulevard, Staten Island
- Hillside Avenue, Queens
- Webster Avenue, Bronx
- Utica Avenue Corridor
- Laguardia/East Elmhurst/Jackson Heights/125th St Crosstown Corridor

Routes under study and which may be implemented during the Plan 2040 period include: Woodhaven Boulevard, Flushing-Jamaica Corridor, and Southeast Queens Corridor. A full list of these is found in the vision list of projects, proposals, and studies in Appendix 1 of this Plan

MTA's Second Avenue Subway Phases 2-4, New York City

The Second Avenue Subway project will ultimately include a two-track line along Second Avenue from 125th Street to the Financial District in Lower Manhattan. It will also include a connection from Second Avenue through the 63rd Street tunnel to existing tracks for service to west Midtown and Brooklyn. Sixteen new accessible stations compliant with the Americans with Disabilities Act will be constructed.

MTA LIRR East Side Access, New York City

The East Side Access project will connect the Long Island Rail Road's Main and Port Washington lines in Queens to a new terminal beneath Grand Central Terminal in Manhattan. The new connection will increase the Long Island Rail Road's capacity into Manhattan and dramatically shorten commuting time from Long Island and eastern Queens to Manhattan's East Side.

No. 7 Subway 10th Avenue Station, New York City

This project is the construction of a new Tenth Avenue Station for subway service on the MTA New York City Transit #7 subway line to the far west side of Manhattan.

Manhattan Bridge Seismic Retrofit, New York City

The purpose of this project is to evaluate and strengthen all structural members and their connections of the Manhattan Bridge, including expansion joints, cables, suspenders, anchorages, masonry piers, abutments, bracings, superstructure framings, and bearings. The project is sponsored by NYCDOT, and the expected year of completion is 2023. The projected cost is $150 million.

Ed Koch Queensboro Bridge Seismic Retrofit, New York City

As part of bringing the Ed Koch Queensboro Bridge into a state of good repair, this project will evaluate and strengthen all structural members and their connections of the bridge. The project is sponsored by NYCDOT, and the expected year of completion is 2023. The projected cost is $150 million.

St. George's Terminal Ramp Reconstruction, New York City

The purpose of this reconstruction project is to bring the ramps at the St. George's Ferry Terminal into a state of good repair. The project involves the re-

construction of the ferry terminal ramps while maintaining all operations and minimizing disruption to the public. The project is sponsored by NYCDOT. The expected year of completion is 2014 and the projected cost is $175 million.

North Shore branch of Staten Island Railway Transit Service, New York City

This project would provide transit service in the right-of-way of the former North Shore branch of the Staten Island Railway.

Increasing Bus and High-Occupancy Vehicle capacity on East River crossings, New York City

This project is to increase capacity between Manhattan and the Boroughs of Brooklyn and Queens.

MTA's Communications-Based Train Control Subway Enhancements, New York City

This project will expand subway capacity and reliability in the borough of Queens through MTA New York City Transit's Communication-Based control system.

MTA's Expansion of Subway, Bus, Depots, and Stations, New York City

This MTA New York City Transit's project will expand the fleet and stations and includes instituting a program of sustainability investments.

Cross Bronx Expressway Improvements, New York City

Starting in 2013, approximately $9 million is scheduled to be spent on design work in anticipation of rehabilitating 15 bridges that make up parts of the Cross Bronx Expressway.

Long Island Motor Parkway Trail, Long Island

The Long Island Motor Parkway (LIMP), also known as the Vanderbilt Parkway, was the first roadway designed for automobiles only. It opened in 1908 as a toll road and closed in 1938 when it was taken over by the state of New York in lieu of back taxes. Parts of the parkway survive today in sections of other roadways and as a bicycle trail in Queens. Nassau County now seeks to develop an 18 mile continuous, multi-use trailway through the County that will, to the extent possible, utilize the route of the historic Long Island Motor Parkway. When implemented, the new Motor Parkway Trail will once again provide an important recreational connection through Nassau County, but this time for hikers and bicyclists. Furthermore, the Trail will provide an important alternative transportation link between communities, open space resources and employment centers for those wishing to walk or bike through Nassau County to these destinations. Motor Parkway Trail can once again become an important recreational and transportation resource for the County. The project is expected to be completed in segments by 2030, at a cost of about $25 million.

MTA LIRR's Main Line Corridor Planning, Long Island

In order to improve on-time performance and to accommodate more service, the LIRR needs to add track capacity to the Main Line. This will allow service reliability improvements and reduction in recovery time following service disruptions. The Main Line between Farmingdale and Ronkonkoma has for decades been envisioned to contain a full second track, and its construction will improve service reliability by enhancing operating flexibility and speeding recovery time following service disruptions. This project is also part of the Suffolk County's Connect Long Island initiative.

Sagtikos Parkway Truck Bypass Construction, Long Island

The Sagtikos Truck Bypass will support the needs of proposed developments and future growth in the Hauppauge/Brentwood area.

Nassau County Coastal Evacuation Routes, Long Island

Nassau County's coastal evacuation infrastructure has been inadequate for years and Hurricane Sandy's impact on this infrastructure proved this point beyond any reasonable doubt. This project is to sequentially address this problem by taking the following systematic approach:

- FFY 2015 – Conduct a study to identify the critical evaluation routes in Nassau County. This study will identify both County and Non-county roads.
- FFY 2016 – Evaluate the condition, deficiencies and effectiveness of the proposed evacuation infrastructure. This portion will only focus on those roads under county ownership identified in 2015. A request will be made to other owners to initiate plans to improve their facilities.
- FFY 2017 – Develop a plan for creating a comprehensive coastal evacuation route system in Nassau County, including a timeline and interagency agreements if it is determined the county will initiate improvements to other owner facilities.
- FFY 2018 – Initiate designs identified above on the most critical county owned elements Post 2018 Nassau County will sequence construction of improvements as identified from the above efforts.

Tappan Zee Hudson River Crossing Project, Lower Hudson Valley

The Tappan Zee Bridge provides the only interstate highway crossing of the Hudson River for the 48-mile stretch between the George Washington Bridge (Interstate 95) and the Newburgh-Beacon Bridge (Interstate 84). It is a vital link between the population and employment centers of Rockland and Westchester Counties, is a major route for freight movement, and is an emergency evacuation route. The bridge replacement project will address the structural, operational, mobility, safety, and security needs of the three mile crossing. The replacement will provide 12 foot wide travel lanes with an oversized shoulder in each direction for emergency vehicle access as well as a share use path for pedestrians and bicycles on the northern span. In addition to addressing the current non-standard elements on the bridge, it will have improved grades and sight distance and meet current seismic design criteria. The project is sponsored by the NYS Thruway Authority and is expected to be completed in 2017. The projected cost ranges from $4.6 billion to $5.6 billion. Additional details are in Appendix 9.

Southeast Railroad Station Pedestrian Bridge Construction and Parking Capacity Enhancement, Lower Hudson Valley

This Metro-North Railroad project involves constructing a bridge over the railroad tracks at the Southeast Station and connecting to a new commuter parking lot on the MNR owned property to the east of the tracks.

I-84 Capacity Improvements between the Connecticut State Line and I-684, Lower Hudson Valley

This project will improve capacity on Interstate 84.

Bus Rapid Transit and Transit Signal Priority: Central Avenue – Westchester County, Lower Hudson Valley

The 14.4-mile long Central Avenue corridor serves Westchester County between White Plains and Yonkers, linking Westchester to New York City. Major destinations along the corridor include downtown White Plains, Westchester County Center, the shopping areas along Central Avenue, Cross County Shopping Center, Yonkers Raceway, the New York City Subway, and Bee-Line routes. The objective of the Central Avenue Bus Rapid Transit (BRT) Assessment is to implement components of BRT for the Central Avenue Corridor that will reduce travel times, attract new riders, improve mobility in the corridor, create an integrated and customer friendly transit service, and improve operating efficiency. The BRT concepts being considered for Central Avenue include limited stop operation, intelligent transportation systems, preferential lane treatments, attractive stations with customer amenities, station access, stylized vehicles with low-floor boarding, faster fare collection, brand identity, and alignment with transit-oriented land development. The final report was completed in 2009. Implementation of transit signal priority is in progress.

I-287 Corridor Transit Enhancements, Lower Hudson Valley

The Tappan Zee Bridge replacement, which is part of I-287, will have four general traffic lanes and one lane for express bus service in each direction. No specific, official, funded plans yet exist to incorporate a public transportation corridor along the rest I-287, although the concept was studied by Westchester County and in the multiagency Tappan Zee Bridge Environmental Review. An I-287 transit sequencing and prioritization task force made up of 28 members from Westchester, Rockland and Putnam counties is expected to issue a final report in December 2013.

Port Jervis Line Improvements, Lower Hudson Valley

MTA Metro-North is installing a new cab signal system along the entire 66-mile Port Jervis Line, including all trackage in Rockland County. Cab signaling provides real-time maximum allowable trains speed information to the engineer's console, better regulating speed and safely decreasing headways.

Hudson River Valley Greenway Link, Region-Wide

The Hudson River Valley Greenway is actually a multicounty network of trails which generally bracket the Hudson River but extend well north of the NYMTC region. The specific link being studied would between Inwood in Manhattan and the Old Croton Aqueduct in the Glenwood section of Yonkers.

CSX West Shore River Line Safety and Quiet Zone Project, Region-Wide

This project is an effort to establish Quiet Zones at 21 grade crossings. Quiet Zones are stretches of rail lines with consecutive railroad crossings where locomotives do not regularly sound their horns. By installing some combination of four-quadrant gates, vehicle presence detection systems, signage, or padlocked chain-link fences (generally in low-traffic industrial areas), trains are no longer required to sound their horns at these locations. Localities can also convert two-way streets to one-way traffic or conduct a full grade separation.

Advance Recommendations of NY-CT-Sustainable Communities Initiative, Region-Wide

A joint planning effort across the NYMTC region and three coastal Connecticut metropolitan planning organizations, this $3.5 million HUD-funded package of initiatives seeks to integrate housing, economic development, transportation and environmental planning by fostering livable, transit-oriented communities. Nine of the 16 funded projects fall within the NYMTC planning area.

Brooklyn and East River Waterfront Greenways, New York City

These projects focus on the continued development and design of greenways along the waterfront in Brooklyn and Manhattan.

Long Island Expressway in Queens High-Occupancy Vehicle / Active Transportation Demand Management New York City

This project will improve mobility on the LIE by extending a managed-use HOV lane from 58th Street to 99th Street in Queens and explores new ITS variable speed and queue warning signs and associated equipment to help manage traffic flow and improve safety along this corridor.

Trans-Hudson Bus Improvements, New York City

This project will improve the efficiency of bus operations across the Hudson River, into and out of Manhattan, including possible roadway and bus terminal improvements.

GROWING THE SYSTEM

Preparing the system for future growth entails not only planning and implementing various transportation investments (projects), but also identifying locations where transportation resources can attract residents and businesses while providing efficient, sustainable and cost-effective mobility. The Shared Land Use Designations component of the shared vision, described in Section 3 of Chapter 1 seeks to establish this connection between land use and transportation which will support the development of a sustainable transportation system over the *Plan 2040* timeframe. Future development needs to be aligned with service to the greatest extent possible. Throughout the NYMTC planning area a number of sustainable development centers, sustainable development corridors, transit-oriented development areas, transit corridors, linked development areas, linked corridors and innovation zones have been identified to accomplish this result. Many of these originate from the Counties' master plans and NYC's *Plan 2040* and are mapped in Section 3, Chapter 1.

Additionally, as mentioned in Chapter 1, the Regional Economic Development Councils (REDCs) in Long Island, Lower Hudson Valley, and New York City established by the Governor, have identified a number of projects, many of which have implications for transportation planning and growth in the NYMTC region. Notwithstanding the fact that there is overlap between some of the REDCs proposed projects and those contained in *Plan 2040*, coordination will be required to ensure that growth and development are consistent.

4. Major Studies that will Impact Preservation, Enhancement, and Growth

The following studies will have a notable impact on the transportation system.

Cross Harbor Goods Movement Improvements, New York City

In May 2000 a Major Investment Study was completed by the NYCEDC which examined alternatives for improving freight movement across New York Harbor. This led to the completion of a Draft Environmental Impact Study in April 2004 which analyzed various alternatives, including the construction of a tunnel dedicated to rail freight. In the federal transportation bill of 2005, SAFETEA-LU, the Cross Harbor Rail Freight Tunnel Project received $100 million in funding.

In 2008, PANYNJ and the Federal Highway Administration restructured and resumed the NEPA EIS process for the project, using a tiered approach that included a new market analysis, interagency and stakeholder outreach, and a broader assessment of rail facilities in both states needed to support enhanced cross-harbor rail service. PANYNJ also received FHWA approval to use much of the earmarked funding for independent improvements to address state of good repair needs for existing rail freight facilities. This program includes rehabilitation of rail car float facilities in Brooklyn and Greenville Yards, Jersey City, to sustain the cross-harbor rail connection provided by the New York and New Jersey Railroad, purchased by PANYNJ. The alternatives evaluated in the EIS process include a rail freight tunnel between Jersey City and Brooklyn with varied operating capabilities, as well as enhanced car float services and other potential improvements.

Bruckner-Sheridan Interchange, New York City

The NYSDOT is preparing a Preliminary Design/Environmental Impact Statement on the improvement of the interchange between the Bruckner Expressway (Interstate 278) and the Sheridan Expressway (Interstate 895). The scope of the project also includes improvements to commercial access to the Hunts Point Peninsula in the southern quadrant of the Bronx.

Nassau Hub Preliminary Regional Study Area Implementation of Transportation Improvements, Long Island

The Nassau Hub is located in central Nassau County and includes Grumman/Bethpage. The area has a northern boundary just to the north of the LIRR Port Jefferson Branch and the southern boundary lies just to the south of the Hempstead Turnpike. The western boundary runs along Rockaway Avenue and Cathedral Avenue and the eastern boundary is along Merrick/Post Avenue, although Eisenhower Park is included in the study area. The Nassau Hub area covers about 10 square miles and encompasses all or parts of the Villages of Minneola, Westbury, Garden City and Hempstead; the Hamlets of Carle Place and Uniondale; and the unincorporated area of East Garden City. The Nassau Hub lacks a sufficient transit network to absorb the full amount of the projected growth, especially with existing major roadways in the corridor already suffering from major congestion. Development will continue in the Hub regardless of whether a new transit service is initiated, however, the desired level of growth will likely never materialize without new transit service.

Suffolk County Connect Long Island, Long Island

This planning initiative which seeks to connect vibrant downtowns in Suffolk County and improve North-South transit connections includes a number of proposed and ongoing studies including:

- Route 110 Corridor transit options
- Sagtikos/Sunken Meadows Parkways transit options
- CR 97 transit improvements
- MTA LIRR Ronkonkoma Second track
- Wyandanch Rising, Heartland and Ronkonkoma Hub transit-oriented development
- BRT Feasibility Study

MTA Metro-North Railroad's Penn Station Access Study, Region-Wide

This study is evaluating the proposed extension of Metro North Services to Pennsylvania Station via the MNR New Haven Division/LIRR and Hudson Division /Amtrak Empire Line.

CSX River Line, Second Track, Region-Wide

Freight access along the Water Level Route, which runs between Chicago and Northern New Jersey via a route parallel to the southern shore of Lake Erie, the Erie Canal and the Hudson River, is routed via the CSX River Line south of Selkirk, New York. Trains dispatched from Selkirk Yard travel south along the west shore of the Hudson River through

Rockland County to North Bergen, Kearny, Little Ferry, and Port Newark yards in Northern New Jersey. Passenger trains are absent from this heavily used route south of Selkirk, which has seen some lengthening and addition of passing sidings to accommodate traffic growth and improve reliability. Recently, CSX announced a new round of capacity expansions along this route, a $26 million effort that will add 18 miles of second main track at various locations.

Amtrak Gateway Project, Region-Wide

The Gateway Program is a critical part of Amtrak's North-East Corridor (NEC) planning that will include provision for planned High Speed Rail access to New York while addressing the need for trans-Hudson tunnel redundancy and added capacity for commuter, regional and long-distance intercity services. It would address critical capacity issues, safety, and operational needs in the congested segment of the NEC stretching from Newark, NJ to the west side of Manhattan. Components include: new trans-Hudson River tunnels; expanded Moynihan/Penn station; new portal bridges; Newark-Secaucus improvements; and Newark and Secaucus station improvements.

North-East Corridor and Empire Corridor Passenger and Freight Rail Improvements, Region-Wide

North-East Corridor (NEC)
NEC FUTURE is a comprehensive planning effort to define, evaluate and prioritize future investments in the NEC launched by the Federal Railroad Administration (FRA) in February 2012. FRA's work will include new ideas and approaches to grow the region's intercity, commuter and freight rail services and an environmental evaluation of proposed transportation alternatives. The NEC FUTURE program includes both a Service Development Plan (SDP) and a broad environmental analysis known as a Tier 1 Environmental Impact Statement, or EIS. These studies will help provide a road map to a better transportation solution for the Northeast.

In April 2013 the FRA issued a Preliminary Alternatives Report which consisted of a summary of the alternatives development process and the list of preliminary alternatives. In the next phase of the alternatives development process, the Preliminary Alternatives will be comparatively evaluated to understand their transportation and environmental benefits and impacts. Screening criteria will be applied to guide the process for identifying the best service and network options to be used to develop the Reasonable Alternatives, which will then be further evaluated as part of the Tier 1 EIS, ultimately resulting in a preferred investment program.

Empire Corridor
NYSDOT and the FRA are evaluating potential improvements and projects to intercity passenger rail service within the Empire Corridor, which proceeds north from NYC to Albany, turns west to Schenectady, passes through Utica, Syracuse, Rochester, and Buffalo, then terminates at Niagara Falls, a distance of 463 miles. Work has been ongoing on a TIER I EIS analyzing a range of alternatives for introducing high speed passenger rail service on the Empire Corridor. The analysis of the range of alternatives has resulted in a total of 5 alternatives being selected for advancement. The 5 alternatives selected for advancement include the Base alternative and 4 build alternatives which include the 90 mph series (90A & 90B) as well as the 110 mph and 125 mph alternatives.

NYSDOT expects to release the Draft EIS for public review and comment in the first half of 2013. Once released, NYSDOT will host public hearings on the project. With consideration of the public input NYSDOT receives through testimony given at the public hearings and other written comments, NYSDOT will recommend a preferred alternative and prepare the Final EIS. Following completion of the Final EIS, the FRA will have sufficient information with which to issue its Record of Decision (ROD) for the project. The ROD and recommendations will include specific improvement projects that may be analyzed further in Tier 2.

New York-New Jersey-Connecticut Transportation Vulnerability Assessment and Adaptation Analysis, Region-Wide

This project is part of the planning for resiliency brought into focus by recent extreme weather events and is being funded by FHWA. The project partners are: four MPOs - North Jersey Transportation Planning Authority; New York Metropolitan Transportation Council; South Western Regional Planning Agency; Greater Bridgeport Regional Council and three State DOTs - New York, New Jersey and Connecticut. The goals of this project are to: assess the impacts of October 2012's Hurricane Sandy (and to some extent Hurricane Irene, Tropical Storm Lee, and the Halloween Nor'easter in 2011) on transportation assets; identify adaptation strategies to increase the resilience of those assets to the impacts of extreme weather events and the possible future impacts of climate change; and perform a gap analysis for the region, consolidate data sources and information, and identify critical areas and transportation assets generally. The project has 2 phases: Phase one will collect and analyze available data from specific storm-related damage of the transportation system. The second phase of the study will identify critical

sub-regions and transportation assets at risk from current and future climate stressors. This phase will also include an adaptation analysis for transportation assets in vulnerable sub-areas.

Southern Westchester East-West Corridor Transit Improvements, Lower Hudson Valley

The Southern Westchester East-West Corridor stretches from New Rochelle to Yonkers and contains the Cross County Parkway which is a limited access roadway extending from the Saw Mill River Parkway on the west to the Hutchinson River Parkway on the east. An Issues Scan completed in 2013 looked at existing conditions in the corridor, and serves as a framework for developing solutions to addressing some of the challenges related to sustainability planning, including transit oriented development. A transit study will be conducted to look at opportunities for enhancing local bus service.

Moynihan Station Phase II, New York City

Phase II is the conversion and construction of the new train hall in the fully renovated Farley Building.

Tarrytown – Port Chester Local Transit Improvements, Lower Hudson Valley

This study will examine transit options in the Tarrytown-Port Chester corridor.

OTHER PLANNING INITIATIVES

As part of the NYMTC Shared Vision outlined in Chapter 1, these projects and initiatives include near-term actions within the 2014-2018 timeframe (Category A on page 1-18) and those that will continue through 2023. All of these projects are region-wide unless otherwise noted.

- ***Evaluate and enhance demand management programs***
- ***Evaluate and enhance mobile source emissions reduction programs***
- ***Inventory greenhouse gas emissions***
- ***Plan for expanded road pricing***
- ***Continue planning for multi-modal access to ports and airports***
- ***Continue planning for multi-modal goods movement and distribution improvements***
- ***Continue local capacity-building through community planning workshops***
- ***Continue planning for transportation sector clean fuels expansion***
- ***Planning for ferry service enhancements and station access improvements***
- ***New cooperative partnerships with multiple government agencies when responding to disasters***
- ***New partnerships through the Federal Disaster Recovery Framework for recovery from disasters***
- ***Develop comprehensive access to safety-related data***
- ***Develop a regional approach to safety-related data analysis***
- ***Develop operating procedures for safety and security considerations***
- ***Enhance Safe Routes to School and Safe Streets for Seniors programs***
- ***Reach consensus on other alternative funding sources to be used individually or corporately***
- ***Advance Bus Rapid Transit and Managed-Use Lane Projects***
- ***Advance Plan 2040 Pedestrian and Bicycle***
- ***Continue Application of Complete Streets Policies***
- ***Pursue agreed upon alternative funding sources***
- ***Expand Park Smart, Commercial Paid Parking, Delivery Windows and other approaches to address congestion in New York City***
- ***Promote and expand DeliverEase in New York City***

5. Special Elements

PEDESTRIANS AND BICYCLES

The NYMTC planning area is in the midst of a shift that is affecting all modes of transportation: the recognition that all users of the road, including pedestrians and bicyclists, should have safe access to the streets and roads. This emphasis on walking and bicycling has contributed to the passage of the Complete Streets legislation in New York State in 2011 that requires state agencies to consider pedestrians and bicyclists in roadway designs. This shift has seen the creation of a plan to extend greenways along the Long Island Motor Parkway in Nassau County and to advance cutting-edge street designs and traffic calming elements in villages such as Southampton. Bicycle and pedestrian facilities have expanded in Westchester County with the successful establishment of off-road multi-use paths throughout the county, the addition of bicycle parking at train stations, Complete Streets policies, Safe Routes to School Programs, the addition of sharrows and bicycle lanes to local roads, and traffic calming initiatives. The Rockland County (Transport of Rockland) Bike-on-Bus program, which continues to expand with the majority of the Rockland County's bus fleet fixed route, is now capable of carrying bicycles; and the recent construction of sidewalks along NY Route 59 in West Nyack to allow for safe pedestrian crossing over the CSX West Shore Line and Hackensack River. In New York City, close to 3,000 miles of bicycle lanes have been added between 2006 and 2011, and the nation's largest bicycle share program launched in 2013.

Each NYMTC sub-area has developed its own pedestrian and bicycle plans to guide future investments in non-motorized transportation. These networks are key to providing mobility in the region and to providing transportation options that reduce greenhouse gas emissions, promote healthy activities, reduce congestion, and maintain overall quality of life. Detailed information on the pedestrian and bicycle plan including existing conditions and facilities, regional strategies for pedestrian and bicycle improvements, initiatives in the NYMTC planning area, and maps of constrained and vision projects, is available in *Plan 2040*: Appendix 2.

COORDINATED PUBLIC TRANSIT - HUMAN SERVICES TRANSPORTATION PLAN

The NYMTC planning area has a diverse, multi-modal transportation environment that includes several layers of public transit, paratransit services, and human service transportation programs. The objective of this Coordinated Public Transit-Human Services Transportation Plan (CPTHSTP) is to identify and prioritize coordination strategies that will improve the efficiencies of these varied and complex services. The ultimate goal is to enhance the capabilities of funding that currently supports these community transportation services in the region, enabling the funders to expand service or introduce new mobility options for persons who depend on the services. In the CPTHSTP, "community transportation" refers to public transit and paratransit services, other public transportation services, human services transportation, and non-emergency medical transportation services that focus on older adults, persons with disabilities, and persons below the poverty line.

The CPTHSTP is an update of NYMTC's previous plan which was developed in 2009 and guided by the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU), the federal transportation act guiding transportation funding at that time. This update is guiding by the current federal transportation Moving Ahead for Progress in the 21st Century Act (MAP-21). One of MAP-21's central goals was to reverse the proliferation of smaller and more specialized programs and consolidate them into larger programs that give funders more flexibility. The challenge is to create the appropriate balance within a single funding source to meet the diverse needs of these key groups. Accordingly, this plan focuses on identifying 1) demographic changes that occurred since the 2009 plan was issued, 2) the changes in unmet needs of the population groups largely dependent on these services, and 3) coordination strategies to address those unmet needs. Appendix 6 of *Plan 2040* has detailed information on existing services and unmet needs, opportunities to address the unmet needs, and updated plan strategies.

FREIGHT PLAN

At the time it was published in 2004, the NYMTC Regional Freight Plan was generally considered to be one of the premiere, state-of-the-art urban and regional freight planning undertakings. NYMTC staff and member agencies have pursued

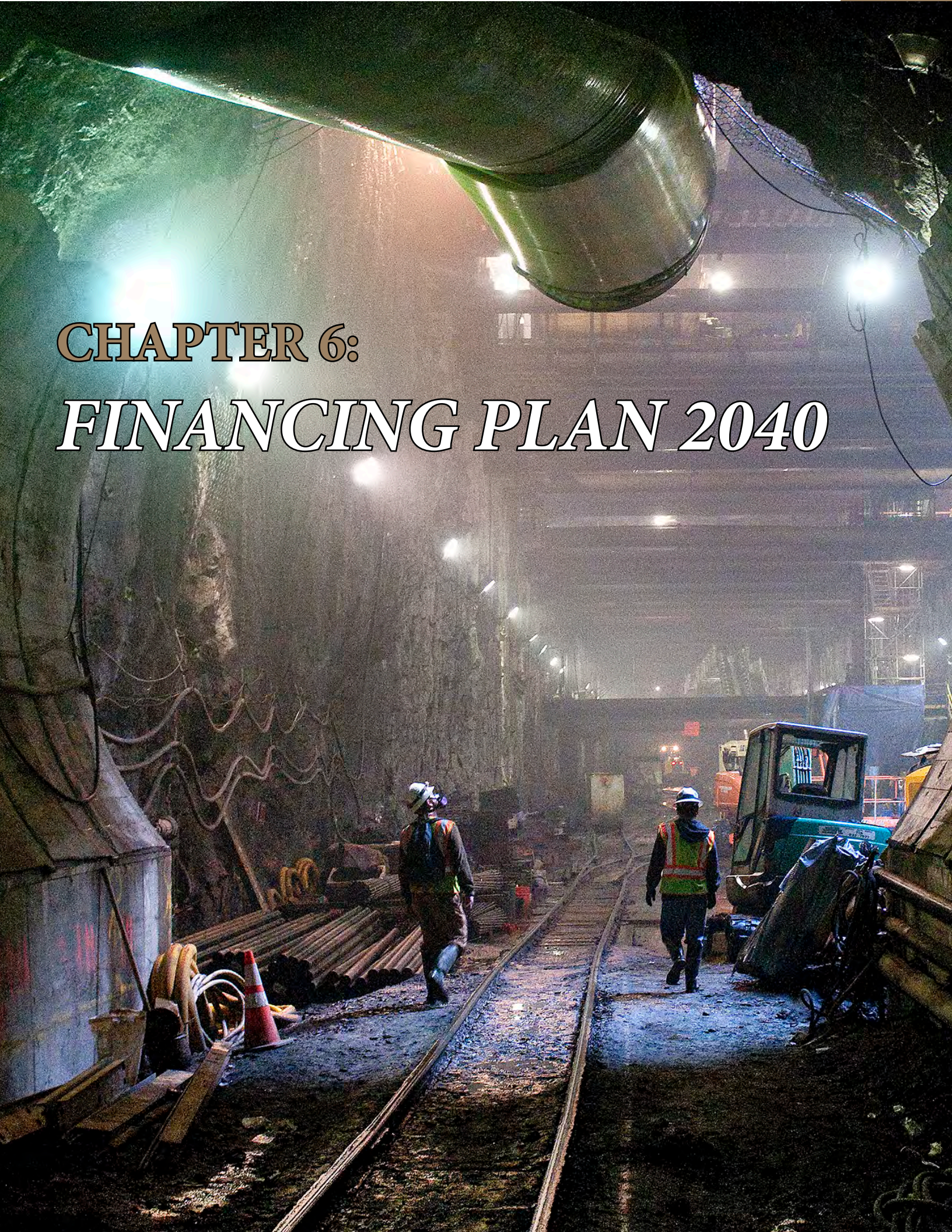
many of the recommendations set forth in the Regional Freight Plan, however, significant changes have occurred in the regional and national economies and in global logistics patterns in light of the 2008-2009 economic recession and subsequent recovery. Demand for all goods and services is only now getting back to or exceeding pre-recession levels. Growth in household disposable income (and hence, consumer product demand) is generally expected to grow more slowly than pre-recession forecasts had estimated. Fluctuations in the price of fuel, currency values, and labor availability and cost are changing production and raw materials sourcing locations. These changes impact the volume, origins and destinations, and modes by which freight travels.

In addition, the state of the planning practice has changed, with more Federal emphasis and grant selection criteria placed on coordinated freight planning, freight performance measures, coordination with economic development goals, and advancing technology-based and operational strategies. MAP-21 recommends that states and MPOs prepare or update their freight plans to describe how their plans support national freight goals, develop freight performance measures, describe freight trends and issues, inventory needs and bottlenecks, and develop freight improvement strategies.

These developments necessitate an evaluation of the progress made toward implementing the recommendations of the 2004 Regional Freight Plan, for developing a fresh understanding of goods movement trends and forecasts in the NYMTC planning area, and for developing a new program of projects and policies to advance regional freight planning goals.

The Regional Freight Plan Update 2015-2040 Interim Plan (hereafter "Interim Plan") offers the first step toward achieving this objective. The Interim Plan is an information- and data-supported planning effort, with emphases on agency and stakeholder outreach, data gathering, and analysis. The Interim Plan includes a review of planning studies and projects that have recently concluded or are on-going, an analysis of commodity flow data, assessment of the components and condition of the region's multi-modal freight network, and documentation and outreach materials that clearly and simply explain a very complex regional freight system to community stakeholders and the public at large. These activities are aimed at establishing a foundation from which NYMTC can address freight in *Plan 2040*.

Appendix 8 of *Plan 2040* establishes a fresh assessment of existing conditions and serves as a convenient launching pad from which the next phase of the Regional Freight Plan Update can advance specific project and programmatic recommendations.

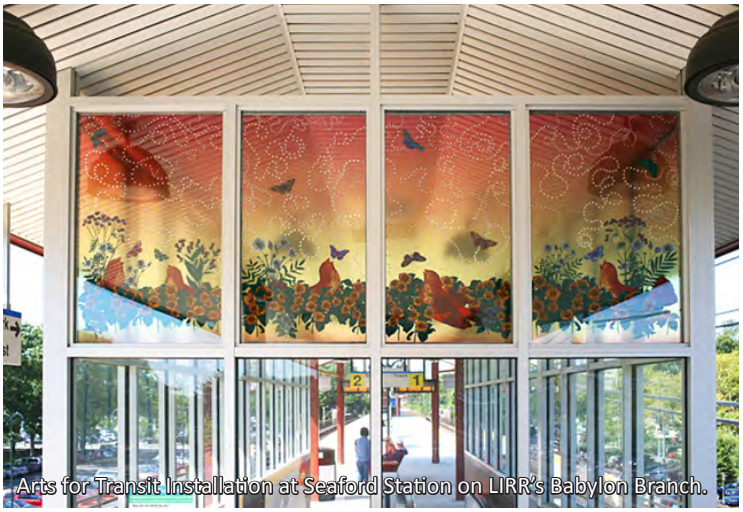


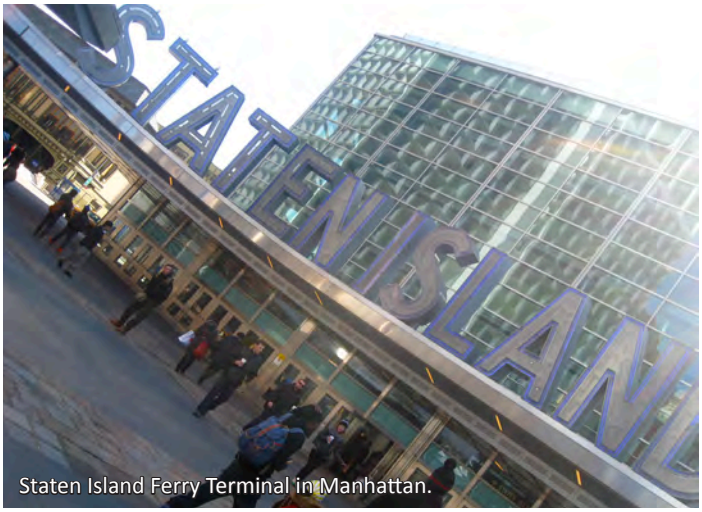
CHAPTER 6:
FINANCING PLAN 2040

PLAN 2040

Chapter 6: Financing Plan 2040

Second Avenue Subway rapid transit subway expansion in Manhattan.


Arts for Transit installation at Seaford Station on LIRR's Babylon Branch.



Staten Island Ferry Terminal in Manhattan.

1. Introduction

The purpose of this chapter is to demonstrate how the federal requirements for fiscal constraint are met and how *Plan 2040*, NYMTC's long-range metropolitan transportation plan, *when adopted can be implemented.* Federal regulations require that the financial plan includes the following (see Appendix 10 for the full regulatory language):

- System-level estimates of the costs and revenues reasonably expected to be available to adequately operate and maintain Federal-aid highways and public transportation;
- Estimates of funds that will be available for the implementation of the Plan; and
- Additional financing strategies for the implementation of the Plan.

THE FISCALLY-CONSTRAINED ELEMENT OF PLAN 2040

Guidance issued by the Federal Highway Administration and Federal Transit Administration states that *fiscal constraint* has remained a key component of transportation plan and program development since enactment of the Intermodal Surface Transportation Efficiency Act (ISTEA) in 1991, followed by the Transportation Equity Act for the 21st Century (TEA-21) in 1998, the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) in 2005, and most recently, Moving Ahead for Progress in the 21st Century (MAP-21) in 2012. The fiscal constraint requirements apply to the metropolitan long-range transportation plan, metropolitan Transportation Improvement Program (TIP), and Statewide Transportation Improvement Program (STIP).

Fiscal constraint requires that revenues in transportation planning and programming (Federal, State, local, and private) are identified and "are reasonably expected to be available" to implement the metropolitan long-range transportation plan and the STIP/TIP, while providing for the operation and maintenance of the existing highway and transit systems.[1]

Additionally, revenue and cost estimates that support the metropolitan transportation plan must use an inflation rate(s) to reflect "year of expenditure (YOE) dollars," based on reasonable financial principles and information, developed cooperatively by the MPO, State(s), and public transportation operator(s).[2]

In keeping with these requirements, *Plan 2040's* forecasts of costs and revenues begin with Federal Fiscal Year (FFY) 2014, are provided in YOE dollars and define the following *fiscally-constrained* elements of the Plan and the associated 2014-2018 TIP:

- Current and anticipated Operations & Maintenance costs of the existing and planned transportation system;
- Costs of System Preservation projects and strategies for the existing and planned transportation system proposed for funding through *Plan 2040*;
- The costs of the Systems Enhancements that are included within the fiscally-constrained element of the Plan;
- Anticipated revenues – reasonably expected for meeting these various costs;

• Emergency relief projects, eligible pursuant to the Disaster Relief Appropriations Act of 2013 or successor legislation, are not required to be included in the TIP or the Plan; however, those projects which provide for resiliency or address adaption needs above the repair and replacement of damaged facilities will be amended into the Plan as these projects are approved for funding by the appropriate federal transportation administrations.

Those projects and strategies proposed for funding within *Plan 2040's* fiscally-constrained element are eligible to be advanced through the federal-aid process.

Plan 2040's forecasts of costs and revenues indicate that additional funding will be necessary to meet needs beyond revenues that can be regarded as reasonably expected within the fiscally constrained portion of the Plan. Potential sources for additional funding and the steps necessary to implement these sources are discussed in Sections 5 and 6 below, as well as the implications of failing to realize this additional funding in Section 7 below.

Plan 2040 also contains an aspirational vision element as allowed by federal regulations. Aspirational projects and strategies contained in *Plan 2040's* vision element are conceptual and are not included in this chapter's forecasts of costs and revenues.

COST AND REVENUE CATEGORIES

Plan 2040's financial chapter is built around the following categories of the costs and revenues associated with the Plan:

Operations & Maintenance (O&M)
O&M, as defined by the Federal Highway Administration, is "an overarching term for activities related to the performance of routine, preventive, predictive, scheduled, and unscheduled actions aimed at preventing transportation system failure or decline." [3]

Additionally, this financial chapter contains current systems-level estimates of costs and revenue sources for O&M that are reasonably expected to be available to operate and maintain the Federal-aid highways and public transportation system as defined by Federal regulations [23U.S.C 101 (a)(5) and 49 U.S.C. Chapter 53]. O&M includes costs related to the provision of transportation services, the day-to-day operation of transportation system components, and operational improvements.

System Preservation
For the purpose of the financial chapter, System Preservation is broadly defined as costs related to the lifecycle replacement, refurbishment, rehabilitation, reconditioning or reconstruction of transportation system components (i.e., equipment and facilities).

System Enhancement
Finally, System Enhancements are extensions to the existing transportation system or new segments or services added to the transportation system to improve capacity and/or through-put.

KEY STEPS IN THE DEVELOPMENT OF THE FINANCIAL FORECASTS

The forecasts of costs and revenues associated with projects that move both people and goods in Plan 2040 lie at the heart of this chapter have been developed through a multi-step process as outlined below:

1. Defining the Transportation System and Federal-Aid Eligible Portions: as a first step, the transportation network that moves people and goods in the NYMTC planning area is a complex network of multi-jurisdictional facilities, some of which are operated and maintained by self-supporting authorities, *Plan 2040* defines the federally-supported transportation system so that the long-range operations and maintenance needs and resources can be more easily identified, estimated and forecasted. The federally-supported transportation system is a subset of the overall transportation network in NYMTC's planning area. Travel simulation models used for planning purposes cover the entire transportation system. It is assumed that operations and maintenance needs for those federal-aid eligible system components[4] owned, operated and maintained by self-supporting public authorities (described below) are met by those authorities as demonstrated in their board-approved capital budgets, plans and programs. Regionally significant non-federally funded projects are included in planning for the system.

2. Inventorying System Components: next, *Plan 2040* inventories the current needs based on condition of the transportation system components that were determined to be part of the federally-supported transportation system, including both existing system components and future components that are in the fiscally-constrained elements of the Plan.

3. Forecasting Costs: Based on the inventory of the federally-supported transportation system components, forecasts of O&M, System Preservation and System Enhancements costs were developed through the *Plan 2040's* horizon year. The forecasts are aggregated modally for roadways (including bridges and non-motorized) and transit.

4. Forecasting Revenues: *Plan 2040* estimates resources that are reasonably expected to be available from federal, state, local, public authority, and supplemental funding sources to support *Plan 2040* implementation by addressing the forecasted O&M, System Preservation and System Enhancements costs. *Plan 2040* also discusses additional financing strategies to address those costs.

RISKS IN FORECASTING LONG-RANGE RESOURCES

The federal planning process requires that metropolitan planning organizations (MPOs) adopt a long-range (minimum period of twenty years) plan based on fiscally-constrained and reasonably anticipated revenue sources. NYMTC's Plan2040 includes an additional five years in its horizon to allow for amendments to the Plan.

Since the expiration of SAFETEA-LU (Public Law 109-59) on September 30, 2009, the rescission by Congress of the transportation program's firewalls and funding guarantees and the changing economic climate, there have been risks and significant challenges to the ability of states and MPOs to reasonably forecast federal resources and conduct longer-term project and program planning. In addition to the protracted delay in enacting a new surface transportation authorization bill -- nearly three-years -- following the expiration of SAFETEA-LU, forecasting federal resources in the current fiscal environment is further complicated by the projected insolvency of the federal Highway Trust Fund (HTF), possibly by the end of Federal Fiscal Year 2014 and the reduction through sequestration of the General Fund transfers to the HTF that are necessary to meet past federal program commitments. Taken together, all of these factors introduce considerable challenges and a higher level of risk and uncertainty into long-range resource forecasts than any period since the enactment of ISTEA in 1991.

Passenger information flat-panel screens for the LIRR and New York City subway trains.

2. System-level estimates of costs and revenue sources to adequately operate and maintain Federal-aid highways and public transportation

Federal regulatory language For purposes of transportation system operations and maintenance, the financial plan shall contain system-level estimates of costs and revenue sources that are reasonably expected to be available to adequately operate and maintain Federal-aid highways (as defined by 23 U.S.C. 101(a)(5)) and public transportation (as defined by title 49 U.S.C. Chapter 53).

THE FEDERALLY-SUPPORTED TRANSPORTATION SYSTEM

In Chapter 3 and Appendix 10, *Plan 2040* inventories the components which comprise the federally-supported transportation system which is the focus of the Plan. This inventory includes existing system components, as well as new components planned in the future, which are defined in either the 2014-2018 Transportation Improvement Program (TIP) or *Plan 2040's* fiscally-constrained element.

As noted in Chapter 3, the New York City metropolitan area has one of the oldest, most complex and highly utilized transportation networks in the world. On a typical weekday, the region's multimodal transportation network handles millions of passenger trips and thousands of tons of freight shipments. Notably, public transit mode share on this network is much higher than in other regions of the United States, which is a testament to the scale of the public transit components of the network.

The federally-supported transportation system is a subset of this overall transportation network. To assist in the estimation of resources and costs, federal-aid eligibility of a transportation system component defines it as federally-supported. Transportation system components which fall within this threshold are eligible for and make use of federal funding to help meet O&M, System Preservation, and/or System Enhancements costs. Tables 1 and 2 below provide details of the general parameters of the federally-supported transportation system. Planning includes improvement projects planned for system components that are not federally-supported but that require a federal action to proceed.

Local roadways that are not part of the Federal-aid highway system and whose costs are borne by the locality, regardless of ownership, are not included in the federally-supported system. Similarly, any transportation system components that are financed exclusively with non-federal funds through state, local or private means are not included in the federally-supported system, regardless of eligibility.

In the NYMTC planning area, five self-financed public authorities have jurisdiction over significant components of the overall regional transportation network

Table 1 - MAJOR COMPONENTS OF THE FEDERALLY-SUPPORTED TRANSPORTATION SYSTEM

Over 19,000 lane-miles of interstates, freeways, parkways, expressways, arterial and collector roadways.
Over 2,400 roadway bridges of all types under the ownership of the State, counties and local municipalities.
Nearly 480 route miles of commuter rail and 225 route miles of subway tracks in passenger service, plus hundreds of miles of local, express, commuter, and intercity bus routes and an aerial tramway.
An extensive network of passenger hubs, transit stations and stops, bus terminals and subway transfer facilities, ferry landings, and bus stops.
More than 1,100 miles of bicycle facilities, ranging from shared-use bike trails to on-road bike lanes, in addition to pedestrian sidewalks, trails, and paths.
Supporting infrastructure such as rail yards and highway maintenance facilities, highway rest areas, parking lots and garages, bus depots and transit storage yards, bicycle parking areas, toll plazas, signage, signals, electronics, and other equipment.

that are not considered part of the federally-supported system for the purposes of *Plan 2040*. Brief descriptions of these five authorities follow. A listing of the system components that are under the jurisdictions of these five authorities appears in Appendix 10.

• The Port Authority of New York and New Jersey provides a diverse, multimodal portfolio of infrastructure assets that support regional transportation, trade, and commerce, including some major facilities and services that are integrated into the bi-state surface transportation network: the George Washington Bridge and Bus Station; the Lincoln and Holland tunnels; the Bayonne Bridge, Goethals Bridge and Outerbridge Crossing; the Port Authority Bus Terminal in midtown Manhattan; the Port Authority Trans-Hudson (PATH) rapid-transit system; rail freight and car float operations, and the World Financial Center Ferry Terminal. In addition, the Port Authority has taken the lead in financing infrastructure at its airports and marine terminals to connect with that network, including on-dock rail freight service at the container terminals and the AirTrain-JFK and AirTrain-Newark transit links.

• MTA Bridges and Tunnels, whose legal name is the Triborough Bridge and Tunnel Authority, is one of the component operating authorities of the Metropolitan Transportation Authority (MTA) and operates seven bridges and two tunnels connecting four of the five boroughs of New York City over and under various water bodies. Note that all of the other MTA component operating authorities (i.e., MTA New York City Transit, MTA Metro-North Railroad, MTA Long Island Rail Road, MTA Staten Island Railway and MTA Regional Bus Operations) operate facilities and services which are defined as part of the federally-supported transportation system.

• The New York State Thruway Authority operates the New York State Thruway (I-87), the New England Thruway (I-95) and the Cross Westchester Expressway (I-287) within the NYMTC planning area, as well as the Tappan Zee Bridge, which carries the New York State Thruway over the Hudson River between Westchester and Rockland counties.

• The New York State Bridge Authority operates the Bear Mountain Bridge, which carries U.S. 202 and U.S. 6 over the Hudson River between the northern portions of Westchester and Rockland counties.

• The Nassau County Bridge Authority operates the Atlantic Beach Bridge, which connects the Nassau Expressway with Atlantic Beach across the Reynolds Channel.

Other transportation facility owners and service that are not included in the financial forecasts for the federally-supported transportation system are described below. A listing of the system components that are under their jurisdictions appears in Appendix 10.

• The National Railroad Passenger Corporation, otherwise known as AMTRAK™, which provides intercity rail services in the NYMTC planning area but does not program its federally-funded projects through NYMTC's metropolitan transportation planning process.

Table 2 - Total System Roadways / Bridge & Federal-Aid Roadways / Bridges

	Roadway Lane Miles		Roadway Bridges	
	System	Federal-Aid	System	Federal-Aid
LOWER HUDSON VALLEY				
Putnam	1766.89	613.71	104	81
Rockland	2798.31	1111.53	238	208
Westchester	8246.28	3266.93	766	607
Subtotal	**12811.48**	**4992.17**	1108	896
SUBURBAN LONG ISLAND				
Nassau	10192.61	3816.94	323	302
Suffolk	15975.58	5173.91	364	327
Subtotal	**26168.19**	**8990.85**	687	629
NEW YORK CITY				
Bronx	1796.61	925.28	315	262
Kings	3278.62	1459.49	238	196
New York	1289.62	954.30	245	202
Queens	5254.85	1896.09	485	380
Richmond	1567.82	602.56	159	135
Subtotal	**13187.52**	**5837.72**	**1442**	**1175**
Total System	**52167.19**		**3237**	
Total Federal Aid		**19820.74**		**2700**
% Federal Aid		**38.0%**		**83.4%**

Sources: Highways - NYSDOT Road Inventory Extract, June 2010 Edition; Bridges- NYSDOT AprilWinBoltsinAccess.mdb, April 2011 Edition

• New Jersey Transit and Connecticut Transit, public benefit corporations providing bus and rail transit services in the states of New Jersey and Connecticut, including services that terminate in Manhattan and in the City of White Plains in Westchester County. Although these carriers are eligible for and make use of federal transportation funding, they do not program federally-funded projects through NYMTC's metropolitan transportation planning process.

• Privately owned and operated ferry systems, rail freight systems and intercity and interstate bus systems that provide services in the NYMTC planning area.

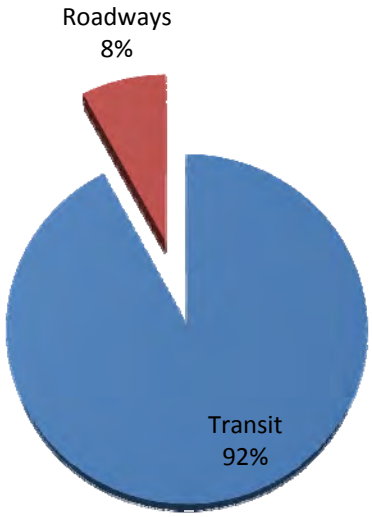
• Suburban municipalities that have jurisdiction over Federal-aid eligible roadways and/or bridges within their jurisdictions.

COSTS TO OPERATE AND MAINTAIN THE FEDERALLY-SUPPORTED SYSTEM

Plan 2040's system-level **forecasts of costs to adequately operate and maintain system components and services** are based on the current operating budgets of NYMTC's member agencies, as well as any longer-range operational plans they maintain. Entities generally have annual budgets approved by their respective legislatures or boards, while a capital program may have a longer term. New York State has shown a historically demonstrated commitment and track record to matching federal funding and financing transportation infrastructure. The O&M costs of System Enhancements are included in these estimates in cases where planned enhancements add new components to the system. System Enhancements that are included within the fiscally-constrained element of the

Figure 1 -- O&M Costs by Mode

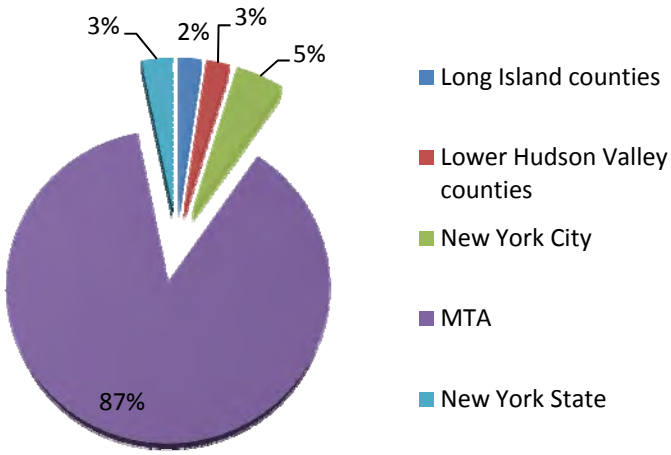
Federally-Supported Transportation System
Total Projected Cost = $395.290 billion (YOE)



NOTE Modal breakdown of total projected operations & maintenance (O&M) costs for the federally-supported transportation system based on the current operating budgets of NYMTC's member agencies, as well as any longer-range operational plans they maintain. The O&M costs of System Enhancements in the fiscally-constrained element are included in these estimates in cases where planned enhancements add new components to the system.

Figure 2 - O&M Costs by Agency

Federally-Supported Transportation System
Total Projected Cost = $395.290 billion (YOE)



NOTE Agency breakdown of total projected operations & maintenance (O&M) costs for the federally-supported transportation system based on the current operating budgets of NYMTC's member agencies, as well as any longer-range operational plans they maintain. The O&M costs of System Enhancements are included in these estimates in cases where planned enhancements add new components to the system.

Plan 2040 are described in detail in subsequent sections of this chapter.

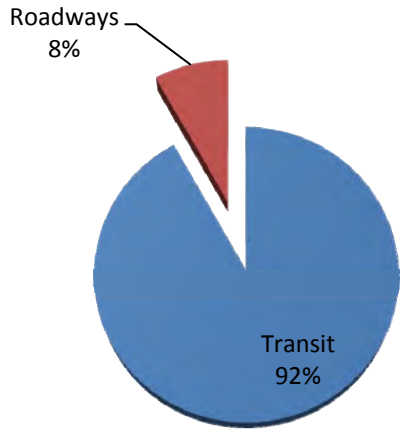
***Plan 2040* forecasts that just over $395 billion in YOE dollars** will likely be needed through the 2040 horizon year to adequately operate and maintain system components and services. These O&M cost forecasts are detailed in Section 3A of Technical Appendix 10. Figures 1 and 2 below provide a modal and agency breakdown of these projected O&M costs for the federally-supported transportation system. Over 90 percemt of the O&M costs are related to the operation and maintenance of transit services on the federally-supported system.

Forecasts of revenue sources that will be available to adequately operate and maintain the federally-supported transportation system are based on revenues reasonably expected to be available from federal, state, local (including New York City, suburban county and public authority), and supplemental funding sources (see section on forecasting risks above). These funding sources were projected into the future using the assumptions of local tax receipts, user fees and/or budget allocations that underlie the agency operating budgets themselves. A conservative 2.5 percent escalation rate was employed[5], compounded annually, based on an analysis of monthly inflation rates for calendar years 2010 through 2012 calculated using the Current Consumer Price Index published monthly by the Bureau of Labor Statistics (see Appendix 10, Table 5).

Plan 2040 assumes that New York State and local (including New York City, suburban county and public authority) revenue sources are used to address the majority of the O&M costs. The MTA—the region's major transportation-related public authority whose services are mainly part of the federally-supported system — forecast their revenues

Figure 3 -- O&M Revenue Sources

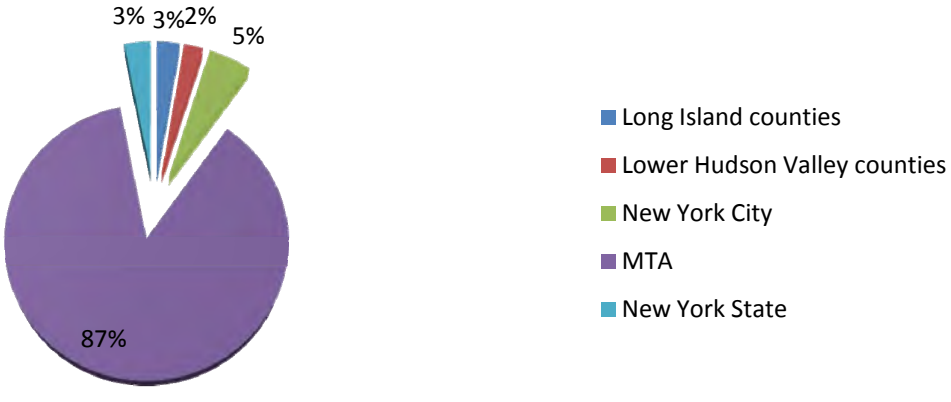
Federally-Supported Transportation System
Total Revenues = $395.103 billion (YOE)



NOTE Modal breakdown of total projected operations & maintenance (O&M) revenues for the federally-supported transportation system based on the forecasts of the revenue sources likely to be employed by the member agencies to operate and maintain system components and services.

Figure 4 - O&M Revenue Sources

Federally-Supported Transportation System
Total Projected Revenues = $395.103 billion (YOE)



NOTE Agency breakdown of total projected operations & maintenance (O&M) revenues for the federally-supported transportation system based on the forecasts of the revenue sources likely to be employed by the member agencies to operate and maintain system components and services.

based on current and anticipated capital and operating plans (see Appendix 10). Figures 3 and 4 present summaries of the forecasted O&M revenue sources. New York State has shown a historically demonstrated commitment and track record to matching federal funding and to finance transportation infrastructure. Within the NYMTC region, New York's Statewide Mass Transportation Operating Assistance (STOA) program provides more than $4 billion annually in operating assistance to transportation providers based on service and utilization characteristics.[6]

Based on the forecasts of the revenue sources likely to be employed by the NYMTC member agencies to operate and maintain system components and services, which is detailed in Section 4 of Technical Appendix 10, *Plan 2040* forecasts that roughly **$395 billion in YOE dollars** will be available to NYMTC's member agencies through the 2040 horizon year for this purpose. Figures 3 and 4 provide a modal and agency breakdown of these projected O&M revenue sources for the federally-supported transportation system. As with O&M costs, over 90 percent of the revenues are related to the operation and maintenance of transit services on the federally-supported system.

The projected revenue sources that can be reasonably expected to be available to NYMTC's members from federal, state, local, and supplemental funding sources to address the forecasted O&M costs meet almost all of the forecasted costs. The small discrepancy – roughly $200 million -- between forecasted revenues and costs can be generally attributed to local municipal ownership of Federal-aid eligible roadways and/or bridges in the suburban counties, since the revenue forecast does not include local municipal budgetary O&M contributions in the suburban counties.

Through these forecasts, *Plan 2040* meets the federal regulatory requirement for a financial plan which shall contain system-level estimates of costs and revenue sources that are reasonably expected to be available to adequately operate and maintain Federal-aid highways (as defined by 23 U.S.C. 101(a)(5)) and public transportation (as defined by title 49 U.S.C. Chapter 53).

3. Projects and Strategies Proposed for Funding

Federal regulatory language In developing the financial plan, the MPO shall take into account all projects and strategies proposed for funding under title 23 U.S.C., title 49 U.S.C. Chapter 53 or with other Federal funds; State assistance; local sources; and private participation.

The projects and strategies proposed for funding through *Plan 2040* fall into two broad categories: System Preservation and System Enhancements. As defined earlier in this chapter:

- System Preservation includes project and program costs related to the lifecycle replacement, refurbishment, rehabilitation, reconditioning or reconstruction of the components (i.e., equipment and facilities) of components of the federally-supported transportation system under the jurisdiction of NYMTC's member agencies.
- System Enhancements include project and program costs related to the expansion of the federally-supported system's capacity through the addition of new components or the significant expansion of the capacity of existing components to move, people, vehicles and/or goods.

System Preservation

System Preservation projects and strategies proposed for funding in *Plan 2040* for the different transportation system components in NYMTC's planning area were developed using technical models run by the New York State Department of Transportation, as well as the MTA's 2010-2029 Twenty Year Capital Needs Assessment and the capital plans and programs of the other NYMTC member agencies. In building these forecasts, NYMTC's members relied on system preservation goals and methods for prioritizing capital investments that were based on their internal capital budgeting assumptions and policies. Figures 5 and 6 present summaries of these forecasted costs.

The forecasts incorporate a number of regional and local assumptions and policies, such as pavement treatment costs

and strategies as well as transit fleet life-cycle replacement cycles (see Appendix 10 for details). The unit costs for the preservation of individual system components, such as lane miles of roadway or track miles of rail, were assumed to include costs of peripheral infrastructure, such as signage, lighting, and fencing.

Inflation rates were applied to unit cost estimates to represent YOE dollars, using either local inflation data for planning and programming estimates, or, in the absence of such data, applying an inflation rate of three percent, compounded annually, to their cost estimates. The three percent rate is consistent with federal guidance.

Based on the forecasts of the member agencies' costs to preserve the various components of the federally-supported transportation system under their jurisdiction, (see Appendix 10 for details), *Plan 2040* forecasts that approximately **$266 billion in YOE dollars** in System Preservation projects and strategies will need to be funded through the 2040 horizon year for this purpose. Figures 5 and 6 provide a modal and agency breakdown of these projected System Preservation costs for the federally-supported transportation system. The majority of the costs (60 percent) are related to the preservation of transit services on the federally-supported system.

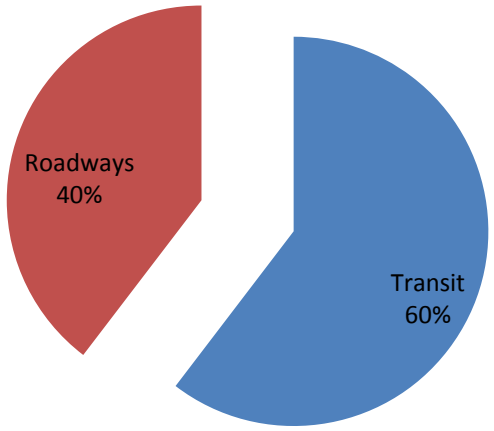
System Enhancements

System Enhancements include forecasted costs related to projects and strategies proposed to be funded through *Plan 2040* and/or the 2014-18 TIP in order to expand the federally-supported transportation system's capacity through the addition of new components or by significantly expanding the capacity of existing components. These include both major System Enhancements, generally defined as transportation projects or programs that meet this definition with an

Figure 5 -- System Preservation Costs

Federally-Supported Transportation System

Total Cost = $266.260 billion (YOE)

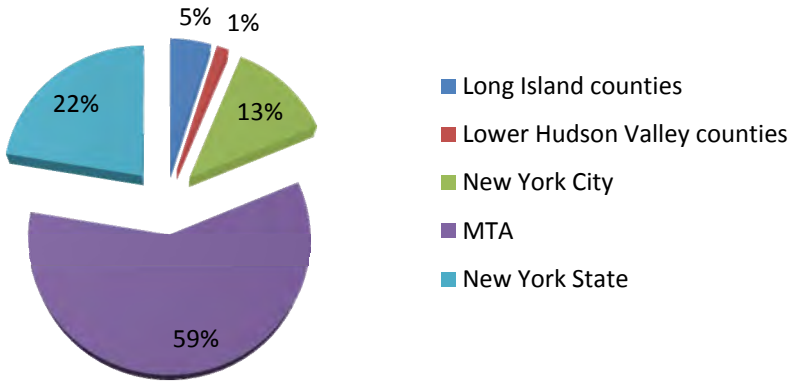


NOTE Modal breakdown of total projected System Preservation costs for the federally-supported transportation system. System Preservation projects and strategies proposed for funding in *Plan 2040* for the different transportation system components in NYMTC's planning area were developed using technical models run by the New York State Department of Transportation, as well as the MTA's 2010-2029 Twenty Year Capital Needs Assessment and the capital plans and programs of the other NYMTC member agencies. In building these forecasts, NYMTC's members relied on system preservation goals and methods for prioritizing capital investments that were based on their internal capital budgeting assumptions and policies.

Figure 6 -- System Preservation Costs

Federally-Supported Transportation System

Total Projected Cost = $266.260 billion (YOE)



NOTE Agency breakdown of total projected System Preservation costs for the federally-supported transportation system. System Preservation projects and strategies proposed for funding in *Plan 2040* for the different transportation system components in NYMTC's planning area were developed using technical models run by the New York State Department of Transportation, as well as the MTA's 2010-2029 Twenty Year Capital Needs Assessment and the capital plans and programs of the other NYMTC member agencies. In building these forecasts, NYMTC's members relied on system preservation goals and methods for prioritizing capital investments that were based on their internal capital budgeting assumptions and policies.

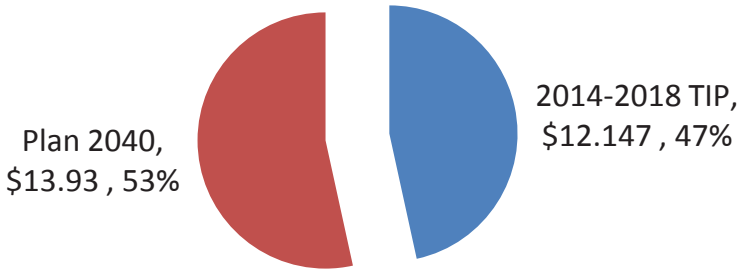
estimated cost of $100 million or greater and/or those of regional scope or impact, and minor System Enhancements with lower estimated costs and/or lesser scope or impact. Generally, major System Enhancement projects included in the fiscally-constrained Plan and/or 2014-18 TIP are derived from the *Plan 2040* strategic vision described in Chapters 1 and 5.

Given the System Enhancement projects and strategies proposed for funding through *Plan 2040*, as summarized in Figure 7 and Table 3 below, **just over $26 billion in YOE dollars** will be needed through the 2040 horizon year to fund these projects and programs. Figure 7 provides a breakdown of these projected costs from the 2014-18 TIP and from the fiscally-constrained element of Plan 2040. The majority of the costs (53 percent) are related to longer-term enhancement projects contained within *Plan 2040's* fiscally-constrained element. Table 3 lists these system enhancement projects and programs.

In total, *Plan 2040* projects costs of **$292 billion in YOE dollars** for System Preservation and System Enhancements projects and strategies for the federally-supported transportation system, through the 2040 horizon year (see Appendix 10 for additional details). Estimates of the revenues that will likely be available to fund the implementation of these projects and strategies are based on *revenues reasonably expected to be available from federal, state, local, and public authority sources*. With regards to the private funding of infrastructure projects, this is mostly considered on a project-by-project basis. One such example is the No. 7 Subway Line Extension project and related complex Tax Increment Financing (TIF)[7] to finance the project.

Figure 7 -- System Enhancement Costs

Federally-Supported Transportation System
Tota Projected Cost = $26.073 billion (YOE)

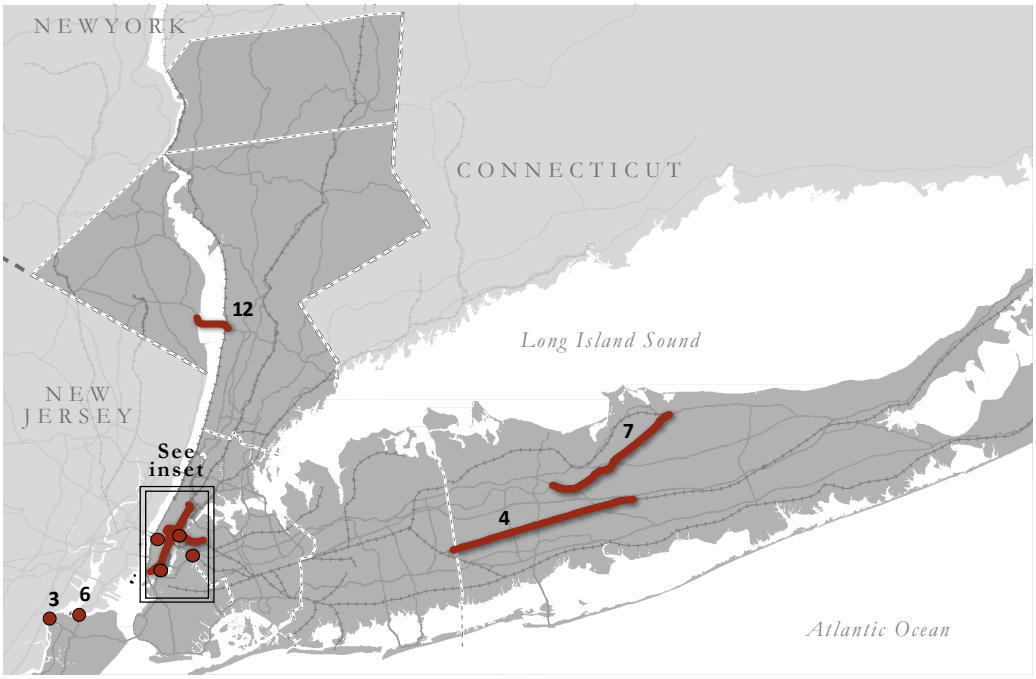


NOTE Total projected System Enhancements costs by planning process status - 2014-18 TIP or fiscally-constrained element of *Plan 2040*.

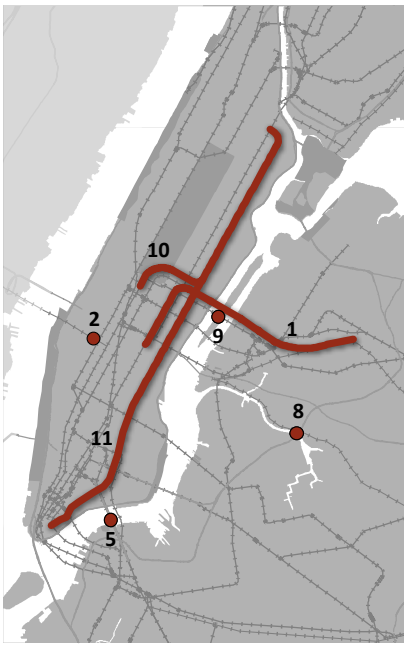

Escalator demolition and replacement on the LIRR in Babylon, NY.

TABLE 3 - SYSTEM ENHANCEMENTS (estimated costs in billions of YOE dollars)

Map #	Plan #/PIN #	Category/Item	Pre 2014	Total $$ programmed	Fund source	2014-2018	2019-2023	2024-2028	2029-2033	2034-2038	2039-2040	COMMENTS
	Minor Projects			$ 2.728	Reasonably expected	$ 1.306	$ 1.422					
					Project-specific	$ -	$ -					
	Major Projects (Itemized)											
1	PIN: G609/01/AA 09	MTA LIRR East Side Access Project	$ 1.002	$ 1.020	Reasonably expected	$ 0.172						Project-specific funding to include agency capital funding ($424M) and federal discretionary ($424M)
					Project-specific	$ 0.848						
2	PIN: X82266	Moynihan Station Phase 1	$ 0.016	$ 0.067	Reasonably expected	$ 0.067						
					Project-specific	$ -						
3	PIN: X77047	Goethals Bridge Replacement		$ 1.500	Reasonably expected	$ -						Project-specific funding to include public-priavte partnership ($1B) and federal credit ($500M)
					Project-specific	$ 1.500						
4	PIN: L603/04/ TX 03	MTA LIRR Ronkonkoma Branch 2nd Track	$ 0.009	$ 0.129	Reasonably expected	$ 0.129						
					Project-specific	$ -						
5	PIN: X76416; PLAN: NYCMB247C	Manhattan Bridge Cables & Suspenders		$ 0.388	Reasonably expected	$ 0.085	$ 0.303					
					Project-specific	$ -	$ -					
6	PIN: X09629	Bayonne Bridge Clearance Project		$ 1.000	Reasonably expected	$ -						Project-specific funding is agency capital funding
					Project-specific	$ 1.000						
7	PIN: 005418, 005409, OT2155, 005410, OT2156, 005412, OT2493, 005411, OT2305; PLAN: NSSC646C; NSSC647C: NSSC649C: NSSC650C	NY Route 347 Safety, Mobility and Environ-mental Improvements	$ 0.152	$ 0.855	Reasonably expected	$ 0.049	$ 0.204	$ 0.326	$ 0.275			
					Project-specific	$ -	$ -					
8	PHASE 2 PIN: X72977: PLAN: NYCMB569C; NYCMB571C	Kosciuszko Bridge Replacement Project	$ 0.686	$ 0.290	Reasonably expected	$ 0.290						
					Project-specific	$ -						
9	PIN: X77283: PLAN: NYCQ1686C	Ed Koch Queensboro Bridge Seismic Retrofit		$ 0.150	Reasonably expected	$ 0.125	$ 0.025					
					Project-specific	$ -	$ -					
10	PIN: G610-01AA	MTA NYCT Second Ave Subway Phase 1	$ 1.126	$ 0.804	Reasonably expected	$ -						
					Project-specific	$ 0.804						
11	PLAN: NYCM2013V	MTA NYCT Second Ave Subway Phase 2-4		$ 12.776	Reasonably expected	$ -	$ -	$ -	$ -	$ -		Project-specific funding to include agency capital funding ($6.39B) and federal discretionary ($6.39B)
					Project-specific	$ 1.836	$ 1.836	$ 2.480	$ 4.416	$ 2.208		
12	PIN: 8TZ101; PLAN: MHSMC1590C	Tappan Zee Hudson River Crossing Project	$ 1.200	$ 3.900	Reasonably expected	$ -						Project-specific funding to include agency bonding ($2.7B) and federal credit ($1.2B)
					Project-specific	$ 3.900						
N/A		Transportation Demand Management		$ 0.286	Reasonably expected	$ 0.036	$ 0.050	$ 0.050	$ 0.050	$ 0.050	$ 0.050	
					Project-specific	$ -	$ -	$ -	$ -	$ -	$ -	
N/A	PLAN: NYCMB584C	Bus Rapid Transit Routes in New York City		$ 0.180	Reasonably expected		$ 0.180					
					Project-specific		$ -					
	TOTALS		**$ 4.190**	**$ 26.073**	**Reasonably expected**	**$ 2.259**	**$ 2.184**	**$ 0.376**	**$ 0.325**	**$ 0.050**	**$ 0.050**	
					Project-specific	**$ 9.888**	**$ 1.836**	**$ 2.480**	**$ 4.416**	**$ 2.208**	**$ -**	



New York City Detail



4. Estimates of funds that will be available to support metropolitan transportation plan implementation

Federal regulatory language For the purpose of developing the metropolitan transportation plan, the MPO, public transportation operator(s), and State shall cooperatively develop estimates of funds that will be available to support metropolitan transportation plan implementation, as required under § 450.314(a). All necessary financial revenues from public and private sources that are reasonably expected to be made available to carry out the transportation plan shall be identified.

Plan 2040 assumes that federal funding will continue to play a significant role in the preservation and expansion of the transportation system. However, at the time of this writing, federal transportation policies and funding remain in an unprecedented state of flux. MAP-21 provided only a two-year authorization period in place of the traditional six-year authorization period. MAP-21's authorization period was intentionally truncated to address the funding available. Underscoring this point is USDOT's June 13, 2013 testimony on Infrastructure before the U.S. Senate Committee on Appropriations. According to USDOT, "by the end of federal fiscal year 2014, the Highway Trust Fund (HTF) will be nearly depleted and Congress will have transferred nearly $54 billion in General Funds into the HTF" to meet surface transportation program Commitments. To put the current HTF crisis into perspective, an additional $85 billion in General Funds (above and beyond revenues available from the HTF) is required just to keep surface transportation programs at current levels over the next six-year period.

Given this uncertainty, the extrapolation of federal funding trends from predecessor legislation (i.e., ISTEA, TEA-21, SAFETEA-LU) is not a reasonable assumption that can be made. In addition, from a policy perspective, MAP-21's

L train: one of the MTA's new subway fleet.

restructuring of core highway programs resulted in a major shift of responsibility to states and local governments for the rehabilitation and replacement of roadways and bridges off of the National Highway System (NHS).

For this reason, *Plan 2040* projects federal revenues as a range. The lower limit of the range is derived from the MAP-21 base year funding levels using the 2.5 percent escalation rate, compounded annually. Applying this escalation anticipates that future federal funding, while generally held constant, will be increased to accommodate inflation, as it was under MAP-21. *Plan 2040* projects the upper limit of the federal funding range by applying the historical trend of MAP-21's three predecessor acts – ISTEA, TEA-21 and SAFETEA-LU – to each of its successor acts, which are assumed to be five years each in duration. Generally, the funding authorized by Congress in each of these predecessor acts was 20 percent greater than the funding authorized in the immediately preceding act.

Table 4 presents the projected federal funding range in terms of upper and lower limits to the range. Again, the lower limit of the range is derived from the MAP-21 base year funding levels using the 2.5 percent escalation rate, compounded annually, as described above. The upper limit applies the historical trend of MAP-21's three predecessor acts. Note that, given the current fiscal environment as described earlier, this upper limit may be overly optimistic.

Further, the table is organized by the federal authorization acts anticipated during the planning period. For the purpose of this forecast, each successor act to MAP-21 is assumed to be five fiscal years in duration and is assumed to be followed immediately by its successor. Note that the sixth successor act would have only its first year within the planning period. The table presents the difference in federal funding between the lower and upper limits of the range for each of the successor acts and then extrapolates an assumed 20 percent local match for these additional federal funds.

New York State-authorized revenues for transportation purposes were projected from base year funding levels and generally use the same 2.5 percent escalation rate, compounded annually. In addition, based on historical precedents, *Plan 2040* assumes two voter-approved transportation-related New York State Bond Acts in 2020 and 2030, with total amounts escalated from the 2005 Bond Act to account for inflation. Local revenues, including those revenues from public authorities whose facilities and services are part of the federally-supported transportation system, are projected from base year funding levels using the same 2.5 percent escalation rate, compounded annually.

Additional state and local revenues are calculated to provide the necessary local match for the additional federal revenues calculated as the upper limit of the federal forecast range. These revenues are considered to be additions to state and local revenues forecast from the base year

Table 4 - Federal Revenue Range (in millions of YOE dollars)

FEDERAL ACT	FEDERAL FISCAL YEARS	FEDERAL LOWER LIMIT	FEDERAL UPPER LIMIT	FEDERAL DIFFERENCE	ADDITIONAL LOCAL MATCH	MATCHED DIFFERENCE
MAP-21	2014	$ 1,639.18	$ 1,639.18	$ -	$ -	$ -
SUCCESSOR 1	2015-19	$ 8,522.29	$ 10,226.74	$ 1,704.46	$ 426.11	$ 2,130.57
SUCCESSOR 2	2020-24	$ 9,642.18	$ 12,272.09	$ 2,629.91	$ 657.48	$ 3,287.38
SUCCESSOR 3	2025-29	$ 10,909.25	$ 14,726.51	$ 3,817.26	$ 954.32	$ 4,771.58
SUCCESSOR 4	2030-34	$ 12,342.81	$ 17,671.81	$ 5,329.00	$ 1,332.25	$ 6,661.25
SUCCESSOR 5	2035-39	$ 13,964.76	$ 21,206.17	$ 7,241.42	$ 1,810.35	$ 9,051.77
SUCCESSOR 6	2040	$ 3,005.87	$ 5,089.48	$ 2,083.61	$ 520.90	$ 2,604.51
TOTALS		**$ 60,026.33**	**$ 82,831.99**	**$ 22,805.66**	**$ 5,701.41**	**$ 28,507.07**

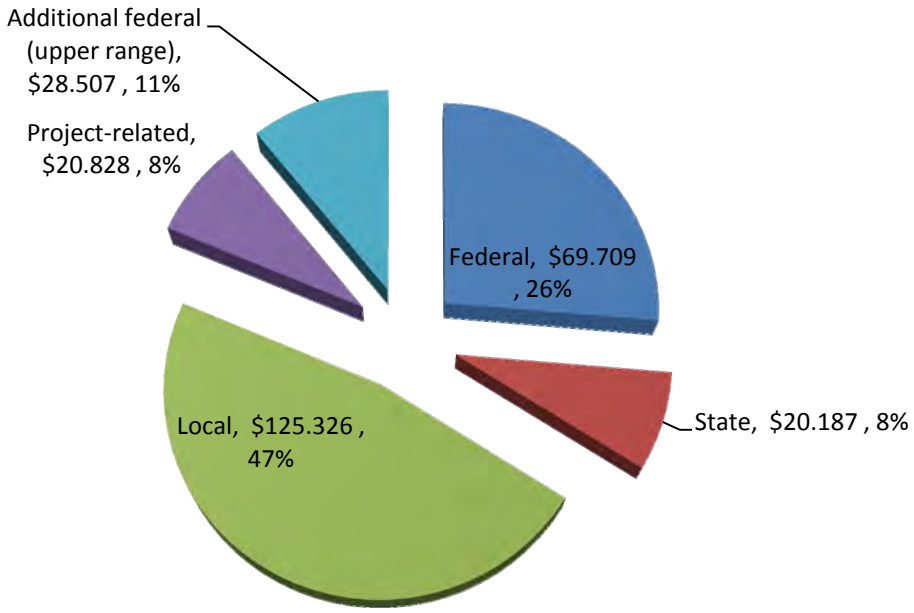
as described in the preceding paragraph. They therefore represent additional state and local funding provided in response to higher levels of federal revenues, since the local match is a requirement of federal funding. These revenues will likely originate from the same sources through which local match is provided for current projects – the capital budget of the agency which has jurisdiction over the system component being improved. The local match will leverage a much higher proportion of federal funding, so the availability of local match can be regarded as assured should additional federal funding be available. Past history indicates that NYMTC's members rarely if ever fail to identify necessary local match for federal funding and it is not unreasonable to expect these results will continue throughout the plan period as long as the Federal share of costs remains at or above current levels.

Using the anticipated revenues and assumptions described above, *Plan 2040* forecasts that approximately **$236 billion to $265 billion in YOE dollars** is expected to be reasonably available from federal, state, and local sources to fund the Plan's projects and strategies at either the upper of lower limit of the federal funding range. State and local sources are assumed to be the capital budgets of the state, local counties, local municipalities and relevant public authorities such as the MTA. Note that this forecast of revenues includes assumptions of reasonably available discretionary federal funding.

Figure 8 below provides a breakdown of these anticipated revenue sources (see Appendix 10 for details). A plurality of the reasonably expected revenues (47 percent) is forecast to be available from local sources, including New York City, suburban counties and public authorities whose facilities and services are part of the federally-supported transportation system. Federal sources are forecast to provide roughly one-quarter to one-third of the reasonably expected revenues.

Figure 8 -- Estimated Funds for Plan Implementation

Federally-Supported Transportation System
Total Funds = $264.557 billion (YOE)



NOTE Projected revenues for Plan implementation by revenue category. The lower limit of the federal range is derived from the MAP-21 base year funding levels using the 2.5 percent escalation rate, compounded annually. New York State-authorized revenues for transportation purposes were projected from base year funding levels and generally use the same 2.5 percent escalation rate, compounded annually. In addition, based on historical precedents, Plan 2040 assumes two voter-approved transportation-related New York State Bond Acts in 2020 and 2030, with total amounts escalated from the 2005 Bond Act to account for inflation. Local revenues, including those revenues from public authorities whose facilities and services are part of the federally-supported transportation system, are projected from base year funding levels using the same 2.5 percent escalation rate, compounded annually.

Figure 9 -- Plan 2040 Revenues & Costs

Federally-Supported Transportation System

Total Financing and Costs = $292.333 billion (YOE)

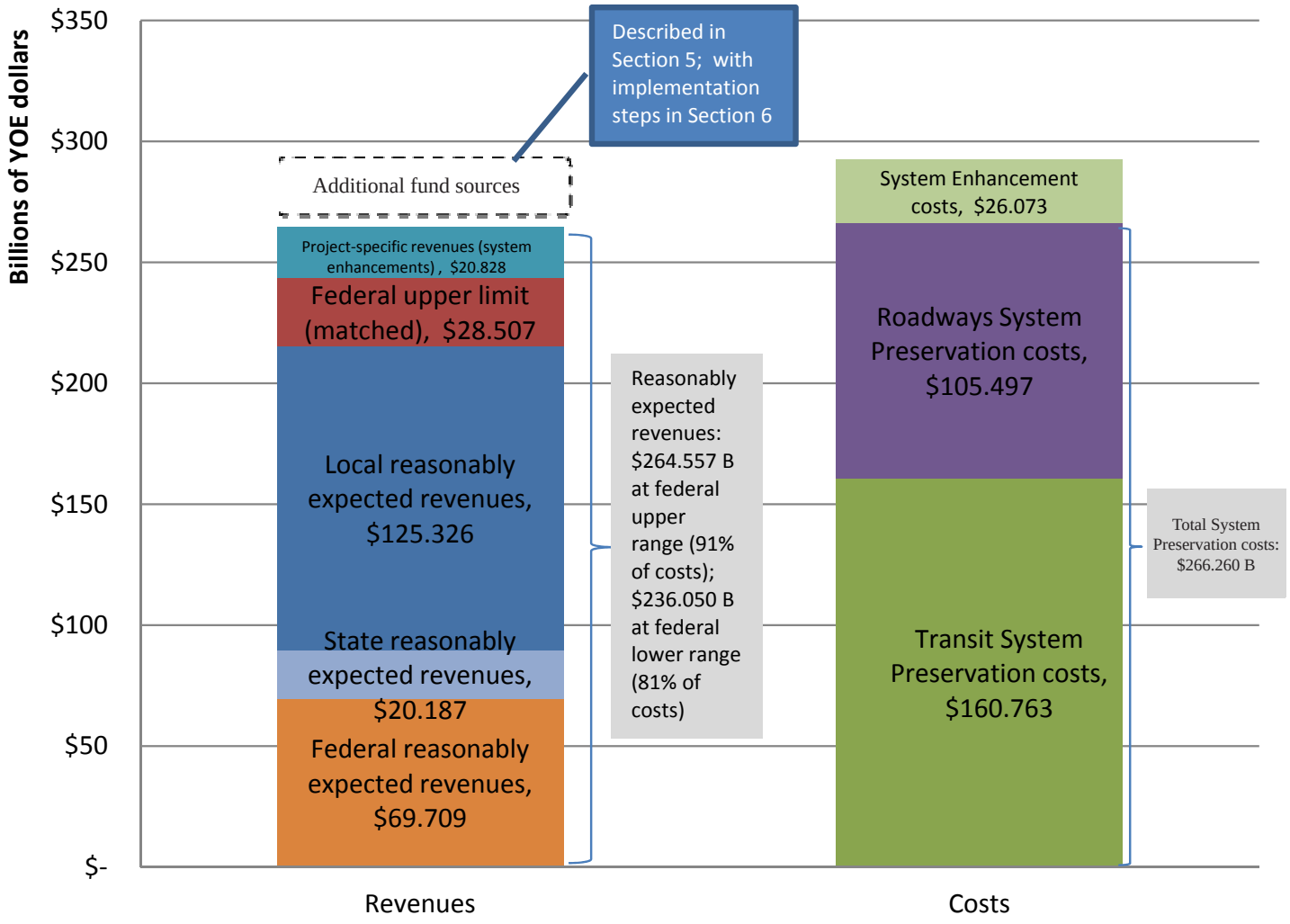


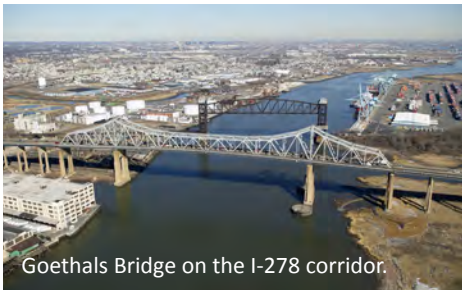
Figure 9 compares the forecasts of reasonably expected revenues to the forecasts of the costs to implement the projects and strategies proposed for funding in *Plan 2040*. Broadly speaking, reasonably expected revenues will cover 81 percent to 91 percent of the projected costs of *Plan 2040* implementation, given the range of forecasted federal revenues. The difference between reasonably expected revenues and forecasted costs is therefore a range of $28 to $56 billion in YOE dollars that will need to be provided through additional funding sources in order to fully implement *Plan 2040*. These additional funding sources are outlined in more detail in the following section.

5. Additional financing strategies for the implementation of the metropolitan transportation plan

Federal regulatory language The financial plan shall include recommendations on any additional financing strategies to fund projects and programs included in the metropolitan transportation plan. In the case of new funding sources, strategies for ensuring their availability shall be identified.

In keeping with the federal regulation cited above, *Plan 2040* recommends that additional funding sources be explored and implemented as strategies to fund the projects and strategies it proposes. An approach to ensuring the availability of these new fund sources is described in Section 6 below. The recommended additional funding sources fall into two broad categories: *project-specific* and *regionwide*.

Although it is possible for these funding sources to be implemented during the period of the Plan, all of them are subject to individual agency budgeting and policy decisions, as well as legislative changes at municipal, county, and/or state levels. Thus, the mechanisms for implementation of these funding sources are outside of the metropolitan planning process for which NYMTC is the responsible body as a regional council and therefore outside of NYMTC's direct influence as an organization. However, NYMTC can take steps organizationally to facilitate the consideration and potential future use of these funding sources. And those steps constitute the approach outlined in Section 6 of this chapter in keeping with the federal requirement that "strategies for ensuring [the] availability [of new funding sources] shall be identified."


Goethals Bridge on the I-278 corridor.

PROJECT-SPECIFIC FINANCE STRATEGIES

Project-specific strategies are generally applicable only to specific transportation improvement projects. Table 3 above provides a listing of System Enhancements projects for which project-specific financing strategies have been identified as part of *Plan 2040's* reasonably expected revenue sources. As can be seen in Figure 9, roughly $20 billion in additional project-specific financing sources have been programmed in *Plan 2040* for Systems Enhancements projects.

Public-Private Partnerships (P3 agreements)

P3 agreements are contracts between a public agency and a private sector entity that result in greater private sector participation in the financing and delivery of public services and facilities than is normal under traditional procurement practices, taking advantage of the private sector's profit motive and market discipline.

Transportation improvements capable of generating revenues from user fees in the long run could be implemented using P3 agreements. Although P3s can take various forms, one possible arrangement is known as Design-Build-Operate-Maintain (DBOM). Under DBOM, a project's implementing agency contracts with a private entity to construct the project and then operate and maintain it for a set period of time. In this type of arrangement, the user fees act as a return on the private entity's investment in the project. Examples of P3s in the form of DBOMs in the New York City metropolitan region include a completed project – New Jersey Transit's Hudson-Bergen Light Rail in northern New Jersey -- and the planned Goethals Bridge replacement on Staten Island.

According to the Federal Highway Administration, as of this writing, 33 U.S. states and one U.S. territory have enacted legislation authorizing P3 agreements for the development of transportation infrastructure. New York is not currently one of those states, but several entities within the state have that ability, including the MTA and Port Authority of New York and New Jersey.

The New York State Senate Bill 8331 was introduced in 2010 to authorize certain state agencies, including the New York State DOT, to engage in an "alternative project delivery" methods for any project costing $25 million or more, including design-build, construction manager at-risk, integrated project delivery, and P3 agreements, provided that an agency

determined such method would provide best value to the state. The bill would also authorize the New York State DOT specifically to construct or improve state highways using alternative project delivery methods and set forth other provisions concerning procurement.

Senate Bill 8331 offered no provisions for municipal corporations, including counties, towns, cities, and villages, or for public authorities. However, the New York State Assembly Bill 11259, also introduced in 2010, would authorize the New York State DOT and the New York State Thruway Authority to use design-build contracts.

Tax Increment Financing (TIF)

TIF is an economic development tool that municipalities (counties, towns, villages, and cities) can use to stimulate private investment and development in targeted areas by capturing the increased tax revenue generated by the private development itself and using the tax revenues to pay for public improvements and infrastructure necessary to enable development.

Tax assessments can capture value from new development for the transportation improvements which make that development possible. Special tax assessment districts apply a special tax or surcharge in a development area that can then be used for this purpose. These districts can take a variety of forms. For example, a tax increment district may be defined for a one–time assessment targeted to a specific transportation improvement, while a transportation development district may be targeted to a more general approach in an area over a longer period of time. Examples of TIFs in the New York City metropolitan region include a completed project – the Route 119 corridor improvements in the Village of Tarrytown in Westchester County-- and the #7 subway extension to the far west side of Manhattan, which is under construction.

The TIF process begins with a feasibility study and qualification for TIF area designation report where there is a finding of "blight" in an area and redevelopment "cannot be accomplished by private enterprise alone" (GML Section 970-b). These reports are followed by solicitations and negotiations with developers, and bond counsel involvement or preparation of a promissory note. There is a public hearing before the municipality enacts an ordinance or resolution approving the development or redevelopment plan, designating the redevelopment area, and authorizing the TIF area and actual financing. Once the development or redevelopment agreement is signed, the municipality issues bonds or executes the promissory note. The construction begins and is completed, while each year the incremental tax revenue is allocated to retire and pay off the municipality's debt.

TIF bonds are not secured by the "faith and credit" of the city or state and do not count against the municipality's constitutional debt limit. The law requires that property taxes for the TIF district be divided so that the municipality receives an amount equal to the current property tax rate applied to the last assessed property value for the TIF district before the TIF district was formed. Once the municipality has been paid, the remaining revenue can be used to pay the service on the TIF debt. If there is any excess revenue, it must be returned to the municipality. New York State's TIF statute does not require school district property taxes to be included in bond repayment.

TIFs are being used widely in the U.S. in cities such as Chicago, Los Angeles and Washington D.C. In New York however, and specifically in the NYMTC region, they have been used only one occasion.

Establishing a TIF involves a taxing district established by legislation at the state, county and/or municipal level, depending on the location of the district and does not reach its desired financial yield until all of the desired growth in the area is realized. The level and duration of the assessment levied in a district may impact the pace and scale of the development which ultimately occurs, thus affecting the overall yield of the district. In New York State, a legislative change to require that the school district property taxes be included in the tax increment calculation would be necessary to make the implementation of TIF effective in most cases. Such a measure has been introduced in the State Legislature and prospect for passages are uncertain as of this writing. This issue will be considered by the study and Financing Task Force discussed in Section 6 below.

Debt Financing

Mechanisms exist to finance transportation improvements through debt. These include bonding, various federal credit programs and the New York Works state infrastructure bank, as well as any national infrastructure bank that may be developed through future federal legislation. In all cases, capital is effectively loaned for the transportation improvement and must be paid back over time, along with some level of interest. As with P3 agreements, transportation improvements capable of generating revenues are targets for this type of financing. Alternately, the improvement must be able to pay off debt through the ongoing funding from the mechanisms described above. Examples of debt financing in the New York City metropolitan region include the planned Tappan Zee Hudson


East Side Access will connect LIRR to a new station and Grand Central Terminal.

River Crossing Project between Rockland County and Westchester County and the MTA Long Island Rail Road East Side Access project, which is under construction.

The capacity to issue bonds for capital expenditures is defined specifically for each NYMTC member and often is limited in terms of the types of spending to which bonding may apply or the level of debt service that the agency or entity may assume in any given period. Various bonding arrangements are assumed to provide local match to the current sources of funding that comprise the baseline forecast of anticipated resources during the period of the Council's Regional Transportation Plan.

Debt financing can be developed on a project-by-project basis. Thus, each project could therefore employ a different combination of bonding and the use of Federal credit given their characteristics and the capabilities of sponsoring agencies. The availability of Federal credit in the long-term assumes that appropriate legislation will be passed on an on-going basis that will make this credit available and that there is revenue stream dedicated to repay the debt.

Debt financing will impact agency and municipality operating budgets, which are the usual mechanisms for the payment of debt service. Given the project-specific nature of each potential debt financing arrangement, it is difficult to accurately forecast an aggregate yield. In New York State, constitutional debt limits exist that impose constraints on the amount of debt that a local government can incur. Debt limits for counties, cities, towns, villages and school districts in cities are percentages of the five-year average full valuation of taxable property within a municipality. Changing these debt limits would require legislative action.

Supplemental Federal Funding

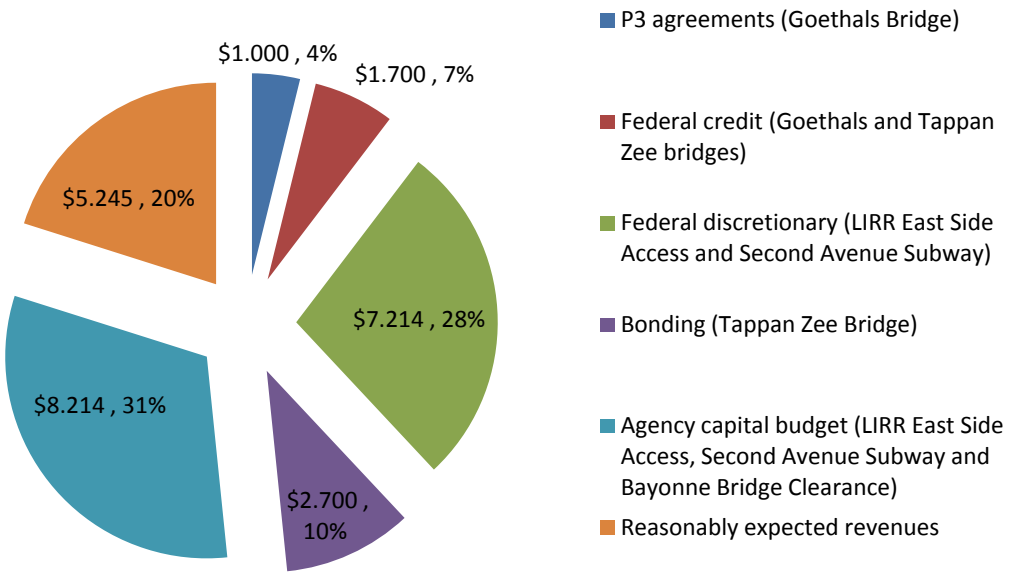
Supplemental federal funding through discretionary USDOT programs authorized in federal legislation may also be available to individual projects through the period of the Plan. Selection of projects for these discretionary funding programs is undertaken competitively on a national basis. Two current discretionary programs illustrate the potential availability of supplemental federal funding at the level of individual projects:

Section 5309: capital investment grants administered by the Federal Transit Administration are available under Section 5309 of 49 U.S.C. 53. The Secretary of Transportation may make grants under Section 5309 to assist State and local governmental authorities in financing new fixed guideway capital projects, capital projects to modernize existing fixed guideway facilities, capital projects to create bus facilities, and the development of corridors to support new fixed guideway capital projects. Capital investments proposed for funding under Section 5309 are evaluated using specified criteria. An example of Section 5309 financing in the New York City metropolitan region is Phase I of the Second Avenue Subway project on the East Side of Manhattan, which is under construction.

TIGER: the Transportation Investment Generating Economic Recovery, or TIGER, Discretionary Grant program administered by the Federal Highway Administration provides an opportunity for federal investment in road, rail, transit and port projects that promise to achieve critical national objectives. Congress dedicated $1.5 billion for TIGER I, $600 million for TIGER II, $526.944 million for FY 2011, $500 million for FY 2012, and $474 million for the FY 2013 round of TIGER Grants to fund projects that have a significant impact on the Nation, a region or a metropolitan area. The TIGER program enables USDOT to use a rigorous process to select projects with exceptional benefits, explore ways to deliver projects faster and save on construction costs, and make investments in our Nation's infrastructure that make communities more livable and sustainable. An example of TIGER financing in the New York City metropolitan region is

Figure 10 -- System Enhancement Financing

Federally-Supported Transportation System
Total Financing = $26.073 billion (YOE)



NOTE Total projected System Enhancements cost by funding category. The project-specific sources that have been programmed as part of *Plan 2040*'s reasonably expected revenue sources are detailed.

Phase I of the Moynihan Station project in midtown Manhattan, which is under construction.

Although both the Section 5309 and TIGER programs exist under current federal transportation legislation (MAP-21) and must be reauthorized under subsequent legislation through the period of the Plan, there is a significant likelihood that discretionary federal funding programs will continue to be an aspect of federal transportation legislation through the Plan's horizon year of 2040.

ANTICIPATED YIELD OF PROJECT-SPECIFIC FINANCING STRATEGIES

By definition, the financial yield of project-specific financing strategies proposed above for *Plan 2040* is directly related to the projects for which the strategies might be employed. The project-specific sources that have been programmed as part of *Plan 2040's* reasonably expected revenue sources, as displayed in Figure 9, are detailed in Figure 10.

Figure 10 indicates that roughly $5 billion has been programmed for System Enhancements from reasonably expected sources. Project-specific financing programmed in either the TIP or in Plan 2040 includes P3 agreements ($1 billion), federal credit ($1.7 billion), federal discretionary ($7.2 billion), bonding ($2.7 billion), and agency capital budgets ($8.2 billion).

REGIONWIDE FINANCING STRATEGIES

Additional regionwide financing is also needed to supplement reasonably expected revenue sources in meeting the System Preservation costs of the Plan. Regionwide strategies can generate financing to be used throughout NYMTC's planning area to meet both System Preservation and new System Enhancements costs. Specifically, these strategies have the potential of supplementing the reasonable expected revenues forecast by *Plan 2040* in order to meet the projected costs of Plan implementation.

Regionwide financing strategies comprise other forms of governmental assistance, including through federal and/or state infrastructure banks, and increased federal, state and local funding beyond the conservative levels forecast, as well as travel-based surcharges in the form of new and/or increased fees and tolls as appropriate and approved by the respective transportation authority and state and/or local legislature.

Travel-Based Surcharges

Travel-Based Surcharges can be drawn from a variety of fees charged to travelers

for the use or availability of various transportation services and/or facilities. Unlike general tax levies which are targeted to transportation systems, travel-based sources are paid either in proportion to actual use of the system or geographically in relation to specific services or facilities.

Various travel-based revenue sources, both transit-related and vehicle use-related, currently fund operating and capital expenses in NYMTC's planning area, and the New York State legislature recently enacted legislation to include vehicle use-related fees on car registrations, drivers' licenses, rental cars, and use of taxis. *Plan 2040* assumes these existing travel-based sources in the forecast of reasonably expected revenues for both O&M and for Plan implementation. Additionally, existing travel-based revenue sources are assumed to escalate to keep pace with inflation as costs rise over the period of the Plan. This assumption is based on historical trends which demonstrate that travel-based revenue sources have escalated over time in a rough approximation of inflation.

Regionwide travel-based revenue sources could include a direct surcharge for vehicle-miles of travel (VMT); surcharges on assorted types of tolls for use of roadway facilities, tax surcharges levied on the use of fuel, user "buy-in" to premium facilities such as high-occupancy vehicle lanes, weight-distance charges and parking surcharges.

These possible proposed surcharges as regionwide financing strategies are consistent with travel-based options recommended by two congressionally-mandated national transportation commissions[8] that included a direct surcharge for annual VMT, which would be levied at the time of annual inspection of a registered motor vehicle; new surcharges on fuel consumption; enhanced or expanded tolling; user "buy-in" to premium facilities such as High-Occupancy Vehicle (HOV) lanes; parking surcharges; and weight-distance charges. Legislative and policy changes would be required to implement any or all of these proposed surcharges. Additionally, application of the surcharges in the New York City metropolitan area would need to accommodate the significant cross-state travel in this larger region.

Additional Federal and State Funding

Additional federal and state funding are other additional regionwide financing strategies that could increase funding for both System Preservation projects and new System Enhancements projects. As discussed above, *Plan 2040* assumes a range of assumptions about the availability of federal funding through the period of the Plan. Both of the congressionally-mandated national transportation commissions discussed above recommended increased federal investment in the nation's transportation infrastructure above and beyond the financing trends defined by the last three federal authorization acts. Similarly, state financing could be increased in the future above the levels forecast by *Plan 2040*.

ANTICIPATED YIELD OF REGIONWIDE FINANCING STRATEGIES

Travel-based surcharges in the NYMTC planning area would likely require at least a ten year implementation phase, given the combination of individual agency budgeting and policy decisions, as well as legislative changes at municipal, county, and/or state levels, that would be necessary to implement this strategy.

The yield from this strategy would result from some combination of the various surcharge options described above. That implementation period would also require a preliminary study phase during which the surcharge options would be considered in detail and alternative scenarios assembled for implementation. *Plan 2040* therefore assumes that additional revenues from the regionwide surcharge strategy would likely accrue beginning after 2024 and continuing onward for each year through the 2040 horizon year.

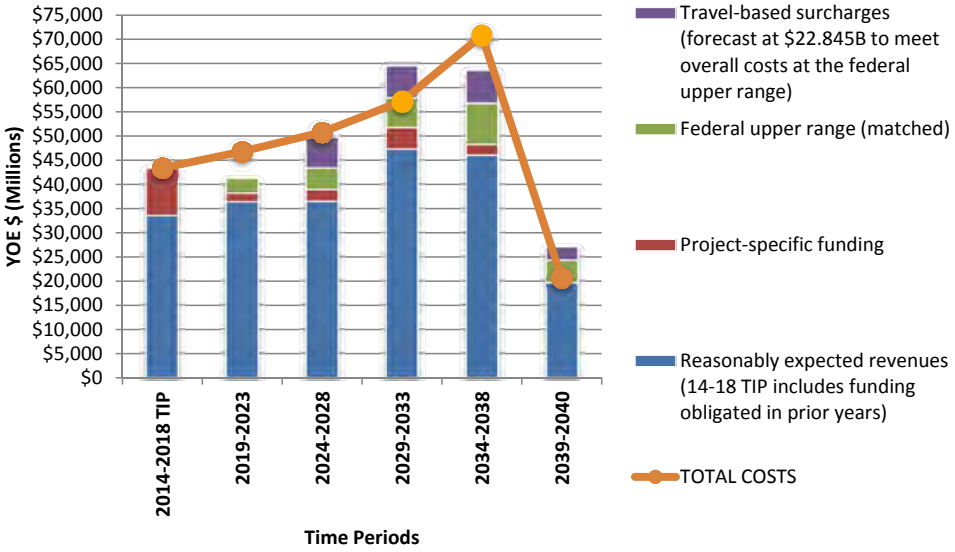
Should the upper range of the federal range be realized, an additional $28.5 billion would be available from matched federal funding. Funding for the local match would be drawn from local and state capital resources that would be budgeted to match additional federal funding. Note that, as stated earlier, this upper limit may be overly optimistic given the current fiscal environment. Given these economic and political realities, the likelihood of additional federal and state funding above and beyond the upper range of federal funding during the first ten years of the Plan is very low. However, the longer-range prospects for increased federal and state investment during the period of the Plan, although uncertain, may improve over time.

Figure 11 on the following page presents the *Plan 2040* forecasted revenues and costs by five year period in order to illustrate the anticipated role of the additional financing sources in meeting system costs over the course of the planning period. The figure illustrates the fact that failure to realize these additional sources will likely impact the region's ability to preserve the federally-supported transportation system over the period of the Plan, as well as to bring aspirational "vision" projects into the fiscally-constrained Plan in the long-term. Note that the first five year period is represented by NYMTC's TIP for FFYs 2014-2018.

Figure 12 below details the impact of a

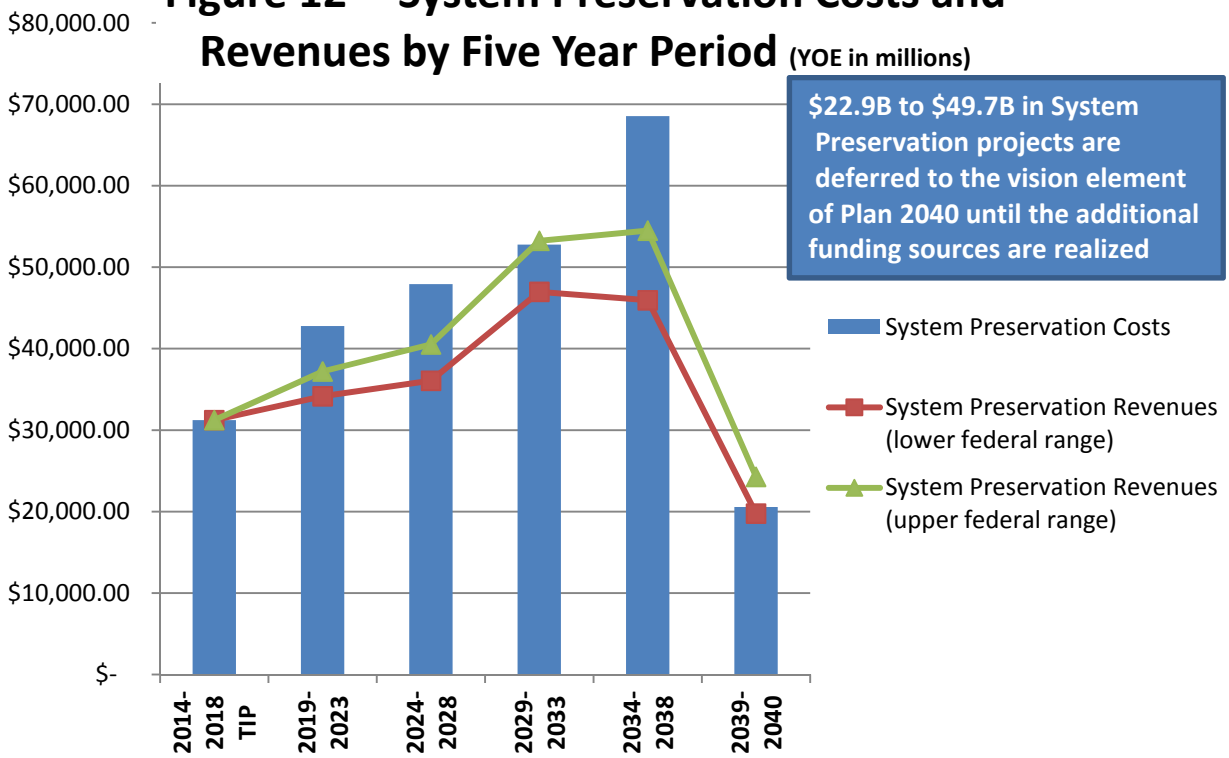
failure to realize the additional financing sources on the ability of NYMTC's members to meet System Preservation needs. Note again that the first five year period is represented by NYMTC's TIP for FFYs 2014-2018. As the figure illustrates, $22.9 billion to $49.7 billion of future System Preservation projects (depending on the federal revenue range) will be deferred to the vision element of *Plan 2040*, beginning in the second five year period of 2019-2023, until the additional funding sources are defined as described in Section 6 below. This represents a range of 9 percent to 19 percent of the System Preservation costs defined by *Plan 2040*. Additional details on these figures are available in Appendix 10.

Figure 11 -- Plan 2040 Revenues & Costs by Five Year Period



NOTE The final two years of the planning period are represented as a single bar in the figure.

Figure 12 -- System Preservation Costs and Revenues by Five Year Period (YOE in millions)



NOTE The final two years of the planning period are represented as a single bar in the figure.

6. Strategies for ensuring the availability of additional financing strategies to fund projects and strategies included in the metropolitan transportation plan

Plan 2040 presents below an outline of implementation steps that will be needed to realize the additional funding sources explored in Section 5 above. Taken together with the information in Section 5, these steps constitute a recommended approach to identifying and implementing an optimal and feasible array of additional areawide and project-specific funding sources. As this approach moves forward, and both the mix of additional funding sources and the implementation issues surrounding them are more fully defined, more specific information will be provided in the next NYMTC Plan – to be adopted before October 1, 2017 – on the exact strategies that will be needed to implement the optimal mix of additional funding sources.

Given this overall development process, *Plan 2040* also discusses the potential impacts of not realizing these additional funding sources. These potential impacts are detailed in Section 7 below.

The strategic basis for the additional funding sources is found in Plan 2040's shared vision and strategic framework. Specifically, Plan 2040's seven shared goals include the following:

> ***Build the case for obtaining resources to implement regional investments.*** *NYMTC's members and the region's other elected officials must think regionally about transportation needs, solutions, strategies, and investment priorities. In developing a shared regional vision, NYMTC's members support the position that these investments are a shared priority, and are of strategic importance to this region and to the nation.*

One of the desired outcomes stated for this strategic goal is that NYMTC will continue to work in a collaborative fashion to achieve an increase in the use of alternative methods of financing transportation investments to supplement existing Federal and State funding sources.

Additionally, the *Plan 2040* shared vision specifies planning for expanded road pricing as a near-term action related to the shared goal of enhancing the regional environment. Thus, *Plan 2040's* exploration of additional funding sources is drawn from within its strategic planning framework. Evidence of the current implementation of several of these additional funding sources can be found in the fiscally-constrained components of the planning process - the 2014-2018 TIP and the constrained element of *Plan 2040* - which demonstrate that NYMTC and its members are already using some of these sources to advance System Enhancement projects (see Figure 10).

Plan 2040's recommended approach to identifying and implementing an optimal and feasible array of additional funding sources is grounded in the regional planning process itself, as well as the various individual project planning processes for major System Enhancement projects of all types.

Specifically, *Plan 2040* offers the following implementation steps for the additional funding sources explored in Section 5 above. *Plan 2040* assumes the likelihood of a ten year implementation period for the use of travel-based surcharges to capitalize a Regional Infrastructure Fund as a regionwide funding strategy. Specific steps in that implementation period are outlined below. Project-specific financing options are also included in the implementation period, but the implementation period for the project-specific options will vary based on the schedules of the projects to which they will be applied.

FFYs 2014-2015
A study of travel-based surcharge and project-specific financing options will be developed and funded through NYMTC's Unified Planning Work Program and professional services will be retained to assist with the study.

FFYs 2015-2017
The study will be executed with appropriate public involvement to assess the feasibility and yield potential of a full range of travel-based surcharge and project-specific financing options, including but not limited to the options described in Section 5 above. The options will be considered in detail and alternative scenarios assembled for possible implementation.

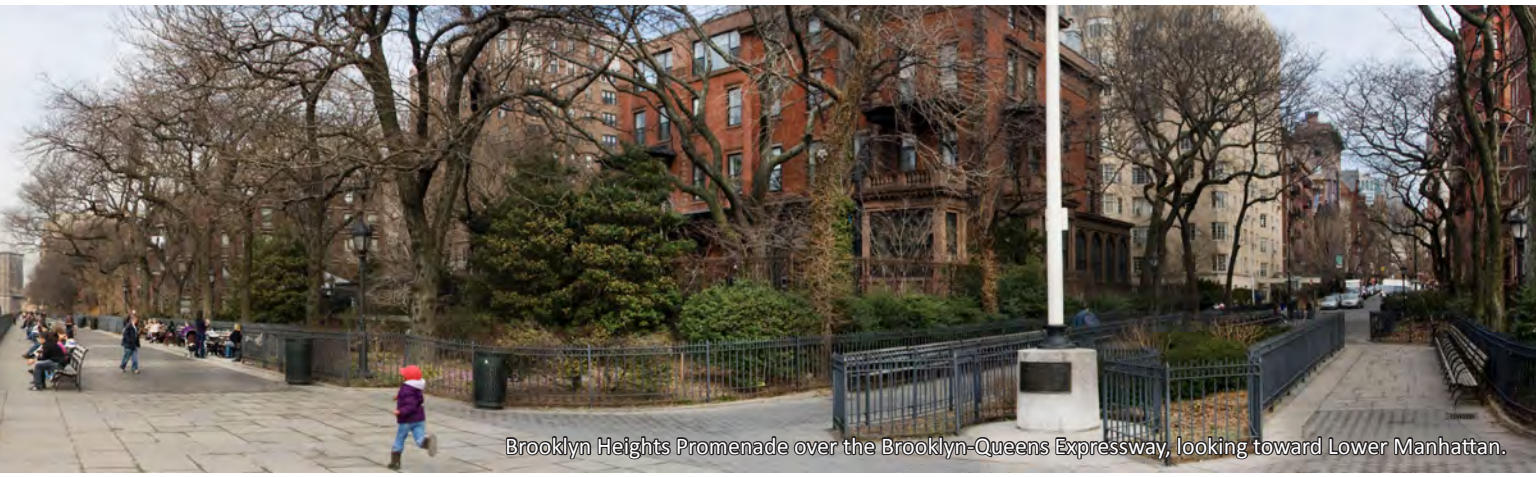
FFYs 2018-2020
NYMTC will establish a Financing Task Force comprised of its members and rel-

evant other governmental agencies and academic entities. NYMTC will have the ultimate discretion in recruiting, establishing and managing this Task Force. NYMTC may also choose to establish an Advisory Board to the Task Force consisting of civic organizations, community-based organizations, business organizations and local government associations.

Once formed, the Task Force will evaluate the results of the study of financing options, consider the feasibility of the options and the institutional, legislative and regulatory steps that would be needed for implementation, and formulate detailed action plans for the most promising options.

FFYs 2021-2023

The Task Force will focus its efforts on facilitating the institutional, legislative and regulatory steps formulated in the action plan for the most promising options. The facilitation process will be complicated by the reality noted in the introductory portion of Section 5 above that the mechanisms for implementation of these funding sources are outside of the metropolitan planning process for which NYMTC is the responsible body as a regional council and therefore outside of NYMTC's direct influence as an organization.


Brooklyn Heights Promenade over the Brooklyn-Queens Expressway, looking toward Lower Manhattan.

7. Potential impacts of not realizing additional funding sources

As Figure 12 illustrates, failure to realize the additional funding sources explored by *Plan 2040* will primarily impact NYMTC's ability to finance System Preservation projects over the life of the Plan. As stated in Figure 12, $22.9 billion to $49.7 billion of future System Preservation costs (depending on the federal revenue range) would be deferred to the vision element of *Plan 2040*, beginning in the second five year period of 2019-2023, until the additional funding sources are implemented as described in Section 6 above. This represents a range of 9 percent to 19 percent of the System Preservation costs defined by *Plan 2040*. Thus, nearly 20 percent of System Preservation costs, in the worst case, would be deferred to the Plan's vision element – the aspirational component of the Plan for which financial resources cannot yet be identified or expected - until financial resources are found or priorities adjusted.

What would the likely impacts of this deferral be? System Preservation needs are forecast by "aging" the transportation system over time and calculating when the lifecycle replacement, refurbishment, rehabilitation, reconditioning or reconstruction of transportation system components (i.e., equipment and facilities) is optimally needed. The long-range costs of System Preservation are estimated in this fashion, using YOE costs factors at the time a system component is forecast to require attention.

If anticipated resources for System Preservation are less than the forecasted need, NYMTC's capability to optimally address System Preservation needs will be reduced. As a result, a backlog of System Preservation needs will increase over time and NYMTC's ability to maintain a state-of-good-repair for the transportation system could be compromised to some degree.

For those assets whose System Preservation needs remain unmet, additional operations & maintenance investment will be necessary to ensure their ongoing safety and acceptable performance until the System Preservation needs can be met.

A secondary impact of a failure to realize optimal funding levels over the period of the plan will be an inability to move identified System Enhancement projects from the aspirational vision element into the fiscally-constrained portion of the Plan and – ultimately – to programmed funding and implementation.

It is important to note that this secondary impact will likely not affect the status of the System Enhancement projects identified in Table 3. The projects in Table 3 are fully within the fiscally-constrained element of *Plan 2040* – as indicated in Figures 9 and 10 -- and enjoy the full commitment of NYMTC's members. Rather, the impact will more likely affect NYMTC's ability to move the next generation of System Enhancement projects described in *Plan 2040*'s shared vision into the fiscally-constrained Plan as an initial step toward implementation.

Endnotes

1. FHWA-FTA Fiscal Constraint Guidance; 6-27-05.

2. § 450.322 Development and content of the metropolitan transportation plan.

3. Federal Highway Administration, "Fiscal Constraint Definitions," http://www.fhwa.dot.gov/planning/fcdef62805.htm.

4. These components are identified in *Plan 2040* Appendix 10: Financial Analysis Technical Documentation.

5. Higher inflation rates for federal resources have been used by comparable MPOs, such as CMAP in Chicago, which uses a 3.0% rate in its long-range plan.

6. See: https://www.dot.ny.gov/divisions/policy-and-strategy/public-transportation/funding-sources/STOA.

7. See: http://www.ny1.com/ny1/content/index.jsp?stid=5&aid=64913.

8. National Surface Transportation Infrastructure Financing Commission (report issued February 2009) and National Surface Transportation Policy and Revenue Study Commission (report issued December 2007).

CHAPTER 7:

ADDITIONAL PLANNING CONSIDERATIONS

PLAN 2040
Chapter 7: Additional Planning Considerations

Pelham Bay Park Greenway to City Island, the Bronx, New York City

Metro-North Rail Station, Lower Hudson Valley

1. Public Involvement

In order to assure that transportation investments are as beneficial and accessible to local and regional transportation users as possible, it is essential to involve a geographically and demographically diverse set of communities throughout the planning process. NYMTC seeks to go beyond federal requirements for public involvement. The Council is proactive, informing stakeholders about critical issues and offering opportunities for contributing ideas in the early stages of the planning process. The goal is to get people involved in the transportation planning process. NYMTC also engages in ongoing collaboration with various community groups that may be impacted by planning efforts and projects, and hosts a number of advisory working groups that act as conduits of information from the interested public on specific aspects of the transportation planning process.

Recognizing the benefits of information technology to public outreach, NYMTC upgraded its website to elicit greater public participation in the planning process. The site allows the public to view spatially-displayed data, information on future projects, and other related information. In 2012, NYMTC launched the interactive MindMixer site, described further in the following section, to facilitate public comments, idea sharing, and discussion. NYMTC also uses social media to capture a broader and more diverse audience.

THE PUBLIC INVOLVEMENT PLAN

NYMTC's Public Involvement Plan (PIP), adopted in September 2012, provides guidance on how and when public involvement should be incorporated in the transportation planning process and in the development of various products. The PIP includes recommendations for continuing and enhancing NYMTC's public involvement program to better involve residents, employers, and other stakeholders in the transportation planning process. It includes specific procedures and strategies for meeting the desired goals and outcomes of the public involvement process and the various mandatory planning products and processes. The full PIP is available on NYMTC's website, www.nymtc.org, under Programs and Projects.

In developing the PIP, NYMTC identified five desired goals for its public involvement activities:

- Educate the public about the transportation planning process and how they can get involved;
- Engage the public and all stakeholders through timely notice of meetings and events and increased opportunities to provide input;
- Enhance outreach tools and techniques to engage the many diverse regional constituencies;
- Ensure that public participation methods, mechanisms and opportunities are clearly defined and accessible;

• Effectively involve the community, including those who have been traditionally underserved and underrepresented in the planning process.

In addition to ensuring that all stakeholders have the opportunity to contribute to the transportation planning process, NYMTC also seeks to ensure that stakeholders can provide input on transportation decisions regardless of their ability to read, write, or understand English. This is made possible through NYMTC's Translation and Transcription services.

Throughout the development of *Plan 2040*, NYMTC staff met with various groups and hosted public workshops and planning sessions in each of its constituent counties. NYMTC organized ten open houses between September 12 and October 17, 2012 in each of the ten counties within the NYMTC planning area, which includes the five boroughs of New York City; the Lower Hudson Valley counties of Putnam, Rockland and Westchester; and Nassau and Suffolk counties on Long Island. Each open house consisted of two sessions at each location, which enabled numerous stakeholders to attend. The sessions in New York City were webcasted and recorded for later review by members of the public.

Visualization tools used during the outreach process included maps, charts, aerial images, photos, and diagrams. Some of these were embedded in presentations and publications used to increase audiences' understanding of the *Plan 2040* development process.

Details on the public involvement process for the development of *Plan 2040* can be found in *Appendix 7: Public Outreach and Participation.*

OUTREACH JUNE - JULY 2013

The required 30-day public comment period for the draft *Plan 2040* began on June 17 and ended on July 18, 2013. As a result of comments received, and in keeping with NYMTC's Operating Procedures, a supplementary comment period was held from August 12-21, 2013. The comments and official NYMTC responses are located in Appendix 7 on pages 7-32 to 7-43.

INTERACTIVE WEBSITE

NYMTC also launched an interactive website MindMixer (ideas.nymtc-rtp.org/), to engage diverse groups of people throughout the planning area. The website served as a platform that allowed visitors to submit original ideas and suggestions as well as interactively comment on thoughts raised by others in the MindMixer community. Through this platform, members of the public were also able to submit comments using Pinterest, Facebook, and Twitter. MindMixer kiosks were part of the open-houses described above. An analysis of the traffic on this interactive website indicated that NYMTC was able to engage a varied cross-section and a greater number of residents than during previous efforts to update the RTP.

2. Social Considerations

Plan 2040 is a product of extensive coordination and collaboration between NYMTC, its member agencies, its partners in the public and private sectors, and the general public, during which these groups worked together to reconcile long-term transportation plans with regional social and environmental concerns. The environmental justice and environmental mitigation assessments were specifically developed by NYMTC to ensure that the planning process continues to be attentive to the transportation needs of low-income minority communities and to the potential impacts of transportation projects on natural and historical resources.

NONDISCRIMINATION EFFORTS AND THE PLANNING PROCESS

It is important to incorporate environmental justice principles into all aspects of the transportation planning process. Many federal mandates ephasize this, including the nondiscrimination policies set forth in Title VI of the Civil Rights Act of 1964 and other directives. Additionally, the issuance of Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations," in February of 1994, required that all federal agencies incorporate environmental justice principles into their policies, activities, and procedures.[1] The order also required that federal agencies identify and address disproportionately high and adverse health and environmental impacts on minority and low income populations to the maximum extent practical and as permitted by law. Each federal agency was also directed to develop a strategy for implementing environmental justice principles.

In response to Executive Order 12898, in April of 1997, the U.S. Department of Transportation (USDOT) issued Order 5610.2, "Environmental Justice in Minority Populations and Low-Income Populations," which established environmental justice guidelines and procedures based on the principles set forth in EO12898 to be incorporated into USDOT planning, programs, and policies.[2] In 1998, the Federal Highway Administration (FHWA) issued Order 6640.23, which established policies and procedures for agency compliance with Executive Order 12898.[3] On August 12, 2012, the Federal Transit Administration (FTA) issued Circular FTA C4703.1 to provide recipients of FTA financial assistance with guidance on incorporating environmental justice principles into plans, projects, and activities that receive funding from the FTA.

Metrocard purchase in New York City

Environmental justice issues that should be considered in the transportation planning process include: proper identification of communities; assessment of benefits of programs; assessment of participation in the development of products and activities (public involvement); and any disproportionate impacts. Nondiscrimination is an integral part of NYMTC's transportation planning and project development processes. NYMTC and its members work assiduously to ensure that the needs of protected populations are addressed and impacts of activities are assessed from project planning to implementation. NYMTC and its members understand that the transportation needs of specific populations should be considered and that these needs will vary from group to group.

Toward this end, *Plan 2040*'s Environmental Justice Assessment was completed to inform and guide the efforts of NYMTC and its member agencies and partners to ensure the benefits and burdens of strategic regional transportation investments do not disproportionately affect minority and low-income populations. More detailed analysis and assessment of impacts are conducted by NYMTC's members at the project level.

Plan 2040's Environmental Justice and Title VI assessment evaluates trends and identifies geographic locations as Communities of Concern in the NYMTC planning area. The following section briefly outlines its findings. All demographic data were obtained from the 2010 Census and the 2006-2010 American Community Survey. A complete presentation of data and analysis, and a list of the agencies contributing to the assessment, is available in the *Plan 2040 Appendix 4: Environmental Justice and Title VI*.

COMMUNITIES OF CONCERN

In keeping with federal mandates, Communities of Concern were located and identified at the census tract level using two criteria: percent of minority population,[4] and percent of persons below the poverty level.[5] Census tracts were designated as a Community of Concern when (1) the percent minority population equaled or exceeded the regional aver-

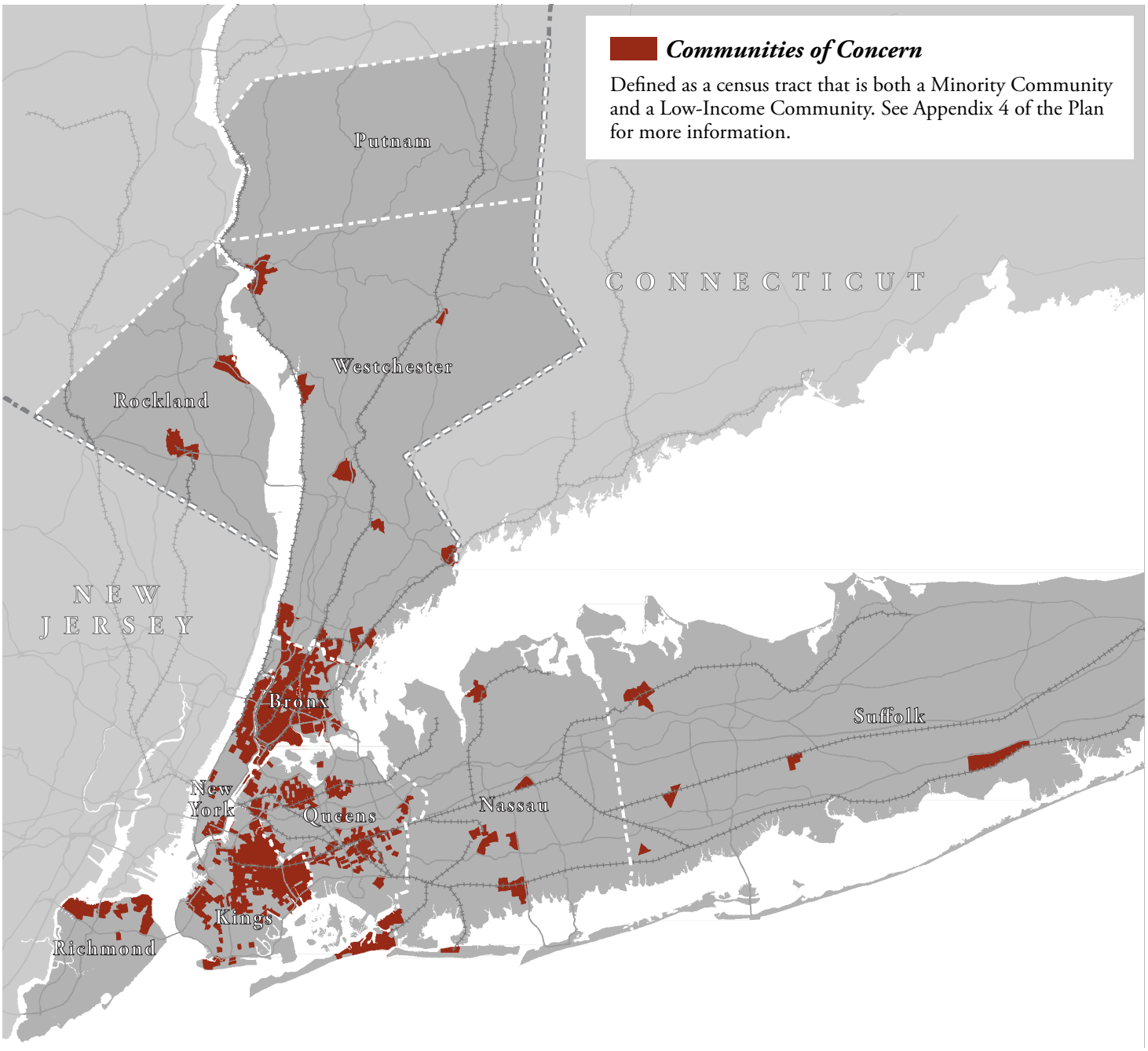


Table 7-1

Communities of Concern by Subregion					
	Minority Population	*Percent Minority*	*Population Below Poverty Level*	*Percent Below Poverty Level*	*Communities of Concern*
New York City	5,452,229	67	7,946,269	19	855
Lower Hudson Valley	529,568	39	1,310,570	9	47
Long Island	1,783,037	31	2,763,772	5	22
NYMTC Region	6,868,642	56	12,020,611	15	924

Source: 2010 U.S. Census Bureau and 2006-2010 American Community Survey

age of 56 percent, and (2) the percent of persons below the poverty level equaled or exceeded the regional average of 15 percent.

Of the 3,082 census tracts within the NYMTC planning area, 30 percent were identified as Communities of Concern. As shown in Table 7-1, New York City has the largest share of Communities of Concern, followed by the Lower Hudson Valley and Long Island, respectively.

Travel Characteristics

Public transportation is more vital to Communities of Concern in the aggregate than to the remainder population of the planning area: within the region's Communities of Concern, 60 percent of workers use public transportation to commute to work, compared with 33 percent of the remainder population. However, the use of public transportation in Communities of Concern varies by subregion. In New York City, 63 percent or 910,404 workers in Communities of Concern use public transportation to commute, whereas only 16 percent or 7,664 workers in Long Island Communities of Concern do so, and are more likely to commute by car, truck, or van. The percentage of workers that use bicycles, taxicabs, walking, or working from home in Communities of Concern is similar to the percentage of workers in the remainder population.

Travel Time to Work

Among the three subregions of the NYMTC planning area, Communities of Concern are only associated with longer commute times than the remainder population in New York City, where 75 percent of workers in Communities of Concern commute longer than the national average of 25 minutes, as compared to 68 percent of the remainder population. Because of New York City's larger population and its large number of Communities of Concern, longer commute times and Communities of Concern are associated in the planning area as a whole when data is aggregated. In the Lower Hudson Valley and Long Island, most workers, whether or not they reside in a Community of Concern, have commute times close to the national average. However, workers in Communities of Concern on Long Island and in the Lower Hudson Valley have slightly shorter commute times than the remainder population: 46 percent and 48 percent of those in Communities of Concern on Long Island and in the Lower Hudson Valley, respectively, commute longer than the national average, compared to 50 percent of Long Island's remainder population and 53 percent of the remainder population in the Lower Hudson Valley.

Linguistic Isolation

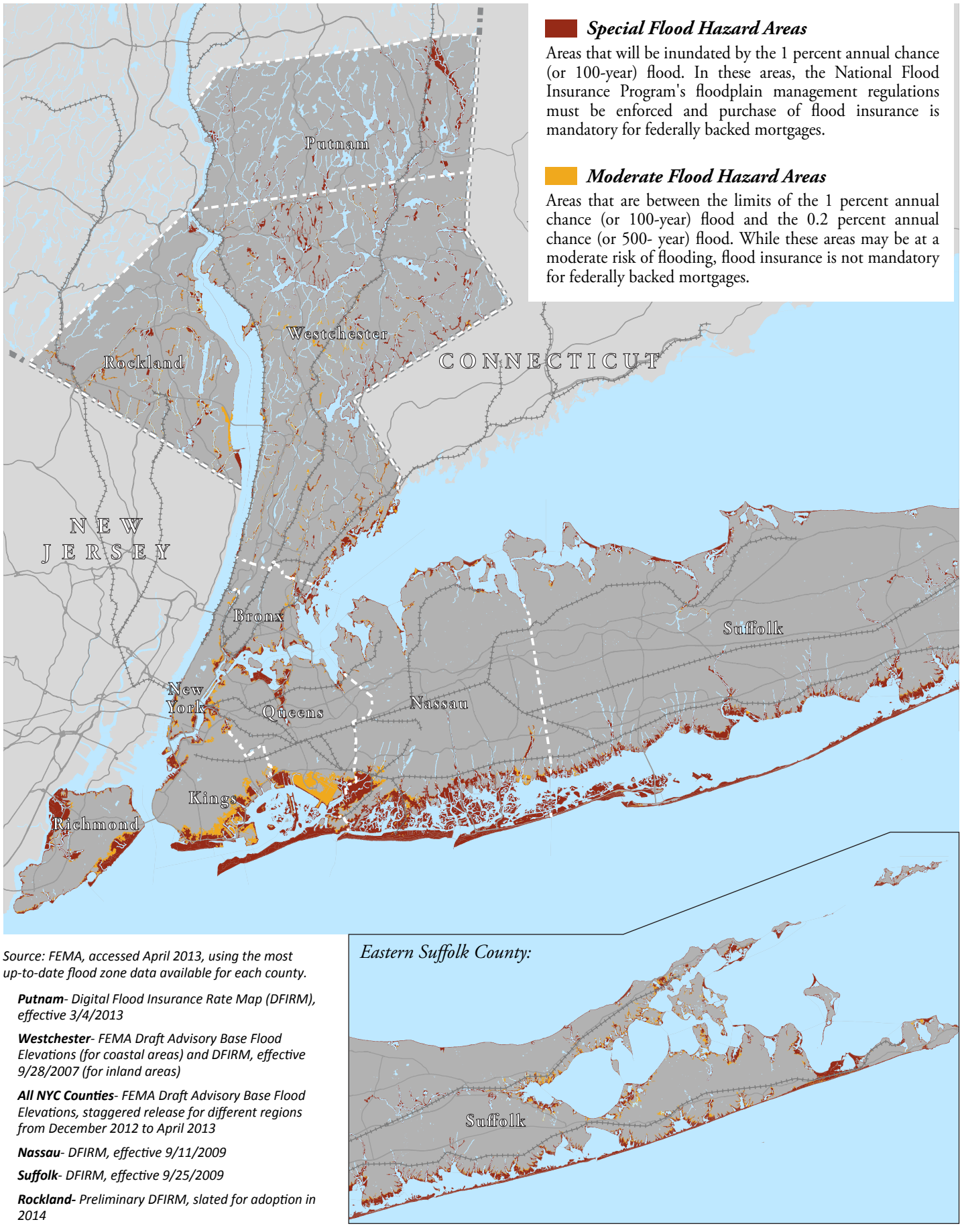
Among all of the households within the Communities of Concern, 282,683, or 21 percent, are considered linguistically isolated. The U.S. Census Bureau defines a linguistically isolated household as one in which "no person 14 years old and over speaks only English and no person 14 years old and over who speaks a language other than English speaks English 'very well.'"[6] The New York City counties have the largest percent of linguistically isolated population within the Communities of Concern, at 21 percent, followed by the Lower Hudson Valley and Long Island, at 19 percent and 16 percent, respectively. Households in Communities of Concern are between two to four times more likely to be linguistically isolated than other households. Thus, most transportation related notices and advisories issued within the NYMTC region will be in two or more languages, reflecting the cultural diversity of the region.

ENVIRONMENTAL CONSERVATION

NYMTC and its members are committed to protecting and enhancing natural resources, promoting energy conservation, improving the quality of life, and promoting compatibility of transportation improvements with state and local planned growth. Therefore, resource conservation and environmental impact mitigation are key elements of NYMTC's transportation planning process. NYMTC works with its partners and the public to reconcile long-term transportation plans with environmental concerns.

A discussion of the types of potential environmental impact mitigation activities and the potential areas in which to carry out these activities, including activities that may have the greatest potential to restore and maintain the environmental functions affected by the plan, are important components of a long-range transportation plan. The discussion shall be developed in consultation with federal, state, tribal, wildlife, land management, and regulatory agencies. Metropolitan Planning Organizations should consult as appropriate with state and local agencies responsible for land use management, natural resources, environmental protection, conservation, and historic preservation concerning the development of a long-range transportation plan and natural and historic resources.

NYMTC's members are engaged in environmental impact mitigation activities at the planning and project levels through the implementation of the National Environmental Policy Act (NEPA), the State Environmental Quality Review Act (SEQRA) regulations, and through Context Sensitive Solutions, which ensure that projects are in harmony with the community and preserve the environmental, scenic, aesthetic, historic, and natural resource values of the area in



Source: FEMA, accessed April 2013, using the most up-to-date flood zone data available for each county.

***Putnam**- Digital Flood Insurance Rate Map (DFIRM), effective 3/4/2013*

***Westchester**- FEMA Draft Advisory Base Flood Elevations (for coastal areas) and DFIRM, effective 9/28/2007 (for inland areas)*

***All NYC Counties**- FEMA Draft Advisory Base Flood Elevations, staggered release for different regions from December 2012 to April 2013*

***Nassau**- DFIRM, effective 9/11/2009*

***Suffolk**- DFIRM, effective 9/25/2009*

***Rockland**- Preliminary DFIRM, slated for adoption in 2014*

which they are located. In the NYMTC planning area, there are a number of ongoing environmental mitigation activities targeting watersheds, wildlife action areas, and eco-systems. Mitigating potential environmental, social, and cultural effects of specific projects is managed through federal and New York State environmental review processes required of each implementing agency. The Environmental Mitigation and New Consultation Appendix of *Plan 2040* presents the data, maps, and research produced by the incorporation of a comprehensive regional coordination of environmental regulation and initiatives into *Plan 2040.*

Partner Agencies

NYMTC's members have formal and informal relationships with federal, state, and local partner agencies that provide feedback on environmental and other issues related to transportation projects and studies in the planning area. Additionally, NYMTC formalized *Plan 2040*'s consultation process through various communication strategies, including one-on-one meetings, letters, teleconferences, and webinars. This outreach identified resource and conservation concerns that may impact future transportation planning efforts in the planning area. A full list of partner agencies can be found in the *Plan 2040 Appendix 5: Environmental Mitigation and New Consultation.*

Data Collaboration and Comparison Process

During the needs assessment stage of *Plan 2040*'s development, NYMTC's members consulted with many agencies and discussed ways to collaboratively collect information from each agency that could be used to identify land use management goals, natural resources, environmental protection and conservation areas, and historic preservation sites in the planning area.

The steps below describe the methodology developed to gather and analyze information from partner agencies.

1. Identify partner agencies to consult regarding natural and cultural resources.

NYMTC compiled a list of agencies in the planning area responsible for land use management, natural resources, environmental protection and conservation, and historic preservation in order to identify the federal, state and local agencies relevant to the long-range transportation plan.

2. Identify agencies' goals, objectives and geographic focus areas.

Initially, research was conducted through partner agency websites and other online resources that house documents and data related to the agencies' work, such as the New York State GIS Clearinghouse. The agencies were then contacted individually to confirm the accuracy of the data sources. Efforts were made to contact each agency at various points in the production of *Plan 2040.*

3. Review planning documents.

Partner agencies provided planning documents with agency-wide and program-specific goals and objectives. NYMTC reviewed the goals and objectives from these plans and compared the information to the goals of its member agencies. Where this review identified issues not addressed specifically by NYMTC in its shared vision, goals, and individual projects, the issue was researched in coordination with the partner agency and the appropriate NYMTC member agency. The agencies' respective goals and objectives were then taken into consideration in the development of the vision, goals, and objectives in *Plan 2040.*

4. Map identified natural and cultural resources.

Maps were created using the GIS data available from partner agencies. The maps will be used to compare the environmental and historic preservation areas and redevelopment areas to projects included in the long range transportation plan. When projects are in proximity to these resources, the NYMTC member agency responsible for the project will review available information and, if needed, undertake further analysis.

Analysis and Results

Thirteen organizations provided data regarding natural, social, and historical resources. The data was used to create maps that will enable NYMTC to identify potential "red flags" that may either affect the feasibility of a project or require steps to reduce or mitigate the impacts of the project. The maps are reviewed by NYMTC's members and the public in order to inform future developments and investments and to minimize the ways in which the implementation of *Plan 2040* would negatively impact or disrupt elements of the human and natural environment.

Maps were created at the geographic level of each of the three Transportation Coordination Committees (TCCs), which provide forums for transportation decision-making at the sub-regional level for the Lower Hudson Valley, New York City, and Long Island. Three types of maps were created for each TCC: land-based issue maps, water-based issue maps, and redevelopment area maps. The first type shows land-based areas, including parks and wildlife areas, historic sites, and government-run facilities. The second type shows water-based areas, such as protected water bodies, coastal wildlife habitats, and wetlands.

They also include elevation data in order to provide geographic context for natural water bodies. The third type of map shows regions that present opportunities for redevelopment and areas that contain former or current brownfields. These maps can be found in the *Environmental Mitigation and New Consultation Appendix* of *Plan 2040.*

As a result of the coordination and consultation with the various agencies and the analytical work completed, *Plan 2040* can serve as a reference point during the planning stages for transportation projects in identifying potential conflicts with the natural, cultural and historic resources.

COORDINATED PUBLIC TRANSIT - HUMAN SERVICES TRANSPORTATION PLAN

In 2009, NYMTC developed a Coordinated Public Transit-Human Services Transportation Plan (CPT-HSTP) guided by the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU), the federal transportation act guiding transportation funding at that time. SAFETEA-LU required that planning areas develop a coordinated plan as a condition to access programs offered by the Federal Transit Administration (FTA) funding transportation services focused on particularly low-income workers and persons with disabilities.

Surface transportation planning and programming is now guided by new federal legislation, Moving Ahead for Progress in the 21st Century (MAP-21). This legislation, which took effect on October 1, 2012, will guide surface transportation funding for 27 months until January 1st, 2015. MAP-21 includes several strategic changes from SAFETEA-LU, including the way human service transportation programs are funded and the associated requirements for coordinated planning.[7] One of MAP-21's central goals is to consolidate smaller, more specialized programs into larger ones that give funders more flexibility.

Some highlights of coordinated planning changes under MAP-21 are listed below; at the time of publishing, final guidance on MAP-21 had not yet been issued by the FTA. MAP-21 eliminates the Job Access and Reverse Commute (JARC Section 5316) program. Program funds aimed at providing services to low-income individuals to access jobs or support reverse commute are now eligible for funding under either the Urban Area Formula Grants (Section 5307) or the Rural Area Formula Grants (Section 5311).

- Projects funded as job access and reverse commute projects do not have to be selected from a coordinated planning process. However, FTA encourages Metropolitan Planning Organizations (MPOs) and Section 5307 recipients to continue the coordinated planning process and to consider the funding needs of existing job access and reverse commute projects and services.

- The New Freedom Program (Section 5317) program has been eliminated. Instead, funding for persons with disabilities is absorbed into the renamed Enhanced Mobility of Seniors and Individuals with Disabilities Program (Section 5310). Projects selected for funding under Section 5310 must be derived from a coordinated and locally developed public transit-human services transportation plan. However, the competitive selection process, which was required under SAFTEA-LU, is now optional.

As an MPO, NYMTC is responsible for overseeing the development of a plan to address the coordination of local community transportation services in order to ensure that the planning area will continue to receive specific FTA funding. This coordinated planning process seeks to ensure the provision of mobility options for older adults, persons with low income, and persons with disabilities. In keeping with the new federal requirements and in accordance with the Regional Transportation Plan (RTP) update cycle, NYMTC undertook an update of the 2009 Coordinated Public Transit – Human Services Transportation Plan (CPT-HSTP). This update focuses on identifying (1) demographic changes that have occurred since the 2009 plan was issued, (2) the changes in unmet needs of population groups that are largely dependent on these services, and (3) coordination strategies to address those unmet needs.

A summary of the update to the Coordinated Public Transit – Human Services Transportation Plan can be found in Appendix 9. The full CPT-HSTP is available on NYMTC's website, www.nymtc.org, under Programs and Projects.

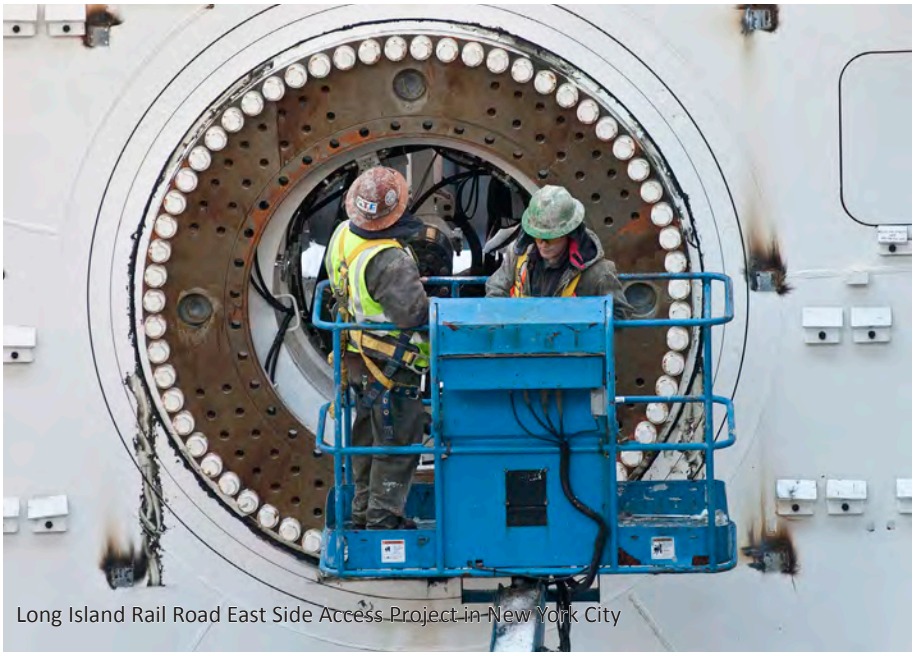

Accessible bus in New York City

3. Major Projects

In June 2008, NYMTC adopted Major Projects Procedures for projects funded by the Federal Highway Administration (FHWA) in response to the requirements of the Safe, Accountable, Flexible, and Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) and subsequent guidance issued by the Federal Highway Administration (FHWA) in June 2007. These procedures defined major projects as those with an estimated total cost of $100 million or more to be funded through FHWA financial assistance. Once identified, the major project must be specified in NYMTC's Regional Transportation Plan, under the following conditions:

- The major project must be specified in the constrained element of the Plan, except in cases where it is defined as a pure planning study; then it may be specified in the Plan's vision element. If the National Environmental Policy Act (NEPA) process has commenced for the project, it must be specified in the constrained element as a prerequisite for federal designation of a Draft Environmental Impact Statement and for federal funding to be used to begin preliminary design.

- The major project specification in the Plan must include a purpose and need statement, a description of a reasonable range of alternatives for the major project, a range of potential project costs and contingencies related to the alternatives, descriptions of potential environmental justice and Title VI implications of the project, critical environmental areas that might be affected by the project, and historic preservation implications of the project. This information must be provided regardless of whether the major project is placed in the vision element of the Plan or in the fiscally-constrained element.



Long Island Rail Road East Side Access Project in New York City

- The costs specified in the major project specification must be accounted for in the Plan's long-range fiscal assessment.

- All applicable public review requirements related to the amendment of the Plan must be followed.

Notwithstanding the above-mentioned procedures, NYMTC also recognizes that 49 CFR Part 633.5 defines Federal Transit Administration (FTA)-funded major capital projects. According to this legislation, a major capital project is one that:

- Involves the construction of a new fixed guideway or extension of an existing fixed guideway;

- Involves the rehabilitation or modernization of an existing fixed guideway with a total project cost in excess of $100 million; or

- Is determined to be a major capital project by the Administrator because the project management oversight program will benefit specifically the agency or the recipient. Typically, this means a project that:

  - Generally is expected to have a total project cost in excess of $100 million or more;

  - Is not exclusively for the routine acquisition, maintenance, or rehabilitation of vehicles or other rolling stock;

  - Involves new technology;

  - Is of a unique nature for the recipient; or

  - Involves a recipient whose past experience indicates to the agency the appropriateness of the extension of this program.

There are a number of major projects in the NYMTC region in various stages of development. These are listed in *Appendix 1: Projects, Proposals and Studies* with the required supporting information.


Central Park, New York City

4. Air Quality Conformity

The U.S. Environmental Protection Agency (USEPA), through the Clean Air Act Amendments of 1990 (CAAA), established National Ambient Air Quality Standards (NAAQS) for various pollutants. Areas where air quality monitoring shows a violation of the NAAQS are designated as non-attainment areas and are subject to a provision in CAA §176(c) known as transportation conformity. The New York State Department of Environmental Conservation (NYSDEC) produces a State Implementation Plan (SIP) that details how the NAAQS will be achieved.

The intent of transportation conformity is to fully coordinate transportation and air quality planning to ensure that the Regional Transportation Plan (RTP), Transportation Improvement Program (TIP), and transportation projects will not:

1. Cause or contribute to any new violation of the NAAQS,

2. Increase the frequency or severity of any existing NAAQS violations, or

3. Delay timely attainment of the NAAQS or any required interim emissions reductions or other milestones in any area.

For transportation conformity, the overall set of investments contained in an MPO's RTP and TIP must move the planning area toward cleaner air. Therefore, NYMTC must consider the air quality impacts of its transportation investments. Transportation conformity determination, or conformity determination, addresses all non-attainment areas that fall in whole or in part within the NYMTC planning area. These include the following:

• The New York Metropolitan Eight-Hour Ozone Moderate Non-Attainment Area, which includes all NYMTC counties except for Putnam County.

• The Carbon Monoxide (CO) Maintenance Area, which consists of New York City (New York, Kings, Queens, Bronx and Richmond counties) and Nassau and Westchester counties.

• The Coarse Particulate Matter (PM10) Non-Attainment Area, which is limited to the county of New York.

• The New York-New Jersey-Connecticut Annual and 24-Hour Fine Particulate Matter Non-Attainment Area, which includes all NYMTC planning area counties, except Putnam, and includes all or portions of eight other MPO boundaries in the tri-state area.

To determine the impact of future non-exempt and regionally significant transportation projects, NYMTC uses the third generation of travel demand models, which are commonly referred to as activity-based models. NYMTC refers to this suite of models, which both forecast and simulate detailed travel patterns residing inside the study area over a 24-hour period, as the New York Best Practice Model (NYBPM). NYBPM uses journeys (travel between two primary locations, including stops) as a unit of travel rather than using only home-to-work trips. The model looks at the daily activity agenda of each household member, intra-household interactions, and other spatial and temporal constraints that affect travel choices. To do this, NYBPM encodes the characteristics of the transportation system and planned improvements using spatially-accurate digital mapping. NYBPM then uses sixteen categories of forecasted socio-economic and demographic data to simulate travel demand.

Air quality impacts will continue to be considered in the regional transportation planning process and in the achieving the goals and outcomes of *Plan 2040*. Many of the projects, policies, and programs that are included in *Plan 2040* and the TIP result in air quality benefits through improved efficiency of the regional transportation system. The results of the conformity determination process demonstrate that *Plan 2040* meets all of the specific transportation air quality requirements. Figures 7-1 and 7-2 show the results for nitrous oxides (NOx) and volatile organic compounds (VOCs).

Further details of the Air Quality Transportation Conformity Determination can be found on the NYMTC website, www.nymtc.org, under Programs and Projects.

Figure 7-1: Nine-County NOx Emissions - tons per day

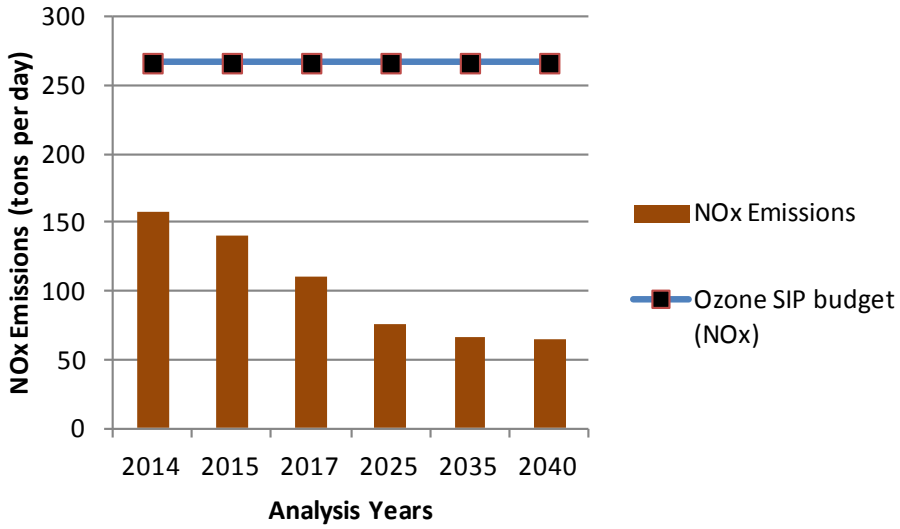
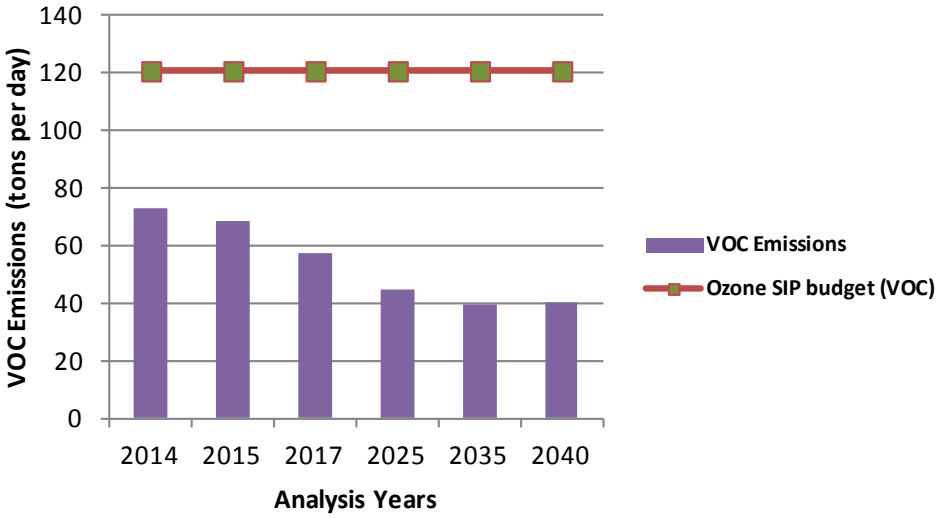


Figure 7-2: Nine-County VOC Mobile Source Emissions - tons per day



5. Updating the Plan

As a living document, *Plan 2040* needs to be adjusted as implementation occurs. Among the actions that are likely to be taken during the planning period are: addition of projects; policies and investment options; removal of existing actions and investments, if appropriate; changes in the status of actions and investments within the plan; changes in the financial analysis underlying the plan; and changes due to new or updated federal legislation or regulation.

In amending *Plan 2040*, fiscal constraint and air quality transportation conformity impact are fully considered. All amendments to the plan are undertaken by resolution through NYMTC's Program, Finance, and Administration Committee.

Endnotes

1 Full text of Federal Executive Order 12898 can be found in *Plan 2040*'s Environmental Justice Assessment, Appendix B.

2 Full text of USDOT Order 5610.2 can be found in *Plan 2040*'s Environmental Justice Assessment, Appendix C.

3 Full text of FHWA Order 6640.23 can be found in *Plan 2040*'s Environmental Justice Assessment, Appendix D. See also http://www.fhwa.dot.gov/legsregs/directives/orders/6640_23.htm.

4 Minority and minority population are defined in *Plan 2040*'s Environmental Justice Assessment, Appendix E.

5 Low-income person and low-income population are defined in *Plan 2040*'s Environmental Justice Assessment, Appendix E, along with information on the determination of poverty status.

6 U.S. Census Bureau, Census 2000, Definition of Subject Characteristics, http://www.census.gov/population/cen2000/phc-2-a-B.pdf

7 Sources include: MAP-21 Transit Programs Summary and MAP-21 Program Overview on the FTA website, http://www.fta.got.gov/map21