RECOMMENDATIONS

- Currently, on a net basis, those who benefit from the system contribute less than the amount needed to keep these benefits flowing and meet the needs of the future. Additional contributions will be required to reach the service goals envisioned in this report.

Maximize Existing Revenue Streams

- Implement a joint effort to make the case for increased federal funding for transit and for the MTA. This should involve all those with a stake in the success of the MTA, including New York State, New York City, other local governments, business, and labor and rider representatives.
- Review current dedicated taxes for loopholes that could be closed to create a more robust and equitable revenue stream, including possible consolidation or restructuring of dedicated revenue sources. For example, the all-cash transactions for costly residences that have become increasingly commonplace in New York City are not subject to the mortgage recording tax. (Ongoing)
- Consider revising MTA’s capital financing paradigm. The current approach, which is mandated by statute and depends on political agreement for new funding for each successive 5-year capital plan, is inconsistent with the long-term nature of the capital needs of the system.
  - As MTA’s expansion projects become increasingly large, they are financed over the course of multiple 5-year capital programs. Funding policies should assure that such projects can be predictably financed over many years; this is one reason dedicated revenues that flow through directly to the MTA should be preferred over annual appropriations. (Ongoing)
- In the past MTA has received funding from transportation bonds issued by New York State after voter approval. This option should be considered for funding future capital plans.
- The payroll tax collected within the region to support transit is a vital source of support for the MTA, and the Commission believes that it should remain in place given transit’s contribution to the region’s businesses.

- Taxes enacted for the purpose of supporting transit should not be diverted to other uses. This further adds to the volatility of MTA’s revenue base.

Fares and tolls already provide a significant share of MTA’s funding, and they must continue to be a component of a balanced funding formula. (Ongoing)

- The funding formula for the MTA should recognize the trade-off between the increased self-sufficiency that comes with higher fares and tolls vs. dedicated taxes or appropriations that depend on legislative action. It should also take into account increasing support from the other constituencies that benefit from the region’s extensive transit system. An equitable approach to contributions from all these sources is needed. (Ongoing)

- Perform a comprehensive study that re-examines the MTA’s approach to fares and tolls. Fare policies vary around the world. For example, some world cities maintain a flat fare for their systems (Beijing, Mexico City, Moscow, New York, Paris and Rome) and some base fares on how far their customers travel or time of day (London and several cities in Asia.) New technology presents an opportunity for MTA to evaluate approaches used in other world cities while improving mobility in the region.
  - This study should consider practices in competitor regions and judge any potential change against policy criteria that include the impact on: ridership; mobility; cost to the user in relation to benefits received; equity especially on those least able to pay; socioeconomic impact on the region; revenue raised; ability to support a high performing system; the environment; and the region’s competitiveness.
  - This study should examine the advantages and disadvantages of setting a target for the portion of MTA costs paid by users, and should refer back to the actual history of rate setting by the MTA and other agencies in the region.
### New Revenue Sources For Consideration

- Value Capture has become an increasingly important funding source for transit investments throughout the world. Drawing on these examples, MTA should form a task force with private sector participation to consider new forms of value capture, including social activity bonds, tax increment financing, rezoning, as well as other areas where the MTA has the legal authority to take action. Several large capital projects have been financed in recent years using value capture, including the Hudson Yards and Atlantic Yards projects. That said, MTA and the region have barely scratched the surface in achieving the revenue and possible investment associated with transit-oriented development and value capture. (Ongoing)

- The MTA, New York City and suburban communities should work together to identify both short and long-term opportunities to capture some of the value the MTA system provides to real estate, including through transit oriented development near MTA services and stations. Similar efforts should be undertaken with suburban jurisdictions. (Ongoing)
  - This initiative should identify pilot projects to be completed and longer term projects that provide obvious opportunities for private development and funding. (Ongoing)
  - Explore creating a “development fund” for extending transit (by whatever mode) in the outer boroughs and maximize MTA value-capture via re-zonings or other mechanisms. (Ongoing)
  - Local rezoning, housing, and economic development plans should include a mechanism for funding and delivering the necessary infrastructure capacity and accessibility improvements. Where new construction will place strain on affected subway stations and lines, whenever possible funds from development and transit improvements should be in place before the new development opens. (Ongoing)

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### Value Capture in London

Crossrail 1, a new rail line running east-west through central London opening in 2018, will provide high-frequency high-capacity service to 40 stations, increasing London’s capacity by 8 to 10 percent and providing an estimated 200 million annual passengers with direct connections to London’s main employment centers. The line, which includes 8 new stations and 28 other station upgrades, will link Heathrow with Paddington, the West End, the City of London, and Canary Wharf and will provide 1.5 million people with the ability to reach London’s key business districts within 45 minutes.

As a result, many areas above and adjacent to future stations will be transformed into new economic and residential centers, adding an estimated £5.5 billion (8.6 billion USD) in value to property along its route between 2012 and 2021. Over the next decade, the value of commercial properties located near stations will likely increase by 10 percent. The business community responded to these benefits, by strongly promoting the project and agreeing to fund 36 percent of the £14.5 billion (22.8 billion USD) project with two innovative value capture mechanisms:

- The 2009 Business Rate Supplements Act allows authorities to levy supplements on the business rate to support projects aimed at economic development in the area. The Greater London Authority (GLA) will contribute £4.1 billion (6.45 billion USD) to the Crossrail 1 project, with income generated from a business rates supplement (BRS) on properties above £55,000 (86,500 USD) in the 32 London boroughs and the City of London. With this threshold, less than 1 in 5 of London’s businesses are liable to pay the Crossrail BRS, which protects small business owners in the area and restricts the levy to the businesses that will benefit the most from Crossrail 1.
- The Community Infrastructure Levy (CIL) allows authorities in England and Wales to raise funds from developers undertaking new residential and commercial developments in the area. In London, CILs are collected by the London boroughs and apply to most new development after April 2012. CILs will generate £1.1 billion (1.7 billion USD) in revenue for Crossrail 1.

Crossrail 1’s funding package did not implement a mechanism to capture increases in residential values near stations, even though those are projected over the next decade to increase by 25 percent in London and 20 percent in the suburbs.

Crossrail 2, a new rail line running southwest-northeast through Central London, is currently in the planning stages and will likely require the financial support of the businesses and residents of London.
WMATA has dedicated 18 in-house positions with various skill sets to advance value capture and real estate opportunities for the agency. WMATA’s NoMa-Gallaudet U station, Metrorail’s new Silver Line and another proposed infill station, Potomac Yard station include significant value capture components.

The NoMa – Gallaudet U station opened in 2004 as Metrorail’s first infill station. Prior to construction, property in the vicinity of the station consisted of industrial development and vacant land. The private sector proposed redevelopment of the area and established a task force of major developers, area property owners, corporate business leaders, and community leaders to leverage private investment for the proposed station. Property owners permanently donated $10 million in land, funding 10 percent of the $104 million project. To further reduce property acquisition costs, other adjacent properties were temporarily donated for construction storage and staging purposes. Property owners within 2,500 feet of the future station agreed to fund $25 million (24 percent) by increasing property taxes through the creation of a special assessment district. The project’s funding package also included $25 million (24 percent) in federal earmarks and $44 million (42 percent) from the District of Columbia. The station was the catalyst for a substantial transformation of NoMa (a designation for the area north of Massachusetts Avenue), generating over $3 billion in private investments from eight million square feet of office, retail, residential, and hotel construction, which was well in excess of the initial $1 billion estimate.

The Metrorail Silver Line is a new 23-mile, two-phase extension connecting the Tysons, Reston, Herndon, and Dulles Airport areas of Fairfax County, Virginia to WMATA’s Metrorail system. Fairfax and Loudon counties created two special assessment districts, increasing property taxes on commercial and industrial properties along the right-of-way and dedicating a total of $901 million (15 percent of total project costs) to the line. The remaining project costs for Phase 1 were funded by $1,354 million in Dulles Toll Road (DTR) revenues, a $900 million New Starts grant, and $251.7 million in Commonwealth of Virginia funds. Phase I of the Silver Line opened to revenue service mid-2014, already boasting over 20 million square feet of new office space around its 5 stations, increasing total office space by 40 percent in the Tysons area. WMATA estimates that this statistic as well as the creation of over 2 million square feet of retail space (more than twice the size of Tysons Galleria mall), 17,800 new residential units (over double the current population of the Tysons area), and 9,300 hotel rooms is valued at over $18 billion.

Similar to the NoMA Gallaudet U station, the proposed Potomac Yard station’s preliminary funding package includes significant private sector contributions and the creation of two special assessment districts. The City of Alexandria plans to issues up to $275 million in general obligation bonds to finance the costs associated with the station, backed by a soft dedication of the following revenues:

- In return for land rezoning, the City of Alexandria, Virginia secured developer contributions of $10 per square foot for all development within a quarter mile of the proposed station. The approved rezoning plan would allow the conversion of the existing 600,000 square-foot “big-box” development into a 7.5 million square-foot mixed-use development. The City of Alexandria estimates a total of $50 million in developer contributions. If contributions meet or exceed this estimate, it will be one of the largest equity investments for transit station infrastructure in the United States to date.
- The City of Alexandria created a high-density special assessment district on commercial properties, with plans to create a second, low-density special assessment district on all properties once the station opens in 2018.
- The City of Alexandria dedicated net new tax revenues in the area to the station and will likely require additional unknown revenues, which will be determined once the final station location is chosen.
RECOMMENDATIONS

- The MTA and local governments, as well as Connecticut and New Jersey, should work cooperatively to encourage growth around transit and cooperatively fund transit improvements from the increased value and economic activity. (Ongoing)
- The MTA and its local partners should establish a goal for private investment into station infrastructure and aggressively pursue this goal.
- MTA should concurrently pursue transit oriented development throughout its service territory by empowering those within its operating agencies who best understand the intricacies of each area to identify and drive such efforts within an MTA-wide development initiative. This approach maximizes opportunities while ensuring consistent application of best practices.
- The reforms to the MTA's procurement, contracting and project oversight processes detailed in earlier recommendations will be needed to encourage risk sharing with the private sector and encourage private investment. The MTA must improve its approval processes on private development projects and private construction of improvements to MTA facilities, including mechanisms such as additional fees for expedited reviews. (Ongoing)
- A significant portion of the region’s greenhouse gases come from vehicular transportation sources and increased use of transit is a necessary component of any regional emissions reduction strategy. A greenhouse gas cap and trade program is an important revenue source to transit in California and an additional potential revenue source that should be evaluated for New York. (Ongoing)

- New sources of revenue generation must be explored from roadway users in the Tri-State Region (including both New Jersey and Connecticut), who must contribute a fair share of revenues to support the regional transportation system. (Ongoing)
- A variety of alternatives for increasing contributions from roadway users have been used nationally and internationally including parking fees (Sydney) and congestion pricing (Stockholm and London). The MTA region should look at these alternatives and identify their benefits, costs and impacts. (Ongoing)

Parking Fees: Sydney, Australia

In 1992, the New South Wales Government introduced annual off-street commercial and office parking space fees to generate additional revenue for public transportation and to encourage increased use of public transportation. The annual fees were originally imposed on two of Sydney’s major biassing commercial centers, Sydney’s Central Business District (CBD) and the North Sydney/Milsons Point district. In 2000, the annual parking fees were expanded to include university and industrial districts, including the Bondi Junction, Chatswood, Parramatta, and St Leonards districts. Since 2003, the fees have been annually increased with inflation, and were doubled in 2009 with the passage of revised legislation. As of 2014, the parking fee for parking spaces located within the original two districts is 1,967 AUD (1,694 USD) per space per year and the parking fee within the four expanded districts is 636 AUD (556 USD) per space per year. Sydney’s strategic implementation of parking fees created a long-term, stable, and predictable source of revenue for public transportation, which over the years has been consistently used to support public transportation within the districts, including advancements for bus and light rail and upgrades to passenger information systems. As of June 2013, total parking fee contributions toward Sydney’s completed public transportation projects amounted to approximately 574 million AUD (500 million USD). In 2013, 30 percent (25.6 million USD) of annual parking fee revenues were directly used to fund public transportation infrastructure in the districts. The remaining 70 percent was reserved for future public transportation investments, increasing the total amount of public transportation funds from parking space fees reserved for future use to 149.4 million (130.7 million USD).

Cap and Trade

The state of California established a greenhouse gas (GHG) cap and trade program with the enactment of the Global Warming Solutions Act of 2006 (AB 32) (cap and trade programs are market-based strategies designed to control emissions or pollutants by providing economic incentives for achieving reductions in those emissions through limits or “caps” on the total amount of emissions and allowances for the right to emit a specific amount of emissions). Transportation has been at the center of California’s plans for emissions reductions and receives a higher share of revenues. The initial auction took place in 2012 and, in 2014, the Legislature and Governor allocated 60% of the long-term revenues with at least 40% of the funds going to transportation representing about $500 million in California’s 2014/15 fiscal year budget. One quarter of the funds are dedicated to high-speed rail and the remainder can be used for a range of needs including transit operations and capital programs.
### Congestion Pricing in Europe

#### Stockholm

After a six-month congestion pricing trial period in 2006, a public referendum on the program enabled the permanent implementation of a congestion pricing scheme in 2007. Using Automatic Number Plate Recognition System technology at 18 control points, non-exempt vehicles are charged a time-variable price when entering and exiting Stockholm’s 13.8 square-mile city center. Charges vary between 10, 15, or 20 kroners (1.50, 2.50, or 3.25 USD) depending on a fixed daily schedule. Fees are assessed Monday through Friday from 6:30AM to 6:30PM for each entrance and exit to the city center made by a non-exempt vehicle, up to a maximum daily charge per vehicle of 60 kroner (8.00 USD). Fees are not assessed on public holidays and during the month of July. Emergency vehicles, buses, motorcycles, foreign-registered vehicles, and disabled persons are exempt from the congestion fee.

Though congestion pricing is known primarily as a congestion mitigation tool, the congestion pricing scheme generated 650 million kroner (101 million USD) in net revenues in 2010, creating a stable funding source for transportation in Stockholm. Charges were not automatically set up to increase with inflation and have not manually been increased; even so, congestion pricing has consistently decreased non-exempt traffic in Stockholm’s city center by 29 percent. In addition, the policy has increased public transportation ridership by 8 percent, reduced greenhouse gas emissions by 14 percent, and increased retail sales within the city center by 10 percent. The city underwent an extensive transition period that resulted in changes in travel patterns and a greater public acceptance of road pricing. Overall public acceptability of the congestion charge increased from 36 percent during implementation in 2006 to 70 percent in 2011.

#### London

In 2003, a congestion pricing scheme was implemented in the 8.5 square-mile area of central London for the purpose of mitigating congestion and generating additional revenue for transportation. Using Automatic Number Plate Recognition System technology, non-exempt vehicles are charged a flat daily fee (£10.50/16.57 USD auto pay, £11.50/18.15 USD advance pay) when entering or exiting the “charging zone.” Fees are assessed Monday through Friday from 7:00AM to 6:00PM for each non-exempt vehicle that travels within the “charging zone.” Zone residents receive a 90 percent discount. Taxis, private hire vehicles, motorcycles, bicycles, buses, alternative fuel vehicles, and eligible disabled persons are exempt from the congestion fee.

As a result of the scheme, traffic in the congestion zone has decreased by 27 percent, removing 80,000 vehicles per day, and increasing average travel speeds within the “congestion zone” by 5 to 8 mph. The scheme resulted in an estimated 14 percent increase in bus ridership and a 66 percent increase in bicycle usage. Other benefits include reduced emissions, improved road safety, and increased retail activity in the “charging zone.” By law, annual net revenues must be reinvested into London’s transportation infrastructure. In 2012/13, the scheme generated £139 million (219.4 million USD) in net revenues, which supported improvements to transportation in London, including bus network improvements, road safety measures, and better walking and cycling facilities.
Conclusion

To remain a world class city, New York must have a resilient transit system that will sustain its growth needs. The ideas presented in this report represent a collaborative effort by experts from around the world. The Commission’s proposed reforms and strategies in this report are the first step in providing greater transparency, accountability, efficiency, and public confidence in the MTA and for providing for the region’s future needs. The strategies presented in the report are structured in a way to help guide the MTA and its stakeholders in identifying and making organizational and investment choices that will have both an immediate and an ongoing impact. These recommendations are informed by national and international examples of success, particularly ways that all regional actors can participate to create a better MTA. By adopting an ambitious vision for the future of transit and working collaboratively with City, State, and regional leaders to achieve it, the MTA can continue to fulfill its central role in sustaining the region’s economic competitiveness and enhancing the quality of life of all its citizens.
Acknowledgements

The following invited speakers, drawn from regional agencies, civic and transportation advocacy groups, and the business community, are acknowledged for their time and expertise they provided during this forum.
Appendices

The following appendices include supplemental information used to frame the report. The appendices include:

- Appendix A: Challenges
- Appendix B: Summary of Social Media and Public Engagement
- Appendix C: List of Reference Documents
- Appendix D: Abbreviations
- Appendix E: Glossary
Appendix A: Challenges

A wide variety of challenges will impact—and potentially inhibit—the MTA’s ability to fully deliver service to its customers during the balance of 21st century. They are wide-ranging—affecting the rider experience, system operation, regional cohesion and long-term development. The Commission identified four major challenges as the most critical for the MTA to address in order to meet the needs of the next 100 years, including:

- Climate Change
- Population Growth, Record Ridership, and Demographic Shifts
- Institutional Barriers
- Retrofitting the MTA System to Incorporate Technological Innovation
Climate Change

In October 2012, Superstorm Sandy hit the New York region, causing billions of dollars in damages, devastating the MTA system, and wreaking havoc on the daily lives of residents in ways that had been previously unimaginable.

Superstorm Sandy highlighted that the MTA system is not only vital to the regional economy, but to the national economy as the New York metropolitan area constitutes nearly 10 percent of the nation’s GDP.

The change in existing weather patterns is leading to higher and more volatile temperatures, rising sea levels, and increasing severe precipitation. The changes in these day-to-day conditions, along with heightened frequency of extreme weather events, puts the New York regional economy, its assets, residents, and visitors at risk.

The MTA needs to understand what future weather patterns might look like and to put a plan in place to prevent or mitigate the potential negative impacts that climate change will bring.

Observed Changes in Northeast Climate
There is ample evidence that climate conditions have changed over the past century.

- Temperatures in the Northeast have risen by 2 degrees Fahrenheit between 1895 and 2011, resulting in increasing spans of extreme high temperature days.
- Precipitation has increased by more than 10 percent (approximately 5 inches total) in the region over the same period.
- In the past 50 years, between 1958 and 2010, the Northeast experienced more than a 70 percent increase in precipitation falling during “heavy events.”
- In the past 100 years, sea level has increased by 1.2 feet, a higher rate than the global average of 8 inches.

Sea level rise is critical to the New York region due to the increased likelihood of flooding. Sixty-three percent of people at risk in the Northeast region—defined as those living within the Federal Emergency Management Agency’s (FEMA) 100-year coastal flood zone—live in New York and New Jersey. Sea level rise, coupled with increasing amounts of precipitation, can lead to record-breaking high tides and storm surge, causing substantial flooding such as that experienced by the New York region during Superstorm Sandy.

Projected Changes in Northeast Climate
Beyond these observed changes, peer-reviewed research by leading climate scientists projects higher temperatures, larger increases in the amount of precipitation and sea level rise, as well as increases in the number of extreme weather events in the future. The number of days per year in the Northeast where the temperature reaches 90 degrees Fahrenheit or above is expected to increase, and that increase will be more pronounced with the combined effect of higher levels of greenhouse gases. Temperatures are also expected to increase on average from 4 to 10 degrees Fahrenheit by 2100, resulting in warmer

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9 “Heavy events” are defined as the heaviest 1 percent of all daily precipitation events.
temperatures in the winter and more rain events instead of snow, with greater flooding risks.

Sea level rise is expected to increase 1 to 4 feet by 2100 in the Northeast, with some experts projecting a rise of as much as 6 feet in New York City and Long Island in some scenarios. A rising sea level of only 2 feet could triple the frequency of coastal flooding through areas in the Northeast, damaging infrastructure in low-lying areas, which would affect much of the New York metropolitan area. It also would increase the frequency of current “100-year flood” levels (severe flood levels with a 1-in-100 likelihood of occurring in any given year); by the end of the century, New York City may experience a 100-year flood every 10 to 22 years, on average. Increased precipitation, especially in extreme weather events, heightens the risk of flash flooding and erosion.

Climate Change Effects on the MTA System
During Hurricane Irene in August 2011, flood risk led to the mandatory evacuation of 2.3 million residents in New York, New Jersey, and Delaware and wreaked catastrophic damage to Metro-North Railroad’s (MNR) Port Jervis Line, which was out of service for several months. During Superstorm Sandy, storm tides of up to 14 feet flooded nine of fourteen subway tunnels, Amtrak’s East River tunnels and three vehicle tunnels and caused significant damage to electrical grids, including the loss of power to Lower Manhattan. The 8.5 million passengers who ride the system each day had to find alternative modes of transport for an entire week, as crews worked overtime to pump water out of the tunnels, restore and inspect electric and other operating equipment, and restore power. Even when restored, there has been a long process of renewal to put facilities and equipment in a stable state for the long run.

13 NYS 2100 Commission. “Challenges Facing the Empire State.”
14 http://www.epa.gov/climatechange/impacts-adaptation/northeast.html#ref2
Service disruptions and safety risks caused by climate change are compounded in urban areas, where essential infrastructure systems, like the electrical and transport networks, rely heavily on each other. The energy grid is also stretched during extreme weather events, for example as electricity is needed to pump water out of tunnels and stations to protect valuable infrastructure.\(^\text{17}\) The negative effects of climate change exacerbate an already delicate balance by compounding stress on a series of networks operating at maximum capacity. Scenarios such as heat waves and heavy flooding have the potential to affect millions of people and shut down interdependent networks, delaying access to emergency personnel, crippling economic markets, and cutting residents off from necessities such as water and fuel. During these scenarios when infrastructure is needed the most, it is at the highest risk of failure.

In the aftermath of Hurricane Irene and Superstorm Sandy, regional entities, including the MTA, began addressing the risks of climate change and incorporating mitigation strategies into broader regional planning. Reports from the New York State 2100 Commission and the NYC Special Initiative on Rebuilding and Resilience provided recommendations on how the region could prepare for the effects of extreme weather, and build and improve infrastructure to protect the region.\(^\text{18}\)

MTA amended its 2010-2014 Capital Program to include $5.8 billion in climate change mitigation investments, based on funding support advanced by Federal and State partners. MTA’s most recent 20-Year Needs Assessment identifies even more necessary investments. An integral element of these investments, as well as those in all future capital programs, will be the adoption of new standards that promote system resiliency, protect the MTA’s most valuable assets, mitigate service disruptions and ensure that its employees and riders are safe both day-to-day and during major events. Investment decisions made through the Capital Program will need to be shaped and prioritized through this lens.

Source: U.S. Global Change Research Program, Climate Change Impacts in the United States, Chapter 16: Northeast; Parsons Brinckerhoff


APPENDIX A: CHALLENGES

Population Growth, Record Ridership and Demographic Shifts

The MTA system is currently experiencing both record ridership and significant capacity constraints. The New York region’s population is projected to grow, which will further exacerbate and strain system capacity. Riders’ travel patterns throughout the region are also changing, resulting in shifting demand on a mostly fixed – and aging – system. With a new generation of customers also come new demands and expectations of what is essential for a customer travel experience. The challenge for MTA will be to reinvent an aging system built on a relatively fixed backbone for the needs of a region as it developed a century ago.

![Crowded subway platform](image)

Photo Credit: Mark Hermann/NYC Transit

Population Growth and New Patterns of Travel

MTA’s customer base continues to grow as the New York City metropolitan region draws more people to live, work, and visit. Approximately one million new residents are projected in New York City by 2040.\(^{19}\) Population declines of the 1970s and 1980s have reversed as new residents take advantage of renewed urban housing stock and the economic and social advantages afforded by the agglomeration of human capital in New York City.

Already crowded subway lines will be further strained by emerging residential neighborhoods, such as Greenpoint in Brooklyn, Highbridge in the South Bronx, and Long Island City in Queens. Within the MTA’s overall service region, population is expected to increase by 13.3 percent (1.6 million) over 2010 levels by 2035 and 15.6 percent (1.9 million) through 2040.\(^{20}\) Long Island population growth is expected to increase by 480,000 people from 2010 to 2040, a 17 percent increase focusing more on Suffolk County, while the Lower Hudson Valley will grow by 269,000 or 19.8 percent. New York City population will grow by 1.2 million, or 14.4 percent, over 2010 levels to 2040. Finally, visitors to New York City have increased steadily over the past 10 years, growing by 36 percent in response to an aggressive tourism marketing strategy and to the reality of New York City as a world business center.\(^{21}\)

Employment is growing but also becoming more dispersed throughout the region. Two million new jobs beyond 2010 levels are forecasted for the MTA service region by 2035, increasing to an estimated 10.2 million (+20.9 percent).\(^{22}\) Projected 2040 Manhattan job growth is 5.9 million, which is an increase of 29 percent over 2010 (4.6 million) levels.\(^{23}\) Job opportunities are expected to grow at a higher proportional rate through 2040 outside of Manhattan in the Bronx, Brooklyn, and Staten Island, as well as in Westchester, Rockland, and Suffolk

\(^{19}\) DCP Report, “New York City Population Projects by Age/Sex & Borough, 2010-2040

\(^{20}\) MTA Capital Needs Assessment 2015-2034

\(^{21}\) http://www.nycgo.com/articles/nyc-statistics-page

\(^{22}\) MTA Capital Needs Assessment 2015-2034

\(^{23}\) NYMTC.
The ATR recorded 83.4 million riders in 2013, an increase of more than 1.6 million passengers over the previous year.

The New Haven Line saw a 4.2 percent increase and carried nearly 27 million riders.

At the start of the year, the MTA began operations on its new East Side Access line, which connects Grand Central Terminal to the Long Island Rail Road (LIRR) and the New York City Subway. This line increases service frequency and reduces travel times for commuters.

In 2013, the LIRR carried 83.4 million riders, marking the fifth consecutive year of growth. This growth is attributed to increased marketing efforts and expanded service offerings.

The MTA has continued to invest in its subway and bus systems, adding new routes and improving existing ones. This includes the opening of the Second Avenue subway extension in 2015, which has significantly reduced travel times and improved service reliability.

Despite these improvements, the MTA continues to face challenges, including a lack of funding and increasing demand for services. The MTA is currently working on a comprehensive plan to address these issues and continue to improve the region’s transportation infrastructure.

Customer needs and preferences are continually evolving, and the MTA is committed to keeping pace with these changes. The agency is exploring new technologies and modes of transportation to meet the needs of its riders and ensure that the region remains a leader in transportation innovation.
Appendix A: Challenges

On top of these record numbers, the MTN can expect continued and significant growth in demand for its intermodal services,Join the MTN to market and delivery a lower cost, more efficient solution for the future needs of the region. Join the MTN to market and delivery a lower cost, more efficient solution for the future needs of the region.
customer service to capture and benefit from regional growth.
and population transformation, the agency will have to as well to provide optimal
decision-making maintenance and construction as the region's economy
depends on the look and feel of the system, but investment strategies and business
provide service to meet the evolving needs of its customers. This will affect not
region. The MTA will have to reinvigorate its thinking towards new, innovative ways to

Appendix A: Challenges
APPENDIX A: CHALLENGES

Institutional Barriers

The current organizational and operating structure of the MTA harkens back to 1965, when the MTA was chartered as a public benefit corporation. This organizational structure, created by statute to solve financial solvency and operations issues at the time, has remained mostly unchanged despite vast changes to the environment in which MTA operates. Failure to take advantage of opportunities to maximize efficiencies in the institutional environment has resulted in a number of barriers to effective planning and prioritizing of investments, as well as project delivery. The barriers are both internal to the MTA organization, as well external between the MTA and the various governing municipalities in the region.

These organizational and institutional barriers have resulted in insufficient coordination in the capital planning process, creating gaps in knowledge about concurrent economic development and land use planning decisions. Without strong coordination between operating agencies and across municipal institutions, the MTA’s ability to effectively and appropriately prioritize its capital investment decisions is compromised. The cost-effective and timely delivery of its capital plans is also hampered by risk aversive policies and procedures of the current organization and suboptimal coordination of shared resources.

Internal Hurdles

Prior to their incorporation under the MTA, the operating agencies were independent private or public corporations. After their incorporation some back office functions were consolidated across the MTA agencies; however, most operations, resources and assets continue to remain largely within agency silos. The current institutional silos discourage resource sharing that could lead to more efficient project planning and execution. Redundancies in processes common across the agencies lead to higher project costs and time delays. These handicaps are known throughout the construction market, and cause MTA to pay a premium on contracts to offset the increased costs and delays to business partners. Although differences among the MTA agencies exist, such as labor and assets, opportunities to do more in the way of knowledge sharing and streamlining processes exist.

Jurisdictional Barriers

Just as silos exist within the agency, the larger region in which the MTA operates presents its own set of jurisdictional barriers to effective, coordinated regional transportation, economic development and land use planning. Since the MTA was founded, the economic and demographic makeup of the region has changed dramatically, yet the framework through which priorities are established and decision-making occurs has remained static.

Currently, decision-making happens largely within local economic and planning agencies and individual transit agencies with little coordination among them. Yet coordinated planning at the local level between municipalities and MTA has produced recent success stories and opportunities upon which to build and maintain momentum. For example, New York City and MTA worked together on both the Hudson Yards/7 Line Extension and SBS projects to coordinate changes in the built environment with access to transit.34

Integrating land use and transportation decisions will help to prevent the types of gaps in access to transit service that has been occurring in the outer boroughs. Incentives to encourage development in neighborhoods should go hand-in-hand with transportation planning to improve service to these development zones. Planning in silos leaves MTA catching up to fill gaps in transit service and lacking information on where capital investments are needed most.

The New York metropolitan area extends beyond the MTA services in New York and Connecticut to include New Jersey. Hundreds of thousands of commuters cross the Hudson River each day to work in and visit New York City and its suburbs. Despite that, capital planning at a higher level is not well coordinated

34 Testimonies by Anthony Shorris and Polly Trottenberg, July 15, 2014.
Testimony of Andrew Albert, NY Riders Council, July 16th, 2014.


The use of multiple transit modes and agencies (subways, buses, ferries, etc.) and decision-making process for institutional integration between the major and minor players in the system, which leads to system gaps, lower levels of service and service quality.

Institutional barriers exist in a region where millions cross regional boundaries every day. There is no regional transit policy to define regional transit decision-making on projects.

Effects of Institutional Barriers on the MTA System

Source: NY Daily News

Hudson Yards, No. 7 Station, Courtesy

MTA’s capital plan, reaching efficiencies, and improving operations and service.

MTA is critical for increasing the efficiencies and geographic reach of the regional transit system. Breaking down institutional barriers is critical for implementing a regional transit system, with a key attribute of a regional transit system being the New York Metropolitan Area’s rail transit system. Implementing improvements is shared efforts is cumbersome, for example.

and assets are located just over the border and an institutional use of each state’s resources are locked just over the border and an institutional use of each state’s resources would lead to continuous routes between compatible systems that would lead to continuous five system improvements. This would improve travel time and ease of coordination to adjacent public transportation systems.


Meeting Customer Communication Expectations

And customer service.

Today, in the age of the Internet, providing both excellent performance and customer satisfaction is critical to businesses of all sizes. "Customer satisfaction is a critical component of business success," said John Smith, CEO of XYZ Corporation. "It's not just about meeting expectations; it's about exceeding them.

Regaining Outdated Mechanical Train Contacts with Modern Technology

The current system lacks the ability to provide real-time updates to customers, leading to frustration and lost business. A new system is needed that can automate the process of communication, reducing the time it takes to respond to customer inquiries.

We found that by integrating modern technology into the system, we can reduce response times by up to 75% compared to the old system. This not only improves customer satisfaction but also reduces the workload for call center agents.

In conclusion, integrating modern technology into our communication system is crucial to meeting customer expectations and improving our overall performance.
MTA is facing a revolution in fare payment systems.

The Metropolitan Transportation Authority (MTA) has been working to modernize its fare collection system, which has been slow and outdated. The new system, called OMNY, will allow for contactless payment using a variety of devices, including smartcards, smartphones, and tablets.

The OMNY system is being rolled out across the MTA's subway and bus systems. It will allow riders to tap their devices at turnstiles or faregates, or use their smartphones to scan QR codes. This will make it easier and faster for riders to get through the fare gates, and will reduce the time spent waiting in lines.

The OMNY system is expected to be fully implemented by the end of 2023. In the meantime, the MTA is working to improve its existing fare collection system, which is currently based on tokens and fares. This will involve upgrading the MTA's existing equipment and infrastructure, as well as training employees on how to use the new system.

Overall, the MTA is committed to providing riders with a better, more efficient, and more convenient way to pay for their rides. With OMNY, the MTA is taking a major step forward in modernizing its fare collection system and improving the passenger experience.
about how, where, and when to travel around the region. The
level of safety and security and the ability of riders to make the best decisions
involves directly impact the quality of customer travel experience. The
information technology and systems with new, innovative technologies, Telematics
and systems that enable, improve customer satisfaction unless a replaces outdated
approach, and improve customer satisfaction
The MTA will not be able to increase system capacity, accommodate

Effects of Technological Innovation on the MTA System

substantially.

where asset management systems and this effort should be sustained and
selected to pursue these systems through the implementation of an enterprise-
scale world class asset management system that utilizes various data sets in accessible
data management systems that enable various insights, improvements and enhance
data analysis, decision-making and real-time decision making and this agility
improvements in system performance and network reliability for land transportation.

Having more robust system performance data will allow the MTA to improve

Understanding of System Performance Data

increasingly expected.

systems and reflect the type of services and amenities that customers
say they desire to NEXT moves. The new, innovative, high-cost
for MTA is essential on the front end. It will ultimately field our core
the system, where an open system will be explored, cost and compatible
circulation, much more progress is needed to implement the necessary across

Appendix A: Challenges
The MTA Website: A Page of Analytics and Measurements

The following page presents an example of how analytics can be used to engage customers and the public in the future.

- Establish this effort as an example of best practices for how the MTA can more fully engage customers and the public.
- Set up social media sites that can continue beyond the Transportation Reform Commission.
- Get public input on strategies for addressing those changes.
- Take part in an ongoing conversation surrounding the changes being considered by the TGC.
- Climate change, population growth, shipping demands, demographics
- Goals and objectives
- Awareness and draw the public into the live sessions.

July 8, 2014: The MTA Reform Commission (TRC) was formed. The MTA scheduled three expert sessions and three sessions open to the public to solicit input in mid-July. After the TRC, people completed the MTA Commission website asking for feedback on the

3.06% Page Views

3.056 Page Views

MTA Website Traffic

Analysis of Results

The Commission's report addressed all the major general themes that were expressed by the general public—connectivity, equity, accessibility—and many of the specific ideas that were expressed—neighborhood connectivity, enhancing and easy-to-understand customer information, to name a few. This report is an initial step in the continued dialogue and engagement that the MTA will have with the public as it begins to implement the recommendations presented in this report.

Appendix E: Summary of Social Media and Public Engagement
More than 5 million reach/impressions from social media engagement.

288 people filled out the Twitter online survey which was promoted heavily on social media.

Twitter survey: To fill the reach/impressions in perspective, the analogy is similar to website accounts. Reaching almost 15,000 reach/impressions.

The tweet was shared by 27 other Twitter accounts including MTA Subway Service.

Over 2 days, shared various 10s account.

Promotion of the online survey closing Aug. 29.

Snapshot of a Tweet:

25% of contributors used mobile devices. 56% used a desktop computer. The rest (22%) were on an undetectable device or tablet.

On the first day of Laboratory usage, MTAEngagement hashtag was tweeted 200+ times, and on day 107 were retweets (shares) of posts, showing significant engagement with the content shared. These in turn resulted more than 30,000 accounts.

Establish the #MTAEngagement hashtag to simulate conversation and likes posing or the

During the live expert sessions and other public sessions, posted live via website broadcast.

Tweets reached, seven of millions of Twitter accounts.

81.3 Tweets (16 per day)

Followers are interested in the following topics: Ed. Fuchs, #mta, #mtareporter, #fransal,
7.9% followers were a person, 20% were a company/organization/entity,
47% of followers were men, 53% women, 16 tweets, 36% unknown.

Transportation: Various news reports.

Including people and entities such as: Streetsblog, NY MTA, Mayor’s Office, Park Slope Neighbors, NY State Campaign. Riders Alliance, NYC DOT, Robert Puentes.

END

Appendix B: Summary of Social Media & Public Engagement
More than 4,000 separate ideas submitted

380 people filled out the survey online. The survey launched July 1, closed Aug. 30.

More than 5,000 people engaged with posts. This means they liked the post, shared it on

- 16% ages 35-44
- 18% ages 45 and older
- 18% ages 18-24
- 42% ages 25-34
Appendix C: List of Reference Documents

Metro-North Transportation Authority. 2013 Customer satisfaction survey.

MR. New York, NY.

Metro-North Transportation Authority. New fare payment system update.


Metro-North Transportation Authority. MA Blue ribbon panel.


We focus on the local need of the MTA and the regional transportation. Creating mass transit links to major regional performance indicators.


with: Queens County Public Information; New York City Transit; MTA Board Website.

The synthesis of road network builders from the TRANSIT Reestat.


update (2013).


Long Island regional planning council. Sustainable strategies for long-term infrastructure systems.


International Association of Public Transport. Road study on buses, roads and services (2014).

International Association of Public Transport. Case Study on Parking Policy.

Institute for Transportation & Development Policy. TOD standard.

Institute for Transportation & Development Policy. TOD standard.

Appendix C: Reference Documents
Articulated bus

Transportation

Promulgated by the Department of Transportation

Service standards are also accessible to individuals with disabilities. Service standards are also accessible to and usable by individuals with disabilities to the maximum extent feasible.

Accessibility

Regulations published by the Federal

ADA Accessible

Appendix E: Glossary

<table>
<thead>
<tr>
<th>Term</th>
<th>Abbreviation</th>
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<tbody>
<tr>
<td>Transit-oriented development</td>
<td>TOD</td>
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<tr>
<td>Shared bus service</td>
<td>SBS</td>
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<tr>
<td>Regional Economic Development Council</td>
<td>REEDC</td>
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<tr>
<td>Future Transit</td>
<td>FT</td>
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<tr>
<td>Metropolitan Transportation Authority</td>
<td>MTA</td>
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<tr>
<td>Metropolitan Transportation Commission</td>
<td>MTC</td>
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<tr>
<td>Light rail</td>
<td>LRT</td>
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<tr>
<td>Light rail link</td>
<td>LRL</td>
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<tr>
<td>Freight transportation</td>
<td>FTP</td>
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<tr>
<td>Freight transportation agency</td>
<td>FTPA</td>
</tr>
<tr>
<td>Freight transportation commission</td>
<td>FTPC</td>
</tr>
<tr>
<td>Communications of Regional Control</td>
<td>CRC</td>
</tr>
<tr>
<td>Communications Business District</td>
<td>CBD</td>
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<tr>
<td>America with Disabilities Act</td>
<td>ADA</td>
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Appendix D: Abbreviations
## APPENDIX E: ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Definition</th>
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<tbody>
<tr>
<td>Baby Boomer</td>
<td>The colloquial term for an individual born after World War II. Within the MTA’s service area, this age bracket is choosing to &quot;retire in place&quot;, and desires to be more mobile. Due to the large number of Baby Boomers, their aging contributes to a large demographic shift.</td>
</tr>
<tr>
<td>Bus rapid transit</td>
<td>A high performance transit system that combines the speed, reliability and amenities of rail-based transit systems with the flexibility of buses. To meet high performance standards, BRT incorporates certain features, including dedicated and/or physically separated lanes, priority signaling at traffic lights, off-board fare collection, level boarding at multiple doors, real-time bus arrival information, and distinctive branding.</td>
</tr>
<tr>
<td>Communications-Based Train Control</td>
<td>A subway signaling system that uses telecommunications between train and track equipment to manage and control train traffic and individual trains on the line; the system improves safety and increases capacity by allowing trains to follow each other more closely.</td>
</tr>
<tr>
<td>Enterprise Asset Management</td>
<td>Refers to the optimal management of the lifecycle of physical assets of an organization to maximize value.</td>
</tr>
<tr>
<td>Extreme weather event</td>
<td>A descriptive term which refers to weather events which are more destructive than in the past due to higher winds, rainfalls, etc. This term is most often used to describe the trend of an increasing number of these events.</td>
</tr>
<tr>
<td>Gross Domestic Product</td>
<td>Estimate used to measure the economic output of a country or region.</td>
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<tr>
<td>&quot;Hub and Spoke&quot; System</td>
<td>System of connection in which service moves along spokes (i.e. lines) to connect to hubs in the center(s) of the transit network.</td>
</tr>
<tr>
<td>Light rail transit</td>
<td>Mode of urban transportation operating electrified rail cars on fixed rails using predominately reserved, but necessary grade separated rights-of-way. Light rail may include streetcar, tramway, or trolley.</td>
</tr>
<tr>
<td>Manhattan Central Business District</td>
<td>The central business district is the city center where retail and office buildings are concentrated. Traditionally in New York City, the CBD has been in Manhattan, south of Central Park near 59th Street. Recently, other areas of New York City, including Downtown Brooklyn and Long Island City, are experiencing large concentrations of retail and office buildings that are secondary and tertiary to the Manhattan CBD.</td>
</tr>
<tr>
<td>MetroCard</td>
<td>Introduced in 1993, this magnetic-strip card is the primary payment method for the MTA’s subway and bus systems. Commuter rail has hybrid ticketing (MetroCard on one side, train ticket on other, as well as separate paper tickets).</td>
</tr>
<tr>
<td>Millennial</td>
<td>Individuals born between 1980 and 1991. This demographic is known for an urban living preference, participation in non-traditional work hours, high use of technology to manage their private and professional lives, and emphasis on mobility and access to non-car modes of transportation (i.e. transit, bike, pedestrian).</td>
</tr>
<tr>
<td>MTA Bus Time</td>
<td>Uses GPS hardware and wireless communications technology to track the real-time location of buses.</td>
</tr>
<tr>
<td>MTA Region</td>
<td>Region including five boroughs of New York City, seven counties (Duchess, Nassau, Orange, Putnam, Rockland, Suffolk, Westchester), and southern Connecticut.</td>
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<tr>
<td>Abbreviation</td>
<td>Description</td>
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<tr>
<td>Northeast Corridor</td>
<td>The rail line running from Boston, MA to Washington, D.C. with branches serving other metropolitan areas. The NEC is owned primarily by Amtrak and is used by Amtrak’s Acela Express and Northeast Regional services in addition to several commuter and freight rail services. The NEC is the busiest passenger rail line in the United States by ridership and service frequency.</td>
</tr>
<tr>
<td>Positive Train Control</td>
<td>Technology designed to automatically stop or slow a train before a collision occurs by sharing information on a train’s location and safe passage via on-board computer systems.</td>
</tr>
<tr>
<td>Regional Economic Development Councils</td>
<td>Created in 2011 by Governor Cuomo to develop long-term strategic plans for economic growth in respective regions created throughout New York State. The Councils are comprised of leaders across sectors and industries in each region.</td>
</tr>
<tr>
<td>Select Bus Service</td>
<td>MTA’s hybrid bus service—a step short of BRT as defined above—generally characterized by high-capacity, articulated buses, dedicated lanes (painted instead of median separated), minimum corridor stops, and off-bus fare payment. Select Bus Service corridors also generally include traffic signal priority for buses to speed up movement along routes.</td>
</tr>
<tr>
<td>Small Business Federal Program</td>
<td>Program created to facilitate and encourage the participation of small businesses in federally funded MTA projects.</td>
</tr>
<tr>
<td>Small Business Mentoring Program</td>
<td>Program created by the MTA to increase, facilitate, and encourage the participation of small business by providing a framework for eligible firms to develop and grow within the construction industry and establish stable, long-term relationships with the MTA.</td>
</tr>
<tr>
<td>Superstorm Sandy</td>
<td>The unofficial name given to Hurricane Sandy by residents along the Northeast Atlantic Coast. The second-costliest hurricane in United States history, the storm caused billions in damage, and crippled transportation systems especially.</td>
</tr>
<tr>
<td>Transcom</td>
<td>Transportation Operations Coordinating Committee; a coalition of 16 transportation and public safety agencies in the New York – New Jersey – Connecticut metropolitan region, created to provide a cooperating approach to regional transportation management.</td>
</tr>
<tr>
<td>Transit-oriented development</td>
<td>High-density, mixed-use residential and commercial development designed and constructed to maximize access to transit.</td>
</tr>
<tr>
<td>Tri-State Region</td>
<td>The group of states comprised of New York, New Jersey and Connecticut.</td>
</tr>
<tr>
<td>Upzoning</td>
<td>Changing zoning of a tract of land to intensify its usage.</td>
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Transmittal Letter from the Co-Chairs

Dear Chairman Prendergast:

The future of this great region is tied to the MTA’s ability to continue to deliver a fully functioning, resilient, world-class regional mass transit system. This system and its recent successes are in jeopardy unless the MTA reinvents itself and those who benefit from this regional asset invest more in this reinvented MTA. Over the past century, the MTA system has been a catalyst for the economic growth that has made New York the center of the regional, national, and global economy. The sheer volume of MTA services—which carry 70 percent of all subway riders in the United States, 40 percent of all commuter rail trips, 20 percent of all bus riders, and have nearly as many stations as all other systems in the country combined—illustrates MTA’s leadership role in moving people and driving economic growth.¹

New York’s economic well-being is inextricably linked to the MTA’s ability to continue to deliver a fully functioning, resilient, world-class regional mass transit system. Its rise to preeminence as one of a handful of true global cities—with very few peers outside of London, Hong Kong and Tokyo—was made possible by the MTA and its predecessor agencies. It is headquarters for a large and significant concentration of multinational corporations. It is a dominant international, financial, trade, technology and media center. And it is an epicenter of ideas, economics, culture, and politics. The New York region’s growth and its economic prosperity was not inevitable but is attributable—in large part—to the decisions that generations of political, business and civic leaders have made to build and then revive a world-class transportation system. That same vision and bold decision-making is needed now. Stakeholders in the region, including Federal, State, regional, and city governments, road users, riders, businesses, developers, and the public, must seize the opportunity and make the investments necessary to enable the MTA to carry the region into its next century of prosperity. The MTA must evolve to reflect the changing needs of the region and characteristics of a world-class institution, including growing population, shifting travel patterns and needs, and stresses from unforeseen emergency events, particularly extreme weather. Through this report, the Commission has provided a range of strategies and actions to help meet the challenges the transportation system will face over the next 100 years. These strategies and actions are presented with particular attention to strengthening the system’s resiliency to ensure that it can withstand whatever stresses it confronts. The region’s stakeholders can choose to implement some or all of these strategies and investments, which in turn will determine what sort of transportation system the region will have in the future. The region’s peers around the world, when faced with these same issues, have chosen to invest aggressively in transit, seeing it as the path to their most prosperous futures.

Over the next 100 years, the New York region will face challenges that will test its transportation system. Paramount among these will be more frequent extreme weather events like Superstorm Sandy, significant population growth and demographic shifts, changing travel patterns, the evolution of the 24/7 economy, customer demand for more and higher quality service, as well as growing expectations for greater connectivity and real-time passenger information. Understanding these challenges and how they can be met will allow MTA to be proactive in leading change, instead of reactive to internal and external forces.

¹ Based on 2013 National Transit Database data of passenger trips for national systems with common modes.
At the urging of Governor Andrew Cuomo, the MTA Transportation Reinvention Commission was empanelled to assess these challenges and we have worked collaboratively to craft a menu of bold actions to address them. Our recommendations call for the MTA to:

- Commit to reengineering how it does business to create a more efficient, integrated, transparent, and accountable MTA—one that gets the right work done, and does it faster and cheaper.
- Accelerate and sustain core infrastructure investments to optimize reliability, expand capacity and maximize resiliency.
- Deliver a high quality customer experience consistent with and reflecting New York’s stature as a world-class city.
- Make the critical investments necessary to accommodate ridership growth and to serve existing and emerging centers underserved by the existing system.
- Reach out to and actively engage the wide range of stakeholders who benefit from this robust transit system, both directly and indirectly, to seek their help and support.

This report responds to the Governor’s charge that the Commission consider the challenges facing the MTA over the next century and develops recommended strategies to address those challenges to ensure the success of MTA—and the region. A goal of this report is to identify and explore the key challenges facing the region and outline a strategic vision for the MTA through a number of actionable recommendations. It is the hope of the Commission that these recommendations will inform the dialogue that the MTA will have with its various stakeholders in coming months about the content and size of the MTA’s next Capital Program. The report is seeded with relevant national and international examples of how these strategies have been implemented successfully by New York’s competitors on the world scene, particularly funding and financing approaches for implementing the vision and actions outlined in this report.

By adopting an ambitious vision for the future of transit and working collaboratively with City, State, and regional leaders to achieve it, the MTA can continue to fulfill its central role in sustaining the region’s economic competitiveness and enhancing the quality of life of all its citizens.

We look forward to working with and supporting you as you take the next steps to keep New York moving.

Sincerely,

Ray LaHood, Co-Chair
Jane Garvey, Co-Chair
Commission Members

Co-Chairs
Ray LaHood, Former Secretary, US Department of Transportation
Jane Garvey, Former Administrator, Federal Aviation Administration

Members
Rohit T. Agarwala, Professor of Professional Practice in International and Public Affairs, Columbia University
Richard T. Anderson, President, New York Building Congress
Kate Ascher, Milstein Chair of Urban Development, Columbia Graduate School of Architecture, Planning and Preservation
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Gary LaBarbera, President, Building and Construction Trades Council of Greater New York

Kevin Law, President and Chief Executive Officer, Long Island Association
Robert Lieber, Chairman, Urban Land Institute, New York
Enrique Peñalosa, Former Mayor of Bogotá, Colombia
Robert Puentes, Director, Metropolitan Infrastructure Initiative and Senior Fellow, The Brookings Institution
Denise Richardson, Managing Director, General Contractors Association of New York
Gene Russianoff, Senior Attorney, NYPIRG Straphangers Campaign
Veronica Vanterpool, Executive Director, Tri-State Transportation Campaign
David Waboso, Director, Capital Programmes, London Underground
Mark Willis, Executive Director, NYU Furman Center for Real Estate and Urban Policy
Larry Wolinsky, Chair, Hudson Valley Pattern for Progress
Kathryn Wylde, President and Chief Executive Officer, Partnership for New York City
Robert D. Yaro, President, Regional Plan Association
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Executive Summary

The Challenge and Opportunity

In many ways, the history of the success of the region over the last 100 years is the history of its subway, bus and commuter rail systems, which have been one of its great economic drivers. In particular, the past thirty years of dramatic growth and vitality of the New York region was not inevitable. It was based on bold decisions to invest in order to secure that future. The development of the region followed the construction of the transit infrastructure and the region’s recent renaissance has depended on reinvestments in the reliability of that system.

Today, the New York metropolitan region accounts for 60 percent of the population of the State and 80 percent of its tax base, and contributes nearly 10 percent of the nation’s Gross Domestic Product. Yet despite the value of the system that enables this success, even a cursory glance at peer regions around the world makes it clear that New York is significantly under-investing in its public transportation infrastructure. The past is not prologue to the future: if New Yorkers want to continue to live in a world class region they must envision and develop a world class transit system. That means reinventing the MTA as guided by the strategies in this report and aggressively investing in that reinvention. That is the path to New York’s future prosperity.

The MTA Transportation Reinvention Commission is a broad-ranging 24-member group of international, national and regional experts representing diverse viewpoints, co-chaired by former United States Transportation Secretary Ray LaHood and former Federal Aviation Administrator Jane Garvey. The Commission was convened this summer upon the recommendation of Governor Andrew Cuomo. Governor Cuomo called upon the MTA to create the Commission to help it develop a plan for its future that prepares it to face the challenges of a changing world, a changing state, a changing region and a changing climate.

This report outlines the strategies and actions the MTA should take to ensure a prosperous future. It includes an in depth focus on successful national and international examples of recommended strategies, particularly examples of funding and financing approaches for implementing the vision and actions outlined in this report.

While no one can predict all of the challenges the MTA will face over the next 100 years, in order to continue to drive the region’s economy, the MTA must reinvent itself to tackle two distinct external forces that are reshaping the region’s landscape at a pace more rapid than ever before. An emphasis on resiliency - the MTA’s ability to withstand shock and stresses while maintaining its essential functions - will be critical to addressing these two forces.

The first force - climate change - was made powerfully clear by Superstorm Sandy, which was seen in real-time coverage around the world. The approximately $5 billion of unprecedented damage wrought by Sandy drove home as never before the unique vulnerabilities of a coastal transportation system in an era of extreme weather events. This event also brought into sharp focus—to the people who live here and to local, state and national leaders—that New York’s public transport system is vital not just to the regional economy, but to the nation’s economic well-being as well, and that both were significantly impacted when the region shut down.

The second force is more subtle, yet equally far-reaching in its impact. Changes in population, demographics (the growth in Millennials and the aging of Baby Boomers) and the consequent shifts in ridership all threaten to swamp America’s largest transit system and stall the economic growth and quality of life for the region. This force is underscored by the MTA’s recent record ridership, changing
travel patterns, 24/7/365 customer expectations, and the prospect of up to two million additional people projected to live in the greater New York region by 2040.

The Commission has identified seven strategies fundamental to creating a resilient system that can meet the challenges of the next century. The change in existing weather patterns is leading to higher and more volatile temperatures, rising sea levels, and increasing severe precipitation. The changes in these day-to-day conditions, along with heightened frequency of extreme weather events, puts the New York regional economy, its assets, residents, and visitors at risk. We must develop resilient systems that can quickly respond to, and rebound more effectively from these extreme weather events and other emergencies. The seven strategies outlined in this report are essential to achieving that goal.

By implementing these strategies, the MTA will reinvent itself into a more resilient system as defined by these critical characteristics:

- **Spare capacity and redundancy**, which will ensure that when the MTA system is under stress, from sudden or severe weather events for instance, there are adequate and effective back-ups, alternatives, or reserves to respond;

- **Flexibility and responsiveness**, which will allow the MTA to readily adopt alternative approaches in response to changing conditions, particularly during emergencies;

- **Managing for safe failure**, which will ensure that emergencies do not take down the whole system and that service disruptions are minimized; and

- **Recovering quickly from emergencies and evolving over time**, which will allow MTA to thrive, not just survive major disruptions.

The recommendations of the Commission reflect the breadth and complexity of creating a resilient system, with some aimed at MTA’s physical infrastructure, some designed to improve the quality and availability of information – both for planning and in times of crisis – and still others directed towards the policy and regulatory reforms needed to encourage and empower institutions to act in ways that reduce vulnerability.

Finally, MTA’s resiliency is founded on its ability to mobilize assets, including financial, physical, regional, organizational, technological, information and human resources, in flexible ways to find new solutions as conditions change. The strategies of the Commission are designed to help the MTA do so.

The Commission has developed seven key strategies and a broad range of implementing actions that reflect their vision for how the MTA can reinvent itself into a more resilient system to best meet its challenges with the highest standards of customer service, safety and reliability. These strategies and actions reflect a number of choices that the MTA, the Governor, the State Legislature, the City, the federal government and indeed all stakeholders in the system should consider. These strategies are not ordered by priority; they interrelate and all are important elements of an MTA reinvention. The implementation actions provided for each strategy are the priorities identified from many more actions considered by the Commission. The seventh strategy, which addresses funding, draws on national and international approaches for funding transportation infrastructure.

Actions are divided into short-, medium-, long-term, and ongoing, recognizing that the tasks are substantial and continuous, and sustained improvement will be essential. The strategies, described below, include:

1. **The MTA must reengineer its way of doing business by creating a “new MTA,” that gets the right work done faster and cheaper and that is more efficient, transparent, and accountable to the public.** This will allow the MTA to accelerate the resiliency investments recommended in this report and to expedite recovery from emergencies. The MTA currently employs

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innovative project delivery methods such as Design-Build and it should continue to look for opportunities to expand the use of these tools across a multitude of projects. These options, while not a panacea, provide the opportunity to transfer risk and optimize the expertise of the private sector to expedite project implementation and reduce costs. The MTA must immediately empower and deploy an Innovative Delivery Unit to reform project delivery by reengineering procurement, contract provisions and project execution to be best in class; and to identify opportunities to use more alternative delivery and non-traditional project, financial, and organizational structures. Every project must be evaluated to identify the most cost-effective delivery option, such as alternative delivery methods and other risk sharing mechanisms where appropriate. The Unit should apply these reforms to early action proof of concept projects. This Unit must coordinate among internal delivery partners and work with regional partners to overcome cross jurisdictional and regulatory delays as well as statutory and regulatory impediments to necessary reforms. These reforms will enable the MTA to more effectively manage its system, deliver service and enhance the trust of its riders and stakeholders, particularly during times of emergency. They will also allow MTA to attain a position on a global stage as the “Public Partner of Choice.” MTA must review and update its work practices and internal processes; preserve and secure internal capability through workforce development programs and use such programs to foster a customer-centric culture, and bring its human resources and business processes to world-class standards. Partnering with local firms and universities and transforming data and information sharing by making MTA information more accessible to third party developers and more timely, accurate, and customer-friendly will unlock efficiencies in the way the agency does business.

2. The MTA must accelerate core capital investment in good repair and sustain investment in the future to maximize the system’s safety, reliability and resiliency. Indeed the federal government has made investments in core infrastructure an imperative as well. The MTA can achieve this by building a substantially more aggressive and sustained core capital investment program. As investments are made, they must reinforce the importance of dealing with extreme weather events using improved design and resiliency standards to ensure that the region is prepared for those events over the next 100 years. While the prior five-year capital program investments have largely lifted the MTA from its nadir in the 1970s and ‘80s to a much higher standard of safe and reliable service, much more remains to be done. Depreciation of the MTA’s nearly trillion dollar asset base is far outpacing investment in maintaining its core infrastructure, putting MTA at best on a path of continual catch-up struggling to balance between critical maintenance needs and meeting demand for more service. Accelerating core infrastructure investment and providing for sustained investment should be the foundation of an ongoing and resilient capital program. This objective will require the commitment of all stakeholders to ensure that funding and investment priorities do not deviate from this fundamental objective.

3. The MTA must create a 21st-century customer experience for all riders, by implementing the responsiveness and ease of access characteristic of a resilient system. This starts with a customer charter that will form the backbone of the MTA’s commitment to its customers, focusing on their basic needs for safety, security, communications, connectivity, accessibility and resiliency throughout the system. Through such a charter, the MTA can begin to develop an accelerated action plan for immediate, tangible improvements to stations. Well-maintained, information-rich, accessible, safe and secure stations as well as reliable, frequent and easy to use services are fundamental to a resilient system and the quality of life New Yorkers, as residents of a world class city, should expect. The shifting needs of a diverse ridership base, including both Millennials and Baby Boomers, combined with the ubiquity of technology – including engaging more efficiently with customers through instant feedback – present an opportunity for the MTA to usher in a new era of quality service and responsiveness. Meeting such a standard will require systematically identifying and promoting future technological and digital data enhancements through a new Office of Technological Opportunity; implementing technological solutions to climate events; advancing a universal fare payment system compatible with other systems in the region; and increasing ADA3 accessibility throughout the

3 ADA refers to American Disabilities Act.
system. Improvements that will enhance the customer experience, such as temperature control and platform doors, should be pursued.

4. The MTA must aggressively expand the capacity of the existing system both to alleviate constraints and to meet the needs of growing ridership, thereby providing greater redundancy and limiting service disruptions, which are key to resilient service. Target expansion investments to growth areas throughout the region that tax the existing system to create reserves in emergencies and ensure the region leverages that investment to maximize economic development. More capacity is essential in order to continue to accommodate the extraordinary large Central Business District (CBD) bound market, projected ridership growth and to maximize system resiliency and service flexibility. The region’s success in weathering emergencies, and continuing economic growth and prosperity depends on investing in and developing additional capacity and providing for new and flexible types of services. This will involve working with other regional rail providers (such as Amtrak and the Port Authority) to increase overall system capacity. The MTA must also prioritize capital investments to address significant CBD-bound growth (like the far west side); and identify locations where other types of transit (light rail transit, bus rapid transit) or partnerships (ferries) can alleviate capacity constraints on existing lines. These improvements must not only eliminate single points of failure but also provide seamless connections throughout the region’s transportation network. Making investments to increase core capacity through Communications-Based Train Control, expanding track capacity, and leveraging available off-peak commuter rail line capacity will increase the MTA’s ability to effectively serve the region’s growing populations that rely on the core system and to respond better in emergencies.

5. The MTA must make investments designed to serve existing and emerging population and employment centers not well served by the existing system in order to ensure service alternatives and flexibility characteristic of a resilient system. This includes investing in circumferential transit, reverse peak, through running service, and non-rail modes. These new services are essential to make best use of the existing network, especially for the population that isn’t necessarily travelling to and from the Manhattan CBD every day. The MTA, in partnership with the City, should implement a true, dedicated bus rapid transit route within the next three years. The dramatic growth of inter- and intra-borough trips, suburb-to-suburb, state-to-state, and reverse commutes, and the emergence of employment centers in new locations are straining a system originally designed for trips to and from the Manhattan CBD. Experimenting with creative and bold surface rapid transit concepts such as bus rapid transit or light rail transit, exploring international examples of agencies that have leveraged existing rail lines and unused right-of-ways to add new rail services, implementing run-through service between different regional systems, improving bus routes by standardizing Select Bus Service features, forming results-oriented partnerships with private on-demand/shared car services, better leveraging water-borne transit, and supporting the expansion of airport access should be the hallmarks of MTA’s resilient service vision for the future.

6. To drive the region’s economic growth and maximize its capacity to respond to and recover rapidly from emergencies now and into the future, the MTA must forge the partnerships that will (1) bring together economic development and planning partners, as well as the private sector; and (2) establish more collaborative working relationships with other transit agencies. In partnership with the appropriate regional players, over the next three years the MTA should implement a showcase project in each of its service territories that ties an improvement in transportation to local economic development plans, ensuring that growth areas have access to transit, particularly during emergencies. The Commission recommends reforms that will seamlessly knit all of the MTA agencies into a more unified and cohesive whole. This MTA, as one of the few agencies with a regional view, must then work with its partners to strengthen regional coordination, eliminate institutional silos, identify growth areas, increase transit-oriented development (TOD) and determine transportation priorities, essential to evolving regional resiliency plans. The MTA needs to foster a decision-making culture that is regional in focus. Fully linking transportation.
investments to the region’s goals for economic growth ensures that those investments deliver their optimal value, both by implementing the transportation needed to support the planned growth and by creating a value-added revenue stream to fund them. A baseline regional plan, co-locating staff across the MTA and partner agencies, working closely with the Governor’s regional economic development councils (REDCs), integrated regional data sharing and more frequent review of interagency operating agreements are also important elements to delivering these ambitious but essential recommendations.

7. **All those who benefit from the region’s robust transit system must invest more revenue if the system is to become a resilient, world-class operation, even as MTA delivers significant efficiencies and generates more creative revenues.** There are many different groups who benefit from the MTA’s service — Federal, State, regional, and city governmental partners, riders, road users, businesses, property owners, developers, and the public. All should contribute to supporting the MTA system. There are many examples of successful funding strategies both nationally and internationally. These can be considered as potential funding sources as the region makes its investment choices.

**A Call to Action**

The Commission recognizes that this report is only the first step in a long journey. The hard work of choosing amongst these strategies, and developing the institutional and financial underpinnings crucial to their success, begins now. An ongoing and durable commitment to relentless improvement by the MTA has to be paired with the political and financial support that will make it possible.

The beneficiaries of New York’s prosperous future promised by these investments have a choice to make as they read this report as to which investments they are ready to embrace and willing to pay for. Those strategic decisions will determine the extent to which MTA will be able to serve the future needs of the region and overcome the challenges to come. As other world class cities face those choices, they have decided that sound, resilient transit infrastructure reinforces their prosperity. Hopefully, the New York region will do the same.

When the system opened 110 years ago, it underscored the value of investing in the region’s transportation system for a better tomorrow—and this investment was made at considerable cost, through much more difficult economic times than we are experiencing today. Now it’s our turn to pay it forward, to do the same for our children and the generations to follow. The members of the MTA Transportation Reinvention Commission accept this challenge, and urge you to do the same.
Introduction

As the largest public transportation network in the nation, the MTA system not only drives the regional economy, it is also vital to the nation’s economy. It serves the over 15 million people who live, work and do business in the 5,000-square-mile area fanning out from New York City through Long Island, southeastern New York State, and Connecticut.

When New York’s first subway opened to the public on October 27, 1904, it was an innovative marvel. Thousands of people lined up at stations across the city to witness a mass transit advancement that for years had been dismissed as merely a dream. The way that the public and private sectors came together to invest in the system was the impetus for much of the development around the region as we know it today. The development of New York’s five boroughs and the economic reach of the region would not have occurred without the transit system. It is the region’s most powerful economic tool.

No other transportation system in the world has the breadth of the MTA. It has 738 stations, across two states and twelve counties with 529 in New York City alone. The diversity of service types it offers, from commuter rail to urban bus and subway, with both express and local service, is unparalleled in the world. No other system in the United States serves as many people—roughly one in sixteen Americans. The people who work and live in New York—and those who own and operate businesses here—rely on it 24 hours per day, 7 days per week and 365 days per year. It is the City’s great equalizer, a truly democratic shared space. It is a critical regional asset that yields dividends to every person who lives here and every company and corporation, large and small, that conducts business here. It is the region’s most powerful social tool.

Clearly, those that use the system benefit directly, but so do many others. Motorists, businesses large and small, property developers, land owners in the region, and citizens of New York State and the nation all benefit from New York’s prosperity and success. Today, the New York metropolitan region accounts for 60 percent of the population of the State and 80 percent of its tax base, and contributes nearly 10 percent to the nation’s Gross Domestic Product. And MTA has enabled that success; every dollar invested in the MTA system is a dollar invested in the health of the economy.

The MTA provides other economic benefits as well. Its capital program creates jobs throughout New York State and the nation. Much of its rail rolling stock rehabilitation and new rail vehicle assembly has taken place in Upstate communities such as Elmira, Plattsburgh and Hornell, providing thousands of jobs in these areas as an example. MTA’s investments also yield environmental benefits, creating a healthier, more livable and inclusive region and advancing New York’s stature as a world-class city.

Continued and sustained investment is vital to building critically needed capacity projects that will meet the needs of a rapidly growing and shifting

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<th>MTA’s Vast Reach</th>
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<td>Seventy-one percent of New York City’s population lives within 1/2 mile of a subway station and 97 percent within a 1/4 mile of a bus stop. For commuter rail, 73 percent of the suburban population in Long Island Rail Road’s service area lives within 2 miles of a station, while 51 percent of the suburban population in the Metro North service area lives within 2 miles of a station.</td>
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<td>Data Sources: Caliper, US Census 2010, MTA</td>
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A Bold Vision for Transforming the MTA in the Next 100 Years

Vision: The MTA will provide a world class resilient 21st century metropolitan transportation system for a world class region.

A world class resilient 21st century system will reliably, comfortably and seamlessly take customers where they want to go. It is accessible, provides customers with service information when and where they need it. It is resilient to extreme weather events and meets the needs of ever growing ridership.

The region will never have this world class resilient system or be able to maintain its world class status unless the MTA reinvents itself and its many beneficiaries invest dramatically in this reinvention.

Strategy: To reinvent itself into this world class resilient system, the MTA must:

- Reengineer its way of doing business by creating “a new MTA,” that is more efficient, transparent, and accountable to the public and that gets the right work done faster and cheaper.
- Accelerate core capital investment in good repair and sustain investment in the future to maximize safety, reliability, and resiliency.
- Create a 21st century customer experience for all riders.
- Aggressively expand the capacity of the existing system both to alleviate constraints and to meet the needs of growing ridership.
- Make investments designed to serve existing and emerging population and employment centers not well served by the existing system.
- Lead the way with local, state, and federal economic development and planning partners, as well as the private sector to maximize the power of the transit system to drive the region’s economic growth and resiliency; and establish more collaborative working relationships with other transit agencies to better integrate regional transit operations.
- Receive more revenue from all who benefit in order to become a world-class resilient operation, even as MTA delivers significant efficiencies and generates more creative revenues.

demographic and economic base. The MTA must continue to evolve, both as an organization and as a system, to meet the needs and ambitions of the region by providing 21st century service, ensuring customer comfort, and creating and maintaining assets that are resilient to a range of challenges facing the region.

The MTA Capital Program has been and must continue to be a crucial element for turning that vision into reality. Since the advent of the Capital Program in the 1980s, the MTA has fundamentally transformed the transit system, making investments that took the system from one that was graffiti-scarred, unreliable, unsafe and avoided by many, to today’s system that is widely used and breaking decades old ridership records.5 The Capital Program has renewed the rail and bus fleet, rebuilt track, improved stations, and invested in the core system to restore reliability and create the foundation for the region’s economic renaissance. Since the Capital Program began:

- System ridership has nearly doubled.
- Mean distance between failures has increased twentyfold on the subway, tenfold on Long Island Rail Road and fivefold on Metro-North Railroad.
- Subway delays have been reduced by 94 percent.
- MTA’s bus fleet is now 100 percent accessible.
- A safer environment has been created and serious crime has fallen dramatically.

Over the next 100 years, MTA must reinvent itself and its system by leveraging this strong history of success. It must challenge itself and the region to rethink how transit service is provided and how it is funded—and it must drive growth and change. Its goal must be to provide high quality service to the millions of people who rely on it daily. In order for New York to succeed and remain competitive in a rapidly evolving global economy it must invest in this future vision.

5 http://www.mta.info/news-subway-ridership-lgb-d-4-7/2014/03/24/2013-ridership-reaches-65-year-high
A bold vision is required. This report outlines a large-scale strategic vision for the agency, the external challenges it faces, and the steps it can take to overcome these challenges and advance this vision. The region has changed in unprecedented ways over the past century and will continue to transform in the next hundred years. Hence, this is a strategic and policy-oriented document that presents a range of choices for the MTA and its national, state, and regional partners, as well as all other stakeholders to consider in addressing these future challenges.

Challenges

The MTA has had to address a number of significant challenges at the start of the 21st century:

- **Climate change.** Superstorm Sandy manifested the real and present threat of extreme weather events and exposed critical shortcomings in the capability of the MTA network to withstand these events that are likely to recur more frequently in the future. The MTA system is an essential public facility that, as Sandy illustrated, is the region’s lifeline. It is critical to ensuring that the New York metropolitan economy – and by extension, the national economy – functions. In the aftermath of Superstorm Sandy, MTA immediately made it a high priority to identify the investments and strategies necessary to protect the system and ensure its resiliency to the effects of extreme weather events as well as other events that might threaten the system in the future.

The risks of projected climate change to the MTA system are profound and severe. Increased flooding could damage assets throughout the system, as parts of the region served by the MTA lie within FEMA’s 100-year coastal flood zone. Flooding not only affects low-lying subway tunnels, rail and bus storage yards, and maintenance facilities, but also leads to flooded roadways and increased congestion, compromising the ability of personnel to access and protect valuable assets within the system. The corrosive effects of seawater on MTA’s complex infrastructure are devastating, requiring extensive rehabilitation work over many years with ongoing impacts on service.

Flooding is not the only climate change risk to the system. Extreme temperatures, particularly rising temperatures in the summer months, can stress the MTA system. At higher temperatures, expansion joints on bridges and highways are stressed, and instances of rail track stresses and track buckling increases.6 Already hot underground subway platforms and stations could become even hotter. The MTA has made resiliency a key priority in its planning and investment strategies, and the Commission’s recommendations affirm the need to continue to shape future investments through this lens. These recommendations will call on the MTA to increase capacity and redundancy, be flexible and responsive during events, isolate failures to limit their impact on the system, quickly recover service, and effectively mobilize assets around the region to respond to challenges.

- **Population growth, record ridership and demographic change.** The MTA system has reached record ridership levels, carrying two-thirds of the nation’s rail riders, more than 802 million annual bus trips and 1.7 billion subway trips. More than two million more people are expected to live in the region by 2040, putting increasing pressure on a system that is already at capacity on many of its existing lines. Along with that growth, the MTA also needs to adapt to fundamental demographic shifts and changing travel patterns. At opposite ends of the demographic spectrum, Millennials (those born between 1980 and 1991) and Baby Boomers (those born between 1946 and 1964) each have new and evolving expectations, service needs and accessibility requirements that the current system is simply not fully equipped to meet. Amenities and services that were once regarded as luxuries—like reliable real-time information and access to transit throughout the region—are the new norm that riders demand from transit services around the world and expect from the MTA.

As the type of riders using the system is changing, so are the economy and land use patterns. New centers of employment throughout the region are joining the traditional Manhattan Central Business Districts, Lower and Midtown Manhattan, as major destinations for the MTA’s riders. The demand for off-peak travel is nearly as high as the demand for peak travel, leading to

crowded trains all day long, on the weekends and even late at night. These changing travel patterns are fundamentally altering the premise underlying where, when and how MTA provides service to its customers.

As ridership surges and the traditional rider profile and travel patterns shift, MTA’s challenge will be its ability to safely and reliably serve and meet customer needs. Increasing demand for non-peak, 24/7 travel leaves MTA with less time in which it can perform maintenance and repairs without causing significant customer inconvenience. The predominantly hub and spoke network of rail lines designed decades ago to move customers into and out of the traditional Manhattan Central Business District is no longer sufficient to meet demand. These changes shaped the Commission’s recommendations for how to meet capacity and offer a quality customer experience in the future.

**Institutional barriers.** Internal and external institutional and jurisdictional barriers, a legacy of how the system has evolved over the last century, have led to redundancies and disconnects that impede the MTA’s ability to deliver projects and service as efficiently as possible. Lack of full integration within the MTA is simply inefficient and ineffective. And the region’s complex and multi-faceted jurisdictional arrangements make it challenging not just to establish regional priorities but to collaborate on them as well. The MTA must have a seat at the table in land use and economic development planning and decision-making in order for regional developments to be successful.

As many have said, “customers don’t care whether they’re using the service of one agency or another,” riders want to travel between their origin and destination as efficiently and effectively as possible. The Commission’s recommendations recognize that breaking down institutional and jurisdictional barriers is critical for increasing the effectiveness and geographic reach of the MTA’s capital plan, realizing efficiencies, and improving operations and service.

**Retrofitting the MTA system to incorporate technological innovation.** Technological innovation has grown exponentially in the past 20 years and the pace of change is accelerating. This has dramatically altered MTA customers’ expectations about service provision, leading to demands for access to real-time information across a variety of devices and connectivity to facilitate better decision-making about travel and ease of interaction with their devices while using the system.

Equally important is the availability of technology that can help MTA not only increase capacity but also better manage its business, assets and operations. Just as technology can help customers make better decisions about travel, new tools at the system level will help the Agency make and implement better strategic and investment decisions about system performance that may save time and money. The challenge facing the MTA is to systematically develop and introduce these new tools, both at the customer and business levels, while not falling behind the pace at which these tools are changing. Failure to implement new technologies, or to remain behind in deploying them, will reduce the Agency’s ability to provide effective and reliable service at the standard that customers expect of a world class system. Many Commission recommendations address this challenge.

These challenges are discussed in greater detail in the Appendix. Tackling these challenges depends on MTA building and maintaining a more resilient system, one that is sufficiently safeguarded from the shock and stresses of unforeseen events so that it can continue to provide basic service to all of its customers. This objective is complex, and requires more than just hardening of physical equipment to protect the system. It will require the coordination of regional partner agencies, the use of information technology and planning resources, and strategic decision-making to create and implement quick

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7 Taken from several comments through MTA Transportation Reinvention Commission public listening sessions.

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Public Commentary: Twitter

“4 Problems the MTA @ReinventTranspo Commission Must Tackle: debt, construction costs, regional integration, buses”
acting and effective recovery plans. The characteristics of a resilient system include:

- **Spare capacity or redundancy**, which provides adequate and effective back-ups, alternatives, and reserves to respond to situations like extreme weather events, security threats, and unforeseen failures in the system. This means expanding capacity and creating redundancies across multiple modes, eliminating single points of failure in the system and providing alternatives for customers and response personnel during emergencies.

- **Flexibility and responsiveness**, which allow MTA to be nimble to changing needs and adopt alternative approaches for responding to challenges. This means creating systems that allow MTA to communicate with partner agencies and customers quickly and effectively, investing in more flexible transportation alternatives and utilizing alternate systems and modes to ensure the network’s resiliency during times of stress.

- **Managing for safe failure**, which ensures that even in the most stressful scenarios, the entire system does not go down, and failures are contained and limited. This requires that the MTA have plans and alternatives to identify and mitigate instances of failure. This means understanding where failure might happen in the system, planning for quicker, targeted, and more effective response and making investments to overcome these potential failure points.

- **Recovering quickly from emergencies and evolving over time**, which requires MTA to have robust transportation alternatives for customers and operating procedures for how to quickly recover from unforeseen shocks and stresses in the region. This means ongoing planning and decision-making with regional partners to best utilize resources to help everyone bounce back from stresses quicker.

Creating a world class resilient system requires mobilizing assets, including financial, physical, regional, organizational, technological, information, and human resources. These assets must all be brought to bear to accomplish this goal. This means making investments and decisions that will continually make the system more resilient and building strong partnerships across public and private sectors in the region to implement these strategies.

In light of these challenges, on May 7, 2014, Governor Andrew Cuomo requested that the MTA empanel a Transportation Reinvention Commission to examine its existing network and develop a plan to address the challenges it will face over the next 100 years. To that end, the MTA selected a panel of 24 international, national, and regional experts, led by two nationally prominent co-chairs. Although diverse in background—spanning academia, business, the not-for-profit community, transit agency management, advocacy, and engineering—Commission members were united in their commitment to proactively rethink how the MTA can best serve its customers and fulfill its mission.

**Approach**

The Transportation Reinvention Commission, under the leadership of its co-chairs—Ray LaHood, former United States Secretary of the Department of Transportation, and Jane Garvey, former Administrator of the Federal Aviation Administration—led the Commission to fulfill this mission through five subcommittees:

- Operating and Maintaining the Existing System
- Meeting and Exceeding Customer Needs
- Spurring the Continued Growth of the New York Economy
- Expediting Processes, Procedures, and Project Delivery of Capital Infrastructure
- Funding Investments into the Future

In addition to the many working sessions of the Commission and the subcommittees, this effort was also informed by significant public input.

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Feedback was garnered both in person and on-line and consisted of the following elements:

- Three public sessions featuring over 25 invited speakers representing regional and city agencies, the regional business community, and regional transportation advocates.
- Three sessions held exclusively for the Commission to hear the perspectives of the general public.
- Additional feedback was gathered via social media, including MTA’s website, conversations over Facebook and Twitter, and opinions and ideas collected via online surveys.

A review of relevant literature and MTA studies, as well as front line perspectives from MTA staff were also key inputs to this report. Illustrative examples of successful national and international actions similar to those recommended by the Commission populate the report and specifically inform the finance strategy.
Recommendations

Overcoming the challenges facing the MTA requires a bold vision for change and a targeted and sustained effort to implement it. To help MTA meet these challenges, the Commission has developed a *Bold Direction for Leading Transportation in the Next 100 Years*, as articulated in the Introduction. Supporting the seven strategies we are recommending is a menu of actions that can be undertaken over three time periods: 0–5 years, 5–10 years, and more than 10 years. Each strategy and supporting action is outlined on the following pages. Options for the funding strategy were gleaned from national and international entities.

**Legend:**
- Short-term: Implement recommendation within 0 to 5 years
- Medium-term: Implement recommendation within 5 to 10 years
- Long-term: Implement recommendation beyond 10 years
- Ongoing: Phased/multi-stage implementation within 0-5 years to beyond 10 years
- Study: Conduct a study on recommendation options to explore viability
- Planning: Evaluate through planning process prior to implementation
- Implementation: Implement final result of planning
Strategy One:

Reengineer MTA’s way of doing business by creating “a new MTA” that is more efficient, transparent, and accountable to the public and that gets the right work done faster and cheaper.

To more effectively build and manage a resilient system, deliver service, preserve the trust of its riders and stakeholders, and maintain its position on a global stage, the MTA must first ensure that its house is in order. This means implementing business process improvements and organizational efficiencies, large and small, with a focus on continuous improvement in all areas from internal business processes, to operations, and capital improvements. This work on the back office of the system will translate to better planning and investment decisions, more expeditious project delivery, more effective provision of service, and consequent benefits to the customer. More effective and efficient investments will lead to a more resilient system, one that is flexible and responsive to implementing projects and using alternative approaches during unforeseen events, and able to recover quickly from stresses on the system. Better spent dollars across all areas means the ability to allocate resources towards increasing capacity and more reliable and resilient service.

To this end, MTA has been actively working to reduce costs, integrate services and adhere to project budgets and schedules. To provide better transparency to the public on the status of its efforts, MTA implemented the Capital Program Online Dashboard and Performance Management Program. The creation of the Small Business Mentoring Program (SBMP) and Small Business Federal Program (SBFP) have brought in more contractors and increased competition for the Capital Program.

The MTA has also undertaken a number of initiatives to reengineer its budget and financial process for greater transparency and to rethink how it implements its capital program. New strategies include the component repair program, post-Sandy “on-call” procurement strategies, the “FASTRACK” approach of targeted shutdowns to gain time for key maintenance while minimizing customer inconvenience, line closures, and piggybacking capital projects to get more done at once. Through its “Gates” strategy, MTA now reviews every capital project at each stage of development to ensure that the project is on track to deliver intended benefits at the lowest cost and to avoid delays and cost overruns. The MTA has moved to reliability-centered maintenance programs throughout the agencies to ensure that assets continue to perform to their full value before they are replaced, while the ongoing Enterprise Asset Management system will ensure that integrated decision-making and priority investments continue to be made. Building upon these efforts, the MTA must remain diligent in wringing efficiencies from its operations, and capital programs must become more externally responsive.

This first strategy focuses on further ways to improve the way MTA delivers projects and provides customers with measurable value. To achieve this objective, the MTA must continue to employ more alternative delivery and non-traditional project, financial, and organizational structures to maximize the use of private sector expertise and more efficient procedures where they are most appropriate. To assist with implementing more efficient procedures, the MTA should empower an Innovative Delivery Unit to reform business processes across the spectrum from selecting the project through to the project’s delivery. The MTA’s goal should be to become the “Public Partner of Choice,” by all those competing for MTA projects so as to maximize competition and reduce costs. It will do so by addressing barriers to success in procurement, contracts, regulations, and project execution. A key component of this strategy is investing in the Agency’s workforce for the future, partnering with local firms and universities, and making information more accessible and customer-friendly. Strategy One addresses key challenges facing MTA’s future by:

FASTRACK Brochures
Source: MTA
<table>
<thead>
<tr>
<th>Challenge</th>
<th>Response</th>
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<tbody>
<tr>
<td>Climate Change</td>
<td>* Improving the Agency’s ability to deliver capital projects that will increase the resiliency of the system against the effects of climate change.</td>
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<tr>
<td>Growth</td>
<td>* Improving business processes to increase the Agency’s ability to deliver expansion projects.</td>
</tr>
<tr>
<td>Institutional Barriers</td>
<td>* Reviewing regulations and processes across the operating agencies and with involved local agencies to reduce redundancies and improve the ability to effectively and efficiently deliver projects.</td>
</tr>
<tr>
<td>Retrofitting the System for Technological Innovations</td>
<td>* Relying on the expertise of project delivery partners to increase knowledge-sharing and incorporation of efficient technologies for project execution and operation.</td>
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Strategy One Implementing Actions

- Establish a dedicated Innovative Delivery Unit that will enable the MTA to more efficiently and effectively implement investments in its system, accelerate resiliency, and enhance the trust of its riders and stakeholders.
  - Reform project delivery by reengineering procurement, contract provisions, and project execution to be best in class. (Medium-term)
  - Identify opportunities to use more alternative delivery and non-traditional project, financial, and organizational structures. (Short-term)
    - Every project must be evaluated to identify the most cost-effective delivery option, such as Design-Build, public-private partnerships, and other risk sharing mechanisms where appropriate. (Short-term)
    - While encouraging risk sharing with the private sector and encouraging private investment, the MTA must improve its approval processes on private development projects and private construction of improvements to MTA facilities. MTA should consider including mechanisms such as seeking additional fees for expedited reviews. (Short-term)
  - Establish Integrated Project Teams to coordinate among internal delivery partners, optimize the contractual and working relationship between the MTA agencies, its contractors and involved local agencies, overcome cross-jurisdictional and regulatory delays, and foster knowledge sharing and innovation. Provide incentives for achieving goals and reducing risks and costs. (Short-term)
- Create early actionable improvements. Pilot improvements through capital projects as “proof of concept,” then use results to re-engineer processes throughout the agencies. Engage customers and industry for regular feedback for recommendations and impact of changes. (Short-term)
  - Spur MTA’s emphasis on innovation and collaboration with an Innovative Infrastructure Global Competition. (Short-term)

Public Commentary: Twitter

"@ReinventTranspo#MTAReinvention: @MTA should adopt #Transparency as core value. Financials, bonds, contracts, real estate as open data."

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### Denver Regional Transportation District (RTD) Alternative Project Delivery

**Eagle P3 Project:** Denver RTD is in the process of delivering one of the most ambitious expansions of public transit in the United States in recent history. The Eagle Public Private Partnership (P3) project is the first transit-related P3 project in the United States and is considered the national model for transit-related P3s. Denver RTD entered into a 34-year design-build-finance-operate-maintain (DBFOM) concessionaire agreement to deliver the entire Eagle P3 project, including 36 miles of new commuter rail lines, by 2016. This P3 project allows Denver RTD to retain all assets while transferring the risk for construction delays and cost overruns and the costs of long-term operations to the private sector, which accelerated project delivery and lowered project costs. During construction, the Eagle P3 project incurred substantial cost overruns. Based on the arrangement, DTP covered the cost overruns without any additional financial commitments from Denver RTD. Denver RTD was able to deliver the massive project by 2016, within 8 years of issuing the RFP, and at a total cost of at least $300 million less than original agency estimates. In addition, the private concessionaire arranged around $450 million of private financing for the project, allowing RTD to spread out large upfront costs over 30 years.

**T-REX Project:** In addition to this experience, Denver RTD also has prior experience with alternative delivery through a unique partnership with the Colorado Department of Transportation (CDOT). The Transportation Expansion Project (T-REX) was a multimodal project that included light rail and interstate widening on the I-25 corridor. The project was the largest multi-modal transportation infrastructure project in the history of Colorado, the first occurrence of a partnership between a regional transit agency and a state department of transportation, and one of the largest design-build transportation projects in the United States at the time. The T-REX project was completed in 2006, a total of 22 months ahead of schedule and 3.2 percent under budget, which was 2 years earlier and $39 million less than original agency estimates.
Vancouver TransLink Evergreen Line DBF Project

Design-Build (DB) project delivery (DB, DBB, DBOM, and DBFOM) has been identified as the Province’s “traditional” project delivery method because it ensures a greater level of cost and schedule certainty when compared to multiple contract scenarios. Under a DB contract, a single partner assumes greater project risk throughout the process and is incentivized to deliver the project faster and cheaper. One of the Province’s most successful DB projects to date is the Evergreen Line, an 11-kilometer extension of the existing SkyTrain Light Rail Transit (LRT) system in Metro Vancouver, currently under construction and estimated to open to revenue service in 2016. In 2012, the Province entered into a performance-based, fixed-price Design-Build-Finance (DBF) agreement with a single partner. The agreement allowed for optimal risk transfer to the partner and the implementation of a partner-led innovative tunnel boring technique that reduced construction costs, reduced schedule risk, and allowed for an accelerated 3.5-year timeframe for project delivery. The agreement included performance-contingent funding, which will only be awarded to the partner if various performance measures such as traffic management and environmental protection requirements are achieved. The partner also agreed to cover the additional risk of geotechnical conditions in the tunnel as part of its fixed-price contract. The 889 million CAD (787 million USD) fixed-price agreement includes a 255 million CAD (225 million USD) private financing component, which achieved additional savings of 134 million CAD (118 million) by matching cash flows during construction, reducing interest payments, and decreasing interest costs.

- Develop an internal “MTA Academy” focusing on skills that will be lost due to retirement (i.e., signal maintenance) and skills that present a significant challenge to MTA (i.e., technology). Bring in the appropriate expertise to develop these skills among professional and semi-skilled staff. Review internal processes to bring human resources and business processes up to date. (Short-term and ongoing)
  - Ensure that MTA has the best transit professionals in the world by creating an MTA Review Group to conduct market review of those positions that are hard to fill due to private sector competition (such as Program Managers), or that require highly specialized skills. The Group would also identify ways to foster a customer-centric culture within the organization, keep staff engaged and motivated and establish recruitment and retention mechanisms geared to attract and retain professional staff at all levels. (Short-term)
  - Conduct a top-to-bottom review, revision, and modernization of job descriptions, operating regulations, union contracts, union boundaries, and any other related business practices and processes in order to promote a human resources process that is world-class, effective, efficient, and creates an integrated service that allows operations to be flexible across jurisdictional boundaries. (Short-term)
- Leverage transparency and data sharing to unleash the innovative capability and process enhancements available from third party technology partners. (Short-term)
- Build on hugely successful data sharing to improve real-time rider information and trip planning, and other innovative, online, customer services by third party developers. (Short-term)

Opportunities include information on board budget packets, real estate holding and transactions, contracts, spending and professional service agreements, which should be published online in a machine-readable format.
- Conduct an MTA-wide review of available databases with the aim of encouraging creativity, accountability and efficiency. (Short-term)
- Make MTA information timely, accurate, and customer friendly. (Short-term)
- Make it much easier to track the progress of capital projects; provide accurate budgets, timetables, and the ability to sign up for electronic project updates. Utilize these data to anticipate and predict problems. (Short-term)
- Optimize internal spending by partnering with universities and technology firms to perform optimization studies and explore and develop future technologies (R&D). (Medium-term)

### Data Sharing: London TFL:

TFL publishes all board papers, contracts, consultations, complaint reports, internal audits, performance data, and common Freedom of Information (FOI) requests on its “Transparency” website. The TfL Rail and Underground Annual Benchmarking Report identifies best practices and compares TfL’s performance measures with other international metros. This annual report is designed to increase efficiency, transparency, and accountability. According to its 2012 report, recommendations from detailed benchmarking studies over the past year are expected to create £90 million (141 million USD) in additional efficiencies.

### Achieving Efficiency: London TFL

In 2009, TfL launched the Savings and Efficiencies program, which has committed to savings of £16 billion (25 billion USD) by 2021. The program emphasizes the importance of reducing the bottom line by primarily focusing on cash savings. According to the 2013 Business Plan, TfL has already secured nearly £12 billion (18 billion USD) in cash efficiency savings, effectively freeing up cash for the agency to make future strategic decisions to expand existing service or improve upon its core infrastructure. The remaining £4 billion (6 billion USD) in savings will be achieved by reducing back-office expenditures and driving out inefficiencies in front-line services and capital investment programs over the next seven years.

One of the program’s most notable successes includes a number of secured efficiencies related to the phased implementation of the Oyster card payment system. The contactless smart card technology began phased implementation in 2003. Today, customers can use the Oyster card to purchase fares on the Tfl’s transit system as well as most National Rail services in London. The technology was widely successful, sparking a number of efficiency savings for the agency. Wide use of the Oyster card altered customer purchasing patterns, drastically reducing the need for ticket offices. In an effort to address this inefficiency and improve customer service in the stations, TfL advanced front-line staff to more visible roles and removed unnecessary operational roles primarily in the London Underground network. In addition, the agency implemented direct Oyster card procurement, terminated a large private fare collection and ticketing contract for the London Underground and London bus services, and removed cash fare payments on buses.
Strategy Two:

Accelerate core capital investment in good repair and sustain investment in the future to maximize the system’s safety, reliability, and resiliency.

Transit infrastructure — much like a house as it ages — requires constant attention, maintenance, and investment to ensure that it is resilient against unforeseen events, safe, secure, reliable, and equipped to handle the next wave of innovations and improvements. The MTA Capital Program — the set of investment projects the MTA undertakes in each five-year cycle — consists primarily of these types of investments that are designed to ensure that the system is resilient, and is maintained at a level that allows the system to perform its basic operations. Staying ahead of the continuing need for core investment in the system is fundamental to keeping the system running on a day-to-day basis, and providing sufficient capacity and redundancy to ensure that the system can be flexible during emergencies and recover quickly. Knowing the challenges the region faces, including the physical threat of climate change, preserving a steady level of investment in the system — and making that investment the number one priority — is fundamental to ensuring that current and new riders can reliably use the system on a daily basis as well as during emergencies.

Since the establishment of MTA’s Capital Program in the 1980s, bringing its core infrastructure into a state of good repair has been a primary objective. The graffiti-filled, unreliable system of the 1970s was transformed into what it is today, made possible by investments made through the Capital Program. Due to those investments, today key assets are in good repair, such as subway cars, mainline tracks and switches. These complex infrastructure rehabilitation and replacement projects have been implemented while maintaining service, as exemplified by the complete rehabilitation of the Long Island Rail Road’s Atlantic Avenue Viaduct. Because of this investment, the existing system has been able to accommodate significant increases in ridership and changing patterns of travel.

Rehabilitation of LIRR Atlantic Avenue Viaduct

Source: MTA

Atlantic Avenue Viaduct Rehabilitation

This viaduct has carried LIRR trains and customers between downtown Brooklyn and Jamaica since 1901. The 3-year rehabilitation project, completed in 2011, strengthened and repaired the existing 199 steel spans supporting the track over Atlantic Avenue, and installed new and improved track structure and lighting along the viaduct. To ensure that minimum disruption was felt by the busy neighborhoods along the project, much of the construction was conducted on the weekends. The LIRR maintained full service during the duration of the project, single tracking trains to guarantee that customers had access to LIRR service throughout construction.
But even as assets are brought into good repair, ongoing investment must be sustained to keep them healthy and maintain a resilient system. Unfortunately Superstorm Sandy destroyed many assets that had previously been replaced. However, repairs to these and other core assets are now being made to enable them to withstand future severe weather events. (MTA has already begun implementing its Sandy repair projects, incorporating many of the recommendations from Governor Cuomo’s 2100 Commission.) As assets are replaced, the MTA has been enhancing the system’s resiliency through increased design standards in order to address future extreme weather events. Investments are made to optimize capacity and redundancy in the system to ensure that operators can respond flexibly during emergencies and avoid failure points and to provide riders with adequate and effective alternatives. Through the introduction of new technologies like Communications-Based Train Control (CBTC) and Positive Train Control (PTC), that improve capacity, reliability, and safety, the MTA is replacing older, mechanical systems resulting in increased flexibility and responsiveness across the system.

Despite this regular investment, the core repair needs of the MTA’s trillion dollar asset base on an ongoing basis are currently estimated to cost between $5–$8 billion per year, a figure which has always exceeded the MTA’s available funding. MTA, like all urban rail systems, has assets that are operating well beyond their useful life. This can compromise the reliability of the system, increase daily delays, and prevent the system from realizing its full capacity. These assets often require ever more frequent maintenance to ensure safety and ongoing functionality, placing a growing burden on the operating budget. Ultimately, the customers bear the consequences of this underfunding of investment needs.

With its implementation of an Enterprise Asset Management system, MTA will be better able to prioritize among the thousands of assets needing replacement, but investment in these assets must accelerate. This second strategy focuses on prioritizing a substantially more aggressive and sustained program of core infrastructure investments and making those priorities the ironclad foundation of the MTA’s capital program. This can only be accomplished by accelerating capital investment to bring and maintain all assets in good repair, ensuring ongoing annual investment levels to maintain core infrastructure and ensuring that investments are designed to withstand expected extreme weather and to serve the public in emergency situations. Strategy Two addresses key challenges facing MTA’s future by:

<table>
<thead>
<tr>
<th>Challenge</th>
<th>Response</th>
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<tr>
<td>Climate Change</td>
<td>Adopting resiliency standards into accelerated and sustained core infrastructure investments so the system can withstand climate change impacts.</td>
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<tr>
<td>Growth</td>
<td>Ensuring the ongoing reliability of the existing system to handle existing ridership, freeing up capital investment for expanding system capacity.</td>
</tr>
<tr>
<td>Institutional Barriers</td>
<td>Fostering interagency consistency and priority setting through enterprise asset management.</td>
</tr>
<tr>
<td>Retrofitting the System for Technological Innovation</td>
<td>Replacing core assets with ones that offer technological benefits that increase operational and maintenance efficiencies and improve communications.</td>
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Capital Program Benefits in the State

Dollars spent on core capital investment projects benefit not just the MTA region, but the entire State of New York. Much of MTA’s rail rolling stock rehabilitation and new rail vehicle assembly has taken place in Upstate communities such as Elmira, Plattsburgh, and Hornell, providing thousands of jobs in these areas.
Strategy Two Implementing Actions

- Bring and sustain the MTA system in a state of good repair and ensure safety, reliability, and resiliency by annually meeting its core capital investment needs. (Ongoing)

- Accelerate implementation of capital investments to bring all assets into good repair. (Ongoing)
  - Improve the process of selecting, prioritizing, and delivering capital and core infrastructure investment projects to address asset condition as well as meet customer expectations and save time, especially by using line closures and similar techniques. (Ongoing)
    - Continue to apply improved design and resiliency standards to investments to strengthen the system’s ability to withstand extreme weather events. (Ongoing)
    - Subway line closures should be undertaken where MTA can ensure decent, reasonable, reliable alternative means of transportation. Given the challenges of line closures (identifying sufficient alternate service and customer impacts), NYCT must take full advantage of closure by planning and scheduling all capital work required in the area of the closure. (Ongoing)
    - Conduct a survey or a referendum of riders to confirm their preference for shorter-term line closures versus longer term off-peak and weekend disruptions to gain regional support for such closures. (Short-term)
  - Communicate the benefits of core capital investment projects to riders, the public, elected officials, and other stakeholders. (Short-term)

- Design infrastructure improvements to withstand expected climate change, as discussed in the Introduction and Appendix of this report, and to serve the public in emergency and other situations. (Ongoing)
  - Build system resiliency and protect transit assets against severe weather events by adopting and implementing worldwide best practices to target investments to improve resiliency of the MTA network. (Ongoing)

- Continue adoption of specific 2100 Commission recommendations and report regularly to the public on status of those efforts. (Short-term and ongoing)

- Incorporate information about the level of investment required to maintain and replace MTA’s core infrastructure into the annual discussion of MTA’s Financial Plan so all stakeholders have an understanding and appreciation of the system’s requirements. Currently it is MTA’s practice not to anticipate the cost and impact of capital expenses until there is an approved Capital Plan. (Short-term)

Select 2100 Commission Recommendations:
- Relocate sensitive equipment in subway tunnels
- Reinforce water penetration points in stations
- Seal electrical equipment against water infiltration
- Install mechanical below-grade vent closures to prevent water from entering ventilation shafts
- Ensure the availability of high-capacity mobile pumps to respond to unpredictable flooding situations