



AMERICAN SOCIETY OF CIVIL ENGINEERS NEW YORK STATE COUNCIL



INFRASTRUCTUREREPORTCARD.ORG/NEW-YORK



CROTON GORGE PARK AT THE BASE OF NEW CROTON DAM IN WESTCHESTER, NEW YORK

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2022 New York Report Card Executive Summary

Volunteers for the American Society of Civil Engineers (ASCE) evaluated infrastructure systems based on publicly available information. Individual infrastructure categories were scored and graded based on the factors of Capacity, Condition, Operation and Maintenance, Public Safety, Funding, Future Need, Resilience, and Innovation. Effort was made to score infrastructure categories by the same metrics. New York State earned an overall grade of C compared to C- in 2015. While this indicates an improvement, the state's infrastructure is still in mediocre condition.

New York's transportation network, especially in the New York City metropolitan area, is under immense strain in the context of an environment where needs outweigh available funding. Broadly, State and Local agencies have utilized coordinated funding solutions to make improvements in recent years, however there is serious concern for the adequacy of future funding. Half of the State's roads are in fair or poor condition, 10% of its bridges are in poor condition. Reduced ridership during the pandemic has exacerbated shortfalls for aviation and transit operations, leaving significant budget shortfalls looming in the coming years.

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Recent supply chain issues and congestion have demonstrated the essential role America's multimodal freight network serves in the national and global economy. New York supports one of the busiest port systems in the U.S., along with 3,279 miles of rail lines. Ports and the smaller freight railroads face substantial funding backlogs to maintain and prepare structures for future needs. While the majority of freight rail is privately supported, the Port Authority of New York New Jersey has identified a capital need of \$20 billion to replace mission-critical wharf structures, greatly exceeding financial resources. Passenger rail also faces severe maintenance shortfalls as Amtrak's Northeast Corridor faces a \$38 billion backlog.

Reduced ridership during the pandemic has exacerbated shortfalls for aviation and transit operations, leaving significant budget shortfalls looming in the coming years.

Water, waste management and leisure infrastructure are critically impactful aspects of public welfare, and unfortunately often overlooked. Funding for public parks decreased 6% in 2021 compared to 2020. While the state has abundant freshwater resources, water and wastewater systems are among the oldest in the country, and many of New York's dams were built before modern design standards. The 20-year need for drinking water is estimated at \$44.2 billion, and wastewater systems will required \$38 billion through the same period. Discovery and regulation of new environmental contaminants will be a point of greater emphasis for water and wastewater systems in the future. Solid Waste was found adequate, with approximately 16-25 years of available landfill capacity, but recycling lags behind the national average.

It should be noted that this Report Card was written and released during an exceptional period of time, as the State and nation wrestle with the effects of a lingering pandemic, and international events threaten global economic stability. Consideration of these factors is outside the scope and experience of our authorship, but we have made comments to their regard as appropriate.

About The Report Card for New York State's Infrastructure

While you may not think about infrastructure every day, civil engineers do because we have pledged to build it, maintain it, and keep the public safe. As an organization of civil engineers who live and work in New York State, we want to share what its condition is and what can be done to improve it.

Methodology

The purpose of the Report Card for New York's Infrastructure is to inform the public and decision makers of the current condition of our state's infrastructure in a concise and easily accessible format of a school report card. Each of the categories of infrastructure covered in the Report Card is assessed using rigorous grading criteria and recent data to provide a comprehensive assessment of the area's infrastructure. ASCE has used the following criteria to discuss and grade the state of the infrastructure:

CAPACITY

Does the infrastructure's capacity meet current and future demands?

CONDITION

What is the infrastructure's existing and near-future physical condition?

FUNDING

What is the current level of funding from all levels of government for the infrastructure category as compared to the estimated funding need?

FUTURE NEED

What is the cost to improve the infrastructure? Will future funding prospects address the need?

OPERATION AND MAINTENANCE

What is the owners' ability to operate and maintain the infrastructure properly? Is the infrastructure in compliance with government regulations?

PUBLIC SAFETY

To what extent is the public's safety jeopardized by the condition of the infrastructure and what could be the consequences of failure?

RESILIENCE

What is the infrastructure system's capability to prevent or protect against significant multi-hazard threats and incidents? How able is it to quickly recover and reconstitute critical services with minimum consequences for public safety and health, the economy, and national security?

INNOVATION

What new and innovative techniques, materials, technologies, and delivery methods are being implemented to improve the infrastructure?

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GRADING SCALE



EXCEPTIONAL: FIT FOR THE FUTURE

The infrastructure in the system or network is generally in excellent condition, typically new or recently rehabilitated, and meets capacity needs for the future. A few elements show signs of general deterioration that require attention. Facilities meet modern standards for functionality and are resilient to withstand most disasters and severe weather events.



GOOD: ADEQUATE FOR NOW

The infrastructure in the system or network is in good to excellent condition; some elements show signs of general deterioration that require attention. A few elements exhibit significant deficiencies. Safe and reliable with minimal capacity issues and minimal risk.



MEDIOCRE: REQUIRES ATTENTION

The infrastructure in the system or network is in fair to good condition; it shows general signs of deterioration and requires attention. Some elements exhibit significant deficiencies in conditions and functionality, with increasing vulnerability to risk.



POOR: AT RISK

The infrastructure is in poor to fair condition and mostly below standard, with many elements approaching the end of their service life. A large portion of the system exhibits significant deterioration. Condition and capacity are of significant concern with strong risk of failure.



FAILING/CRITICAL: UNFIT FOR PURPOSE

The infrastructure in the system is in unacceptable condition with widespread advanced signs of deterioration. Many of the components of the system exhibit signs of imminent failure.



INCOMPLETE

The infrastructure in the system or network does not have sufficient data to provide a grade.



Recommendations to Raise the Grade

- We applaud recent increases in infrastructure funding. However, the additional funding is short-lived, and today's safety needs and tomorrow's climate risk demand substantial, predictable, and equitable funding sources. The gas tax, congestion pricing, and other fees deliver consistent support to transportation systems New Yorkers depend on, especially public transportation. More equitable infrastructure requires we permanently strengthen funding methods. Transportation equity requires choice among universally affordable, accessible, and high-performing travel options.
- Coming out of the COVID-19 pandemic, we have realized there are a variety of variables that impact our daily lives that will continue to evolve and change. New York needs to reassess its infrastructure goals in light of new lifestyles, commuting patterns, and a changing climate.
- 3. Progress has been made to increase the lifespan of infrastructure systems and engineers are now designing assets to last between 75 and 100 years. However, more can be done. Policy changes are needed that allow for the testing of new materials, utilization of new construction techniques, and broader adoption of alternative project delivery methods, including design-build.
- 4. There is an acute shortage of agency staff with the skills and expertise to operate and maintain our infrastructure facilities, as well as manage and administer new projects. Workforce challenges present a major issue to many agencies and departments at the State and local levels, with retirements resulting in a loss of institutional knowledge and the effects of an evolving job market leave some agencies shorthanded. Expanded technical training and apprenticeship programs are needed to address the operational worker shortfalls and general STEM programming can help interest young New Yorkers in engineering and science fields from an early age.



LOWER MANHATTAN AND BROOKLYN BRIDGE IN NEW YORK CITY



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EXECUTIVE SUMMARY

New York State has 131 active, public aviation facilities. 19 of these facilities provide commercial service, such as LaGuardia and Syracuse International Airports. More than 500,000 New York jobs are related to aviation, contributing over \$6 billion in state and local tax revenue each year.¹ Over 97% of runways are considered in good or fair condition. Investment in airports since 2017 is approximately \$1.18 billion, not including CARES Act or COVID-19 relief funding. However, capacity at commercial and general aviation airports can be a challenge. The infrastructure funding gap was estimated from 2017 to 2026 to be \$2.5 billion at non-PANYNJ airports; the shortfall rises to \$13.7 billion when PANYNJ airports are included. Investment is necessary to keep up with projected growth in passenger and air cargo volumes.

CONDITIONS & CAPACITY

New York State has 131 active, public aviation facilities. Each supports the state in being a metropolitan center, tourist destination, and international gateway to the rest of the United States. Of the public airports, 19 offer commercial service. The Port Authority of New York & New Jersey (PANYNJ) reports growth of 3.3% annually from 2009-2019, with more than 93 million travelers using New York's top two airports in 2019.

Passenger travel in aviation was severely impacted in mid-2020 by the COVID-19 pandemic. However, passenger traffic is returning to pre-pandemic levels quickly. New passenger forecasts have emerged from industry trade groups to monitor the effects of COVID-19 on air passenger travel. Only the USA-Mexico market has consistently exceeded 2019 levels of passenger traffic at the time of this writing. There have been peaks in summers and around holidays during which individual airports experienced passenger demand near or exceeding 2019 levels. The trend of passenger traffic indicates that airports need to continue planning for growth as the world emerges from COVID-19 passenger travel restrictions."



AIR TRAFFIC CONTROL TOWER AT JFK





Mar. 7-13: A4A Member Airline Passenger Volumes Were 14% Below 2019 Levels Domestic Air Travel Down 12%, International Air Travel Down 25%



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Air cargo experienced a sudden and sustained growth during the pandemic. Air cargo's importance is ever increasing as a link for transporting medical and commercial goods in the booming e-commerce economy. Research on "uncrewed" aerial systems (UAS) is taking place at Syracuse and Rome airports, which is another indicator that there is growing aviation activity in New York State. Please see the section on Innovation at New York airports.³ Aviation activity remains strong and continuous in New York.

By 2045, passenger demand through New York City's three closest airports, Newark Liberty International, John F. Kennedy International, and LaGuardia (EWR, JFK, LGA) is expected to increase to 212 million annual air passengers, or 177% of 2015 levels. New York City based JFK and LGA are expected to handle 66% of these passengers. LGA is undergoing an \$8 billion redevelopment program, which will improve the airport's terminals and taxiways in preparation for 34 million annual air passengers in 2034. A proposed AirTrain would create a rail link directly to the airport from regional transportation and off-site employee parking facilities. At JFK, passenger demand is expected to exceed capacity three-fold by the mid-2020s. Sufficient capacity is imperative to keep the economic tap of the aviation economy open. The New York/New Jersey region loses approximately \$140 million in annual wages, \$400 million in sales, and 2,500 jobs for every million passengers who are not accommodated.⁴

OPERATIONS AND ENPLANEMENTS					
Airport Category	2015	2020	2025	Growth Rate	Average Annual Growth Rate
National / Commercial					
Enplanements	48,421,167	53,622,543	58,100,197	19.99%	1.99%
Operations	1,649,505	1,717,361	1,760,849	6.75%	0.68%
Operations					
Regional / Corporate Business	684,769	689,362	693,571	1.29%	0.13%
Local / Community Business	390,724	390,850	391,327	0.15%	0.02%
Local / General Aviation	90,975	91,204	91,438	0.51%	0.05%
Total Operations	2,815,973	2,888,777	2,937,185	4.30%	0.43%

TABLE A1: FORECAST ACTIVITY BY AIRPORT CATEGORY (NEW YORK) – OPERATIONS AND ENPLANEMENTS

Table Note: Values, including 2015 and 2020, were retrieved or forecasted in 2018. Source: State Aviation System Plan Table 5-12.

Table A1 is a summary of forecast activity. It shows forecasts as well as enplanements. Airfield operations and enplanements are fundamental indicators of aviation activity. They indicate the frequency of passengers and cargo using the airport, thus influencing facility requirements at the terminal, building, roadway, and auxiliary facilities. 86 of the 131 public use airports in New York State are included in the National Plan of Integrated Airport Systems (NPIAS), which is the system of airports that are considered substantial to air transportation in the United States (U.S.). Airports that are included in the NPIAS are eligible for funds under the Airport Improvement Program (AIP funds). AIP funds can be applied to specific elements of an airport that are directly related to air navigation, such as runways. In the FAA's 2015-2019 report to congress, 97.5% of runways in the NPIAS are considered in good or fair condition. In New York State, airports (including those that are not included in the NPIAS) are found to be in good condition, as shown in the Table A2.

TABLE A2: AIRFIELD PAVEMENT CONDITIONS IN NYS (TABLE 3-8 OF NEW YORK STATE AVIATION SYSTEM PLAN)

Airfield Pavement Condition	Number of System Airports	Percentage of System Airports
Fair	12	9%
Good	93	71%
Excellent	20	15%
Water (Seaplane Bases)	6	5%
Total System Airports	131	

Table Notes: FAA Advisory Circular 150/5320-17 defines pavement condition as: Excellent – new pavement less than five years old; Good – recent sealcoat or possibly requiring repair of open cracks and joints; and Fair – possibly requires new surface treatment, patching, and joint repair.

General aviation, typically known to the public as smaller propeller aircraft and private jets, is prevalent across New York State. The National Plan of Integrated Airport Systems (NPIAS) designates certain airports as general aviation, however any airport can facilitate general aviation activity if they accommodate private aircraft or fixed-base operator terminals.

According to the 2018 State Airport System Plan (SASP), there is latent demand for general aviation that is constrained by the availability of hangars and the condition

of taxiway pavement (see Tables A2 and A3).⁵ Airfields have a maximum operational capacity, similar to a highway has a maximum capacity that may be reached at rush hour. At some airports, airfield capacity can accommodate more aircraft operations than the number of based aircraft, like a highway that has more lanes than are required for the number of houses it connects to a central business district. Repairing taxiway pavement affirms the availability of airfield pavement—essentially the local roads and driveways of an airfield—and maintains airport capacity.

TABLE A3: AIRCRAFT STORAGE SUMMARY (TABLE 3-10 OF SASP)

Status	Based Aircraft Hangar	Conventional Hangar
Sufficient	32%	31%
Not Sufficient	30%	29%
Unreported	34%	36%

The state's aircraft tax exemption has been seen to increase interest in general aviation. The tax exemption is helping to realize latent demand for general aviation and utilize airports' full capacity. The tax exemption, which became effective in September 2015, alleviates the tax burdens on aircraft owners who keep their planes in New York State. By permitting owners to base their aircraft without sales and use taxes, the owners are more likely to choose a New York State airport than if the exemption did not exist. Each aircraft based at an airport produces business from the maintenance, storage, operation, and fuel sales related to the aircraft. Hence, the tax exemption also increases the likelihood of jobs and business associated with aviation. Increased interest in general aviation increases demand for hangars at regional and local airports.⁶ Increasing the number of based aircraft can help airports capitalize on the full capacity of their airfields and increase their revenue.

OPERATIONS, MAINTENANCE

Maintenance is required at various intervals for all airport facilities. Airports that receive federal funding file Airport Capital Improvement Programs (ACIPs) and master plans. These documents serve as short-range and long-range planning documents. The production of master plans, however, binds the airport to certain land uses because master plans are approved by the Federal Aviation Administration (FAA). Airports can apply to change land use through the FAA.

Large airports, especially those that serve as commercial hubs, often have their own maintenance teams. The services provided by these maintenance teams could include asphalt repair, pavement marking repair, sign manufacturing, landscaping, and custodial services. Airports that are governed on the county or municipal level may employ the local department of public works or contracted companies for their maintenance requirements.

Maintenance services can be supported through grants, especially if the funds are for the purchase of safety equipment. Equipment could include, but is not limited to, firefighting vehicles, de-icing equipment, and snow removal equipment. Funding for new equipment is often derived from passenger facility charges (PFCs). These

FUNDING AND FUTURE NEED

Continued investment in aviation is necessary to accommodate increasing demands. The New York State Department of Transportation identified the following capital investments needed for the state's airport system:

- Taxiway pavement rehabilitation;
- Navigational aid and meteorological reporting;
- Obstruction mitigation per FAA design standards;
- Opportunities for revenue generation;
- Sustainability initiatives, including solid waste diversion and recycling programs;

Investing in aircraft storage and airfield pavement will enable growth in New York's general aviation sector.

are charges that are applied to the fares of departing passengers and must be approved by the FAA. PFCs are regarded by airports as important revenue sources. These same fees are seen by airlines as burdens on their customers that decrease airlines' competitiveness. PFCs have been capped at \$4.50 per departing passenger since 2001, hence its buying power has decreased in proportion to inflation for over two decades.

Airports must consider climate change and sea level rise in their plans for operations and maintenance. Among the threats to airports is the increased frequency of heatwaves and high temperatures. Many maintenance jobs are performed by human beings on the tarmac. The aviation industry needs to plan now for preventing and mitigating the effects of heat stress and heat stroke. This can be done through increasing the number of employees and increasing break frequency. There is research proposed by the Airport Cooperative Research Program (ACRP) on autonomous airside vehicles. Implementing robotics to complete tasks can protect humans from the dangers of heatwaves, too.

Further discussion about adapting New York's airports for climate change and sea level rise can be found in the resiliency section below.

- Perimeter security fencing;
- On-site fuel and facility services; and
- Hangar capacity to meet airfield capacity.

Federal grant and funding sources

Airports included in the National Plan of Integrated Airport Systems (NPIAS) may be eligible for funding through the Airport Improvement Program (AIP). Publicuse airports may be eligible to collect Passenger Facility Charge (PFC) fees on passenger tickets and services, however, the PFC rate is capped at \$4.50 and needs to be raised to synchronize with inflation. AIP and PFC revenue only can be applied to projects related to specific safety, capacity, security, and environmental programs, requiring airports to seek other methods of funding for projects that are not directly related to aviation activity.

Recent legislation allocates funding for infrastructure, including airports in New York State. In August, 2021 New York State Senator Charles E. Schumer announced that the Infrastructure Investment and Jobs Act (IIJA) allocates \$28 million federal funding for Albany International Airport, a direct benefit to New York's Capitol Region and the state overall. The package will allow for Albany International to begin new infrastructure projects to improve passenger experience.⁷ Statewide, the IIJA allocates \$685 million to airports across New York State.⁸

State grant and funding sources

According to the 2018 New York State Airport System Plan, approximately \$2.5 billion in capital investments were needed from 2017 to 2026 at non-PANYNJ Airports. Approximately \$13.7 billion in investments were necessary when PANYNJ airports are included⁹. Total investment in airports since 2017 was approximately \$1.18 billion, not including CARES Act or COVID-19 relief funding (see Table A4 below).

New York State's grant program, The Upstate Airport Economic Development and Revitalization Competition, is an application-based program that started in 2016. An additional \$230 million were added to the program in 2021, which will provide funding to projects with successful applications through 2026. New York State included \$20 million extra for the Aviation Capital Grant Program, which supports general aviation and business aviation airports.

Status	Estimated Funding
2016 Upstate Airport Economic Development Program	\$200 Million
Allocations under 2021 Infrastructure Investment and Jobs Act LGA & JFK Combined Non-LGA or JFK	\$137 Million \$84 Million \$53 Million
2021 Upstate Airport Economic Development Program	\$250 Million
NYS Aviation Capital Investment Program	\$20.7 Million
2017-2020 Airport Improvement Program Funds (not including CARES or COVID-19 pandemic relief) JFK Only LGA Only SWF Only (Including pre-PANYNJ acquisition) Non-PANYNJ AIRPORTS Only	\$573 Million \$85.5 Million \$17.2 Million N/A \$470.3 Million
TOTAL Non-PANYNJ 2017-2021	\$994 Million
GRAND TOTAL 2017-2021	\$1.18 Billion

TABLE A4: RECENT AND PROJECTED FUNDING 2017-2021

Table Sources:

1. 2017-2020 AIP Grants: https://explore.dot.gov/t/FAA/views/AIPTableauDashboard-Public_16287828377070/Start?:showAppBanner=false&:display_count=n 2. 2021 Infrastructure and Jobs Act Funding: https://www.faa.gov/bil/airport-infrastructure

Opportunities for non-aeronautical revenue

through Section 163

The FAA Reauthorization Act of 2018 Section 163 gives airports the ability to utilize their property for nonaeronautical uses. Real estate developers are interested in non-aeronautical facilities near airports, some of which can generate aviation business. Proposals that meet

PUBLIC SAFETY & RESILIENCE

Safety, security, and resilience are paramount in aviation, including at airports and their surrounding communities. New York State has emphasized the need for sustainable energy solutions and federal compliance with airport security fencing.

Investment in sustainable energy solutions

Solar panels are encouraged to increase the use of sustainable and resilient energy solutions. In October 2021, Governor Kathy Hochul announced funding for local airport projects across the state, including solar power generation, upgraded solid waste and recycling, FAA design standards and adhere to the filed Airport Layout Plan (ALP) could generate revenue for airports. Reviewing such proposals requires airport resources to evaluate a project, communicate with the FAA, and work with developers to protect the area for safe air navigation.

equipment to continue operations in inclement weather, perimeter security improvements, and airport access improvements.¹⁰ Additionally, the FAA's Voluntary Airport Low Emission (VALE) program is a resource for funding. Several airports in New York State participate in VALE programs, including Syracuse Hancock International, Greater Rochester International, Westchester County, Stewart International, and Albany International airports. In the image below, JetBlue's electric ground support vehicles (eGSE's) are charging at stations that were funded by a VALE grant awarded to the Port Authority of New York & New Jersey's JFK International Airport.



Image of electric ground support vehicles at JFK. Retrieved from http://blueir.investproductions.com/investor-relations/press-releases/2019/09-26-2019-170227350 on March 20, 2022.

Security planning and perimeter fencing

The Transportation Security Administration (TSA)

established guidelines for safety and security at public-use airports. In line with these guidelines, New York requires most general aviation facilities to register an airport security plan every three years. The goal of a security plan is to actively detect intruders and respond to them before they can damage themselves, the airport, or the airport's assets. A typical security surveillance system can eventually locate a breach; however, active detection and surveillance decreases response times, which is crucial when a trespassing event could induce high delay times and costs for the airport and have a scary effect on traveling passengers. Ultimately, a security plan outlines ways to delay intruders (e.g. perimeter fences, active security checkpoints) and decrease response times to apprehend

RESILIENCY

New York is vulnerable to the impacts of sea-level rise and storm surge. Although the state has engaged several regional and multi-agency programs aimed at climate resiliency, there are no formal, state-wide policies specific to aviation. Individual airports and agencies may have programs related to resiliency. For example, the Port Authority of New York and New Jersey adopted Climate Resilience Design Guidelines in 2015. As a result, ongoing redevelopment projects in coastal New York City account for sea-level rise to mitigate risks to the airport's mechanical and communications equipment. Asset management plans that are focused on business continuity during extreme storm events are important in maintaining a resilient airport system. Continuity of airports' mechanical and communications equipment during extreme weather is paramount for the safety of airport patrons and employees. In addition, continuity of airport operations improves supply chain resiliency, meaning that communities served by airports can receive supplies during extreme events.

an intruder. To further emphasize the importance of having a security plan in place, airport perimeter breaches occur in the U.S. approximately once every ten (10) days.

In New York State, all airports that are classified as national or regional have a security plan as of 2018, Meanwhile, not all airports classified as local have a security plan. Only half of all airports have a security plan in place as of 2018.¹¹ Security fencing is required by federal law for the protection of airfields from pedestrian trespassers and to protect unattended aircraft parking areas. Additional projects are required at regional and local airports to meet federal security fence requirements.¹²

Warmer temperatures brought on by climate change will strain the airport workforce. Developing a workforce that is interested in aviation maintenance and operations is imperative to ensure that New York is equipped with personnel to keep aircraft moving. Employees at airports, especially those with commercial and business services, are subject to weather elements when operating on the ramp and when performing maintenance on aircraft. While sustainable and resilient capital projects will help in the broader picture of climate change, planning efforts must consider employee wellness programs. The workforce must be equipped to handle heat stress and extreme weather risks when appropriate. Risks may be mitigated by hiring a larger workforce that works fewer hours outside and by providing cooling features in work areas. Automating certain processes through autonomous vehicles is another way to begin mitigating these risks.

INNOVATION

New York airports are on the cutting edge of innovation. Syracuse Hancock International Airport (SYR) is a host of the FAA's Airport Uncrewed Aircraft Systems (UAS) Detection and Mitigation Research Program, and is a starting point for the state's 50-mile Drone Corridor between Syracuse and Rome.^{14,15} UAS present opportunities for the efficient delivery of consumer and medical goods, personal transportation, and public safety, including national defense and firefighting. Drones, considered a form of UAS, have become popular among everyday consumers and hobbyists. Objects entering the airspace, including drones operated by well-meaning citizens, could result in flight delays if they pose a risk to commercial flight activity. These flight delays are cumbersome in New York's dense airspace and have a ripple effect across the nation. Continued research like that at SYR is important to keep the airspace safe and efficient for all users.

Nationwide, there have been developments to project funding and delivery structures. In 2019 the Chicago Department of Aviation selected three Construction Managers at Risk to administer \$116 million contracts for project delivery as part of the O'Hare 21 program. This project delivery method transfers risk to the contractor, allows for streamlined scheduling, and provides opportunity for minority and women owned businesses. Agencies in New York State could adopt a similar project delivery method.



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Aviation



RECOMMENDATIONS TO RAISE THE GRADE

- Invest in hangar capacity and taxiway pavement improvements at local and regional airports to capitalize on airside capacity
- · Invest in projects that improve airport access for passengers and cargo
- Accelerate sustainability and resiliency through renewable energy, waste recycling, extreme weather event planning, and security planning
- Remove the cap on Passenger Facility Charges (PFCs) to allow access to flexible funding
- Create opportunities for non-aeronautical revenue by encouraging airports to utilize airport-owned land under the FAA Reauthorization Act Section 163

Aviation



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EXECUTIVE SUMMARY

New York State (NYS) has made significant strides in advancing its bridge program, from high profile replacements of critical lifeline bridges, such as the Governor Mario M. Cuomo and Thaddeus Kosciusko Bridges, to the reconstruction or replacement of hundreds of smaller bridges to improve resilience to flooding events. However, much more work remains to be done: NYS has over 17,500 road and highway bridges, carrying 176 million vehicles/day, whose combined length could stretch from Albany, NY to Miami, FL. Almost 10% of NYS bridges are in poor condition, which is above the national average; and 637 bridges¹⁵ are posted for less than legal loads. The federal Infrastructure Investment and Jobs Act, coupled with the subsequent 2022 New York State Budget will go a long way to addressing the state's bridge needs, but we still fall short of the total need.



Bayonne Bridge Raising / ACEC Grand Conceptor Award / Courtesy of WSP

CONDITION & CAPACITY

NYS has the 13th largest bridge inventory in the nation¹¹, including 6 international bridge crossings with Canada. The New York State Department of Transportation (NYSDOT) owns and maintains approximately 43%¹¹ of the overall total, the remainder of the bridges are owned by authorities, counties, and local governments.

Bridges are given a condition status of "good", "fair", or "poor" per Federal Highway Administration (FHWA) guidelines. While not unsafe, bridges in poor condition, also known as structurally deficient bridges, are those that require significant maintenance, rehabilitation, or replacement of load carrying elements. In NYS in 2021, 1,672 bridges¹⁶ (9.5%) are in poor condition, slightly higher than the nationwide percentage of $7.0\%^{16}$. This is a decrease from the 2015 NYS Report Card, when 12% of NYS bridges were in poor condition. To remain in service, structurally deficient bridges are often posted with weight limits. In 2021, 637 bridges¹⁵ (3.6%) were load posted; and of the 1,672 bridges in poor condition, 312 bridges¹⁵ were load posted.





Coal Dock Lane over Amtrak, Hyde Park Emergency Repair to Reopen Bridge with 10 Ton Posting Courtesy of Peter Melewski, LLC

FUNDING AND FUTURE NEED

Funding

In 2016, the NYS transportation budget included \$9.95B for the Department of Transportation including both Federal and State funding. Since then, this allocated budget has dropped as low as \$8.3B between fiscal years (FY) 2017 to 2020. The FY 2021-2022 budget included \$9.5B dedicated for the Department of Transportation that's responsible for the construction, reconstruction and maintenance for the State's highways and bridges¹. Programs such as Bridge NY have given local bridge projects a boost in funding to address the safety of our bridges. Between 2016 and 2022, Bridge NY has awarded \$541.3M for the rehabilitation of 231 bridges². Strategic infrastructure investments have enhanced the quality of life for residents and businesses in every region of NYS and have provided unprecedented support for making New York's communities more resilient to the impacts of climate change. The Bridge NY 2021 Program had a minimum of \$150 million (\$90.6M Upstate NY / \$29.4M NYC / \$16.2M Hudson Valley/ \$13.8M Long Island)³ dedicated over 2 years to address: poor structural conditions; mitigate weight restrictions or detours; facilitate economic development, increase competitiveness; improve resiliency and reduce the risk of flooding. A total of \$584.9M was requested through 240 applications, 52 of which were awarded a total of \$162.7M². As shown in Table-1, the Bridge NY program is oversubscribed, with almost quadruple requests for funding as was able to be awarded. This emphasizes the need to invest more funding to be dedicated for the replacement and rehabilitation of bridges in poor condition.

Round	Awarded Projects	Amount Awarded (in millions)	Submitted Projects	Amount Requested (in millions)
2016	93	\$167.70	Not found	\$422.30
2018	86	\$210.90	259	\$905.60
2021	52	\$162.70	240	\$584.90
Total	231	\$541.30	499	\$1912.80

TABLE 1- BRIDGE NY PROGRAM - BRIDGE PROJECTS



Interstate 787, Albany, NY. Courtesy of Doug Obernesser, EMI Guiderail LLC

The implementation of the Extreme Winter Recovery (EWR) program was driven by the catastrophic damages of 2012 Superstorm Sandy. It provides funding through the state's Consolidated Local Street and Highway Programs (CHIPS) to aid municipalities' efforts to maintain roads and bridges, mainly given the impacts of severe weather⁴. The FY 2021-22 budget, enacted on April 1, 2021, adopted \$100M for the EWR program^{5, 6,} which is an increase from \$65M from the previous fiscal year.

FHWA's Office of Innovative Program Delivery has included the bundling of 12 early 20th century steel pony trusses in the Hudson Valley as a case study in their national 2022 "Advanced Project Bundling" quick start reference document for transportation agencies^{7, 8}. It is important that collaboration and information sharing among all stakeholders be encouraged to assure that funds are optimized across the state.

On Monday, November 15, 2021, President Biden signed the landmark "Infrastructure Investment and Jobs Act" (IIJA) into law. The IIJA is considered the single largest dedicated bridge investment in over 50 years. NYS can anticipate receiving \$1.9B for bridge replacement and repairs over five years. NYS can also compete for the \$12.5B Bridge Investment Program for economically significant bridges and nearly \$16B of national funding in the IIJA dedicated for major projects that will deliver substantial economic benefits¹⁴.

Subsequently, the NYS 2023 Budget was passed on April 9, 2022 and includes a record high \$32.8B five-year spending plan for NYSDOT and the local road network. The final allocation to bridges will be determined in the months ahead via the work of the Metropolitan Planning Organizations (MPOs) and the State Transportation Improvement Program (STIP).



CR 113 over Battenkill River, Washington County. Courtesy of Fort Miller Co., Inc.

Future Need:

The future needs will have to factor in current outstanding bridge needs and proactively plan for changing trends. In the past, travel patterns were predictable, however currently the new economy and the challenges presented from COVID-19 have brought a substantial shift to the habits of the traveling public. Many of these needs and expectations will define the next decade and can redefine the needs placed on the state's surface transportation infrastructure. and will need to be expanded: cashless tolling - open road tolling (ORT), electric charging stations, and the Congestion Pricing (Central Business District Tolling Program, CBDTP) currently in progress in NYC. These concepts change travel patterns, truck routes, and thereby change bridge restoration priorities. A new factor for 2022 is the return of inflation, and the accessibility of certain construction materials, which will adversely impact the number of bridges that can be addressed. The need for "living" five year programs that adjust as needed to optimize bridge expenditures are more important than ever.

Thaddeus Kosciusko Bridge (Twin Bridges), NYSDOT D262025. Courtesy of Fort Miller Co, Inc.

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For example, some new concepts have been implemented

INNOVATION

Innovation is important in design and construction practices, administration, specifications, and procurement to assure that NYS utilizes life cycle costs in all phases of project decision making and can optimize every tax and toll dollar. Innovations reduce project time, minimize user impact, and improve safety for contractors and the traveling public. In recent years, NYS has initiated and advanced the following:

- Design-Build: this approach is when the contractor and designer work together to accelerate the replacement of major lifeline bridges, and to reconstruct/replace hundreds of bridges susceptible to flooding.
- Model Based Design: NYSDOT, working with industry stakeholders such as the NYS Association of General Contractors, initiated their first model based bridge replacement contract in 2021.
- Ultra High Performance Concrete (UHPC): this type of concrete optimizes durability and performance in demanding conditions.
- Collaboration: local stakeholders, not-for-profit organizations, and public agencies have been working together to stabilize and reopen for Amtrak safety and public enjoyment, many historic steel pony truss bridges that span Amtrak and provide access to the Hudson River in Hyde Park, NY.
- RESILIENCY

The 2009 closure of the Lake Champlain (Crown Point) bridge due to condition, and the destruction caused by 2011 Hurricane Irene and 2012 Superstorm Sandy highlighted the need for and lack of resilience in portions of the state's bridge and associated roadway network. In recent years, NYS has been proactive - with available funds - to address critical lifeline bridges and their associated routes to assure that they remain open in the future during natural or man-made disasters. New lifeline bridges are being designed to withstand the maximum credible natural events and tampering/terrorist threats. New design codes are constantly being updated to reflect the latest climate Life Cycle Cost Specifications: working with the FHWA, specifications for concrete, steel and reinforcement are regularly updated to assure that bridges meet or exceed the 75–100 year performance criteria. Prefabricated bridge components are common in high volume locations to minimize traffic delays and quality during construction.



"3D" Project, D264093 Route 28 over Esopus Creek, NYSDOT, H&B Bridge Constructors, Dennis Lee Photography

change projections. For example, the Port Authority of NY and NJ developed guidelines for design of resilient infrastructure¹³. The Guidelines are intended to maximize the long-term safety and operations of numerous critical gateways to the region (airports, bridges and tunnels, rail stations, and seaports) even as climate change increases the frequency and intensity of natural hazards. The challenge will be the ability to stay ahead of the increasing demands of climate change.

OPERATIONS AND MAINTENANCE

A proper bridge maintenance program keeps a bridge in its "as-built" condition. It includes routine work such as cleaning, painting, restoration/repair of pavements and repair of elements damaged by impact, fire or flood. Maintenance is a relatively inexpensive way to significantly extend a bridge's service life,¹² both delaying and minimizing the costs and disruptions associated with full replacement. Maintenance also reduces the risk of accidents to the traveling public. Road and highway bridges in New York State are owned by several entities such as, NYSDOT, municipalities, Authorities and Commissions. Each owner is responsible for the maintenance of their bridges. Owners routinely share information and identify effective maintenance activities. Where federal funds were used to rebuild landmark bridges, the federal government sees the value of protecting its investment and provides funding to help maintain those bridges.



Manhattan Bridge Inspection, Rope Access, Courtesy of STANTEC

PUBLIC SAFETY

Public safety is the engineer's foremost priority. Bridge adequacy can be estimated by examining the federally mandated Bridge Inspection Reports. For example, the Reports show that fewer hazardous or potentially hazardous conditions (Red Flags) were found in 2018 than in 2014. Furthermore, since 2015, the quantity of poor bridges has decreased, fair bridges have increased, and good bridges have remained steady. Therefore, this indicates a positive trend but still showcases a lackluster comparison to the national average. Trends are useful but public safety requires constant vigilance, the ability to plan and act quickly, stakeholder coordination, and an effective public outreach program.

The importance of preventative maintenance as a cost-effective O&M and public safety tool cannot be understated. For example, the NYS Bridge Authority has a well-deserved reputation for their robust preventative and corrective annual maintenance program that have saved significant capital expenses over the years for their five major Hudson River bridge crossings.



Loring Crossing Bridge over East Branch Tioughnioga River, Cortland County, NY.

Courtesy of Barton & Loguidice, D.P.C.

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²⁰²² REPORT CARD FOR NEW YORK'S INFRASTRUCTURE www.infrastructurereportcard.org/newyork

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Bridges

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RECOMMENDATIONS TO RAISE THE GRADE

- All bridge owners should embrace Life Cycle Costs (LCC) in making their bridge decisions. Encourage local agencies to bundle bridge projects together to gain efficiencies in cost and schedule
- Continue advancing alternative delivery methods in an economically efficient manner. Optimize design, construction and materials practices that embrace the LCC approach.
- Encourage coordination among bridge owners to identify and implement proactive best management practices for preventative maintenance.
- Bridge funding needs to find creative financing sources to overcome the chronic underfunding.¹⁰
- It is imperative, regardless of the funding sources, that viable multi-year "living" maintenance and Capital Programs are a management priority.
- Educate all stakeholders on the state and local level of the critical value that proactive and routine maintenance provides in economically extending the life of our bridge investments. Maintenance should no longer be the first thing cut when dollars become tight – the opposite should be true.
- Address the "orphan bridge" issue. For example, numerous historic steel truss bridges, of significant civil engineering historical value and on the state historic register, are in danger of being lost forever due to prolonged ownership and maintenance squabbles between Railroad agencies, state agencies and local governments. A similar situation has evolved in the Ausable Chasm area where two large historic bridges are closed, impacting the local economy and quality of life for residents, and imposing potential safety risks as conditions worsen.



1878 Upper Bridge in Keeseville (closed). Courtesy of Matthew Pray

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Bridges



RECOMMENDATIONS TO RAISE THE GRADE (CONT.)

- Initiate a statewide study in 2022 that assesses the impact of the COVID-19 pandemic, such as working and shopping from home, will have on travel patterns and the number of trucks on state and local roads in the years ahead.
- Transparency in the reporting of transportation agency data in a timely fashion to all stakeholders is imperative.
- State transportation agencies should start rebuilding their in-house staff. The loss of institutional knowledge, and the lack of qualified personnel to perform essential duties that only agency personnel can perform, is negatively impacting the advancement of the bridge programs.
- Expand the BRIDGE NY program by allowing counties to utilize public-private partnership (P3) contracts with contractor/designer teams to enable their bridges to be replaced now, and pay back over a period of time.⁹



FDR National Historic Site Bridge over Amtrak (closed). Courtesy Jeff Anzevino Photography



Bridges

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Fall, 2021 Groundbreaking for the \$44.6M Contract to reopen the Wurts Street Bridge between City of Kingston and Town of Esopus.Courtesy Brian Hollander.

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EXECUTIVE SUMMARY

New York dams are vital to the state's infrastructure, providing water supply, flood protection, hydroelectric power, and recreational spaces.

On average, New York's dams are significantly older than those across the rest of the United States, and many of them were built before modern design standards. The average New York dam is 86 years old (74 years for state-regulated dams), while the national average is 57 years.

Over the decades, populations have developed land downstream from these aging dams. When built, these dams held no risk to human life, but the increasingly populated areas are leading to growth in the number of High Hazard dams. Between 2015 and 2020, the number of High Hazard dams grew from 394 to 408.

Fortunately, 97% of these High Hazard dams have Emergency Action Plans in place and a robust inspection program. Additional aid for maintenance and rehabilitation comes from limited funding provided by state and local governments, between \$5 and \$10 million over the past two years. After thorough assessments, we know more about these High Hazard dams' risks, but unfortunately, the current funding is inadequate for full mitigation.

CONDITION AND CAPACITY

Many of New York's dams were built between 1950 and 1975 and are now exceeding their original design life of 50 to 75 years. As many as 450 dams are considered





NUMBER OF DAMS BUILT BY YEAR IN NYS

The majority of NY State's dams were built between 1950 and 1975 and are now exceeding their original design life of 50 to 75 years (grey dotted line). As many as 450 dams are considered deficient to modern design standards.

Source: New York State Comptroller Report, 2018.

²⁰²² REPORT CARD FOR NEW YORK'S INFRASTRUCTURE www.infrastructurereportcard.org/newyork

that more of New York's dams will be found deficient in the coming years.

Increased scrutiny driven by NY State's Dam Safety Regulations (enacted August 19, 2009) has uncovered issues with dam infrastructure including design deficiencies, deterioration, and poor maintenance. As we learn more about large floods and earthquakes,

FUNDING

Public funding available for dams in NY State comes from federal, state, and local governments as well as some nongovernmental organizations. The funding available is a small portion of the funding estimated to be required to maintain dams in a safe condition. Various grants are available through FEMA, NRCS, New York Works, and the Department of Environmental Conservation (DEC). In the past two years, annual funding has totaled between \$5 and \$10 million. For example, DEC funding in 2021 included \$766,000 for dam rehabilitation across the state. A 2016 report by ASDSO estimated that the cost to rehabilitate the nonfederally owned dams in the US at \$60.7 billion, including \$1.1 billion in NY State alone (ASDSO, 2016).

OPERATION & MAINTENANCE

Dams are classified by risk, depending on what impact on property and life loss the dam may have if it were to fail. The failure of a dam that is classified as high-hazardpotential is anticipated to cause a loss of life. Dams are classified as significant-hazard potential if damage to we find that dams often have not been designed to handle the future projected events. Furthermore, new development downstream of existing dams can increase the consequences of a dam failure driving the need for remediation work to protect those that live downstream. Often, neither the dam owner nor those that live in harm's way are aware of the risks.

The Infrastructure Investment and Jobs Act, signed by President Biden in November 2021, includes \$595 million for High Hazard Potential Dam Rehabilitation grants. This funding is a positive step forward but still falls well short of the identified \$60 billion in needs. Considering the proactive stance of the federal government in funding the rehabilitation of infrastructure it is surprising that there is so little funding available for these structures whose inadequacies create a large hazard to the public. Because of the extreme consequences of dam failure, waiting for an accident to bring the need to the forefront of people's minds is unacceptable.

property would likely occur in the instance of a failure. Low-hazard potential dams are those where failure would result in no probable loss of human life and low economic and/or environmental losses.



NEW YORK STATE DAMS BY HAZARD CLASSIFICATION (2018)

Source: Dam Infrastructure: Understanding and Managing Risks, Office of the New York State Comptroller, June 2018

According to the Dam Safety Performance Report, released by ASDSO in 2018 (ASDSO, 2018), every High Hazard dam in New York is receiving its required state regulatory inspection, which is an improvement from approximately 95% inspected in 2010. These



Also encouraging – 97% of High-Hazard potential dams have an Emergency Action Plan or EAP. EAPs provide dam owners and public safety officials with the appropriate procedures and communications network needed to minimize loss of life in the event of a dam emergency.



regular inspections are critical for spotting potential safety hazards. However, state regulators still lack the capacity to keep up with the permits, reports and questions that dam owners need reviewed in a timely manner.

PERCENTAGE OF STATE-REGULATED HIGH HAZARD POTENTIAL DAM INSPECTIONS COMPLETED

Nearly all High Hazard dams in New York are receiving their required annual inspections which is a good improvement. These annual inspections are critical for spotting potential safety hazards.

Source: New York State DEC Dams Data, 2015-2020, acquired via FOIL request.

A properly written and promulgated document provides the lines of communication to emergency managers and information on the downstream areas affected, giving opportunity to preplan flood response and for these areas to be evacuated during an emergency.

2018 EMERGENCY ACTION PLAN DATA FOR STATE-REGULATED HIGH HAZARD POTENTIAL DAMS

A properly written and promulgated EAP provides the lines of communication to emergency managers and information on the downstream areas affected, giving time for these areas to be evacuated during an emergency.

Source: New York State DEC Dams Data, 2015-2020, acquired via FOIL request.

Many dams are owned by individuals, small homeowner associations or similar, that lack the ability to finance large scale repairs to appropriately address safety concerns. Funding from the state and federal government in the form of grants is vital to preserve public safety. The Water Resources Development Act of 2020 passed by Congress in December 2020; expanded the list of eligible dams and made other provisions to protect public safety and national security putting our nations' dams on a better trajectory toward improved operation and maintenance.
PUBLIC SAFETY

Dams are one of engineering's greatest triumphs, providing countless benefits including water supply, flood protection, navigation, and recreation. However, dams also carry inherent dangers. Failure of large dams can destroy entire cities and have done so in the past. Not many structures built by man have the same consequence of failure.

In NY State, three major issues have impeded large scale improvements in dam safety:

- The state's dams have an average age of 74 years (DiNapoli, 2018), an indication of increasing risk of safety issues due to normal aging and deterioration. When considering all dams in the state, including those outside the jurisdiction of the state dam safety office, the average age jumps to 86 years, according to the U.S. Army Corps of Engineers' National Inventory of Dams.
- 2. Dams initially constructed away from development and according to guidelines appropriate for Low Hazard dams now have populations downstream causing their hazard classification (and resulting design criteria) to be lower than required. As a result, between 2015 and 2020, the number of High Hazard dams has grown from 394 to 408 (NYS DAM CATALOG, 2020). The costs associated with High Hazard dams are significantly higher due to reporting, inspections, and emergency planning required.

3. A better understanding of extreme weather events and earthquakes has improved significantly in recent decades. As this body of knowledge increases, it is apparent that in many cases, the design events required to provide resiliency are larger in magnitude and frequency than previously thought and designed for years ago.

The risks to public safety and infrastructure from New York's 408 High and 570 Intermediate Hazard dams (NYS DAM CATALOG, 2020) have become increasingly known in the last five years. Today, 70% of High Hazard dams have condition ratings that are logged in the National Inventory of Dams.

A growing concern involving public safety and dams has been the increase in fatalities and injuries at low head dams throughout the US. In a 2014 survey of state dam safety officials conducted by ASDSO, officials estimated NY State has 200-300 low head dams (Tschantz, 2014). Low head dams create hazardous flow conditions that trap and drown people. These hazardous flow conditions are neither obvious nor commonly understood. Since dams and the lands nearby dams are public destinations for a wide range of activities, there is a need to communicate the hazards of low head dams. Some states are installing warning signs at dams, developing low head dam databases, and performing outreach to communicate these hazards.



DANGER LOW HEAD DAM AHEAD

Hazardous Recirculating Currents Below Dams Have Trapped And Drowned Victims



COMMUNICATING THE HAZARDS OF LOW HEAD DAMS

RESILIENCY

Because of the forces involved in holding back large quantities of water, dam infrastructure tends to be substantial such that minor degradation and deficiencies are not normally catastrophic. Working against this paradigm is the unforgiving nature of water in regards to load application (water can find and exploit weaknesses in structures like most other applied loads cannot) and variability (climate change affects the magnitude and frequency of storm events). Dams designed only a few decades ago are now found to lack sufficient spillway capacity to safely pass required design flood flows. With insufficient spillway capacity, dams may overtop causing

INNOVATION

Recent improvements in computerized dam breach modeling coupled with high resolution LiDAR terrain data has greatly improved our understanding of the potential consequences of dam failures. With these advances, engineers can provide highly accurate inundation mapping allowing emergency managers to plan evacuations in the event of a dam emergency.

Recent studies of local hydrology to determine more up to date rainfall values have also improved estimates of inflows dams must be designed to handle. As our modeling failure and contributing to flooding, property damage, and potential loss of life.

A greater focus on and understanding of dams and their potential emergency conditions by state and local emergency managers in recent years has greatly enhanced public safety. Updated technology such as NY Alert Emergency Notification System coupled with more accurate dam breach modeling and inundation mapping helps pinpoint and notify those in danger during potential emergency situations.

capabilities and understanding of climate change and its influence on rainfall events expands, we become better prepared for potential disasters and better informed of dam infrastructure needs that increase resiliency and address climate change impacts.

An increased amount of communication between dam owners, regulators, engineers, and emergency management better equips a team to respond in the event of an emergency, saving time, resources and lives.



Kensico reservoir dam located in Valhalla, NY



Dams



RECOMMENDATIONS TO RAISE THE GRADE

- Increase funding for rehabilitation of High and Intermediate Hazard dams. Fully fund the national dam rehabilitation and repair funding program to cost-share repairs and increase NY Works funding for publicly owned, non-federal, High Hazard dams.
- Improve funding for regulators to inspect, monitor and regulate dams. State dam
 safety officials are responsible for independent safety inspections as well as reviewing
 documentation of planned work. Maintaining enough trained staff is critical to achieving
 competent, and independent reviews of the safety of the NY State dams. Many states,
 such as South Carolina have as many as 20 staff to oversee the dam safety program,
 New York has approximately 8 full time dam safety officials for approximately the same
 number of dams.
- Provide funding for signage, a NY State low head dam database, and outreach to reduce the drowning risk near low head dams.
- Educate the public regarding the risks posed by living downstream of dams:
 - Inform the public about the dam condition rating and hazard classification system.
 - Engage a multi-discipline state level panel to assess hazard creep and to develop recommendations for addressing existing and future development downstream of High hazard dams.
 - Notify landowners if the land is in a breach inundation zone during any real estate transaction so they are aware.
- Provide training for dam owners and operators to educate them the NY State Dam Safety Regulations and regulations that are in place from the State.
- Enforce the development and annual updating of EAPs and encourage annual exercises.
- Streamline permitting requirements for dam removals to lessen the barriers that dam owners currently face when contemplating a dam removal.

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EXECUTIVE SUMMARY

Nearly 95% of New Yorkers are served by one of the 9,000+ public water systems across the state. In general, drinking water investment has not kept pace with the demand. The 20-year need for drinking water infrastructure is estimated at \$44.2 billion, but water system revenue has only been growing at about the rate of inflation and the overwhelming majority of proposed improvements go unfunded. Increasingly stringent water quality regulations, aging water treatment and distribution systems — some over 100 years old — and reduced net revenue are just a few of many challenges throughout the state. Despite the challenges, water system operators continue to do an excellent job maintaining supply and meeting regulations. Additionally, utilities are doing what they can to prepare for future challenges; all large and medium size systems have completed a risk and resilience assessment of their water systems, further helping them to understand and prioritize their needs to efficiently invest their limited capital resources.

CONDITION & CAPACITY

The overall condition of drinking water infrastructure in New York State is "fair." There are many water systems in the state with assets that have far exceeded their useful service life, including in-service transmission and distribution mains from the 1800s that still exist. Nearly 40% of New York City's pipes were placed prior to 1941, which is similar to many other utility systems throughout the state. The large number of vintage mains, coupled with insufficient budgets for replacements, yields 100-200year system replacement intervals. This is unsatisfactory given the design life of the installed infrastructure, which is typically 50-70 years for pipes and 20-40 years for core components at treatment plants. As replacement is deferred, repairs become more frequent and costly.



In NYS, many water treatment plants were constructed from ~1970-1990. Many of these also have core components that are nearing or exceeding their useful service life. In general, water treatment facilities are in better operating condition than the pipes they discharge to as regulatory agencies have done a commendable job inspecting treatment facilities and ensuring they are in sound working order.

In New York State, water sources consist of ground water, surface water, or a combination of both. The majority of the state's population is served by surface water. Several systems are served by sources classified as groundwater under the direct influence of surface water (GUDI). NYS does experience drought conditions throughout its boundaries from time-to-time, however, the state is home to an abundance of freshwater sources that are generally resistant to drought. Unlike western U.S. states that rely on desert-strewn reservoirs, NYS is fortunate to be bordered by the Great Lakes and include watersheds throughout the Adirondacks and Catskill regions and substantial groundwater resources on Long Island.

Much of NYS benefits from an abundance of raw water capacity, but source water contamination risks vary statewide. Water treatment plants were typically sized to accommodate future needs, and with the relatively stagnant industrial growth throughout much of NYS, there is not a widespread concern of water treatment plants being undersized. Larger utilities have the resources to track future capacity projections and plan/implement changes accordingly, unlike many small-to-medium sized systems.

Water use in the state is concentrated among population centers, with NYS 2020 total water use depicted in the graph below (less Nassau & Suffolk Counties).



https://www.dec.ny.gov/lands/67073.html

Treated water loss is a sizeable issue throughout much of NYS, especially when compared to the Environmental Protection Agency's (EPA) industry goal of 10% or less unaccounted water. Public water systems are required to submit their unaccounted water volumes to the New York State Department of Environmental Conservation (NYSDEC) on an annual basis, and it is not uncommon for some utilities to have upwards of 40% unaccounted for water.

Unaccounted-for water results in lost revenue potential, decreased system capacity, and increased treatment

and pumping costs. These excess energy and chemical costs hinder a utility's progress towards increasing system sustainability and resilience. While leak detection programs are utilized by many water utilities throughout the state, smaller systems tend to struggle to fund these programs. Older water meters (the cash registers of the water industry) can also be a significant source of unaccounted water as meter accuracy declines with age. Meters in general under-register over time and fail to then generate the associated revenue, further compounding infrastructure challenges.

OPERATIONS AND MAINTENANCE (O&M) & FUNDING

Funding and financing for water infrastructure comes from a variety of sources, including revenue from water rates, property taxes, and federal and state financing.

In 2015, a statewide initiative was conducted to determine how much funding was being spent on water infrastructure. That year, local governments, excluding authorities and private water companies, in New York reported collecting an estimated \$1.1 billion in water fund revenue. The bulk of this revenue (\$889 million, or 79% of total revenue) was from fees and charges related to the sale of water. Many water funds also received property tax revenue (\$171 million, or 15% of revenue). Only a small amount of municipal water revenue comes from other sources (\$65 million, or 6%), including grants and aid from the state or federal government.

In 2015, New York's water authorities reported \$4.6 billion in revenues. NYC's water system accounted for \$4 billion of the revenue alone. These figures do not account for the revenue of private water companies, which provide water to most of Rockland County and a significant amount of Nassau County, and therefore they slightly understate the state-wide revenues, which together were in excess of \$5.7 billion in 2015. It also does not cover private wells, which supply users in many less-developed areas of the State. In general, municipal water systems account for the bulk of water revenues collected in most regions. Not all of the revenue goes towards renewal and reinvestment and a large percentage is the annual O&M of the systems.

In 2008 the New York State Department of Health (DOH) estimated the 20-year need for drinking water infrastructure at \$38.2 billion, excluding dams (\$44.2B 2021 value). In 2017, the Office of the NY State Comptroller acknowledged this estimate of need and that, despite several funding programs, it had not diminished. Annual revenues for water systems since that time has remained relatively flat, growing at a compound annual rate of 1.8% between the same time period, averaging around the national rate of inflation. Despite continued investment across the state, progress is generally not being made to reduce the overall need.

While infrastructure continues to age, treatment needs and regulations are increasing. Current issues such as lead service line replacement, Per- and Polyfluoroalkyl Substances (PFAS), cyanotoxins, and other emerging contaminants challenge public water suppliers and largely were unforeseen needs and costs. Drinking Water State Revolving Fund (DWSRF) sources may be used to assist water systems with investment but cannot meet the need alone. 95% of the drinking water infrastructure improvement projects submitted to the DWSRF program since 1996 have not received financial assistance. The funding challenge is one of scale. Most funding programs provide millions in support, but the statewide need is in the billions.



Otisco Lake Dam, Marcellus, New York

²⁰²² REPORT CARD FOR NEW YORK'S INFRASTRUCTURE www.infrastructurereportcard.org/newyork

It is unfeasible to meet existing O&M needs along with new and increasing challenges while revenues remain flat, barely meeting the rate of inflation in general. More needs to be done to consistently increase water system revenues across the state. As a whole, public water systems remain in a reactive and as-needed basis of infrastructure renewal and have failed to achieve the financial and technical capacity necessary to get ahead of the need. Resistance to rate increases and a lack of public understanding of the need makes proactive decision-making challenging. Despite the challenges, water system operators continue to do an excellent job maintaining supply and meeting regulations. Thus, the public does not perceive the crisis and the water supply remains an underappreciated "silent service." However, each year the state's infrastructure continues to age and the cost of repair and replacement increases.

The last few years have added additional challenges, as the COVID-19 pandemic has significantly impacted received revenue and revenue projections. Water "shut-offs" were prohibited from early 2019 through 2021, which resulted in challenges to utilities providing services without payment. Many businesses were closed or working under reduced conditions, and colleges and grade schools relied on remote learning, which significantly reduced billings for those respective accounts during the pandemic. This caused widespread shortfalls between revenue

projections and received billings from utilities across the State. Additionally material costs have escalated rapidly, outpacing budget projections and inflation. Many utilities are facing budget overruns for treatment chemicals, power, and the materials used to build and repair the water systems and must cut back on capital expenditures to maintain solvency.

Approximately 70% of the state's population is served by one of the 15 entities represented below in Table 1. This means that there are still nearly 9,000 other smaller water systems that serve 30% of the state's population. This highlights the great discontinuity in water system needs within the state and the challenges associated with the long-term O&M of all the water systems. Depreciation, maintenance, and replacement costs disproportionately affect smaller water systems whose population base is often too small to adequately absorb increasing O&M costs. Continued regulatory challenges and pressure by the state and federal government to improve water quality, even if marginally, further challenge water systems as a whole. All the while, the NYS population has experienced fluctuations since 2016 and during times of population decline there are fewer ratepayers to finance infrastructure repairs and improvements. This effectively leads to accelerated rate increases for those that remain within a shrinking ratepayer system.



30 MG Terminal Reservoir, Clay, NY

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TABLE 1: LARGEST WATER SYSTEM OPERATORS IN NEW YORK STATE, 2016

System	Service Area	Population Served	Water Source	Typical Monthly Water Cost*	Notes
New York City Water System	New York City	8,271,000	Surface (Catskills/ Delaware and Croton Watersheds)	\$61.12	
Suffolk County Water Authority	Suffolk County	1,100,000	Ground	\$29.22	unavailable
Monroe County Water Authority	Suburban Monroe County and Parts of Surrounding Counties	496,753	Surface (Lake Ontario, Hemlock Lake)	\$40.38	\$102.3M
Erie County Water Authority	Suburban Erie County	480,939	Surface (Lake Erie, Niagara River)	\$38.04	Operates 15 Systems
Suez Water (United Water)	Parts of Rockland and Westchester Counties.	471,028	Ground and Surface (Lake DeForest)	\$111.85	Private Water Company - 3 Systems
New York American Water	Parts of Nassau County	422,540	Ground	\$92.71	Private Water Company - 4 Systems
Onondaga County Water Authority	Suburban Onondaga County and Parts of Surrounding Counties	300,000	Surface (Lake Ontario, Otisco and Skaneateles Lakes)	\$42.89	
Buffalo Water Authority	City of Buffalo	276,000	Surface (Lake Erie)	\$48.19	
Rochester City	City of Rochester	214,000	Surface (Hemlock and Canadice Lakes)	\$50.00	
Yonkers City	City of Yonkers	196,086	Surface (Purchased from NYC System)	\$79.16	
Syracuse City	City of Syracuse	192,000	Surface (Skaneateles Lake)	\$46.68	
Mohawk Valley Water Authority	Parts of Herkimer and Oneida Counties	130,000	Surface (Hinckley Reservoir)	\$61.08	
Water Authority of Western Nassau	Part of Nassau County	120,000	Ground	\$48.67	
Town of Hempstead Water Department	Part of Nassau County	110,000	Ground	\$20.18	
Albany City	City of Albany	101,082	Surface (Alcove Reservoir)	\$42.83	

Source: Safe Drinking Water Information System, United States Environmental Protection Agency, https://www3.epa.gov/enviro/facts/sdwis/search.html. * Cost for residential customer using 12,000 gallons per month. Calculated by the Office of the NYS Comptroller (OSC) based on information from each water system for the latest available year. Municipal water systems may also be funded with ad valorem or benefit assessments.

FUTURE NEED

Efforts to increase water system revenue have been hindered by declines in the per-capita consumption of the average residential water user and population fluctuations. Not only do water rates and fees need to increase to balance population and consumption trends, but they also need to grow to mitigate inflation and to adequately fund the renewal and improvement of the water systems.

The movement from real property tax-based revenues to metered water sales in the form of fees, combined with the more recent implementation of low-flow water fixtures and efficient appliances, has decreased water usage greatly. Between 1990 and 2010, the per capita daily use of public water nationally declined from 153 gallons to 134 gallons. From 2000-2015 USEPA estimated NY State per-capita use at 76-100 gallons per day. Yet the water systems in many larger population centers predate these changes. While water conservation can help with water sufficiency issues and has clear environmental benefits, it also means that users must now pay higher prices per gallon for the water they still use in order to support the existing water infrastructure.



20MG + 30MG Eastern Reservoir, Manlius, NY

PUBLIC SAFETY

The importance of reliable and efficient water treatment and distribution systems is self-evident. Punctuated by the COVID-19 pandemic, the health of our communities is fundamentally predicated on the availability of clean water. The protection of our waterbodies, the prospects for energy savings, and future economic growth and development, are all linked to our ability to maintain, and as necessary, upgrade these essential facilities.

However, many aged systems are struggling, and municipalities do not have the funds to adequately repair and replace the necessary water infrastructure while simultaneously balancing other needs. For example, PFAS have been found at high levels at select wells on Long Island and elsewhere in the state. Additionally, 1,4-Dioxane is prevalent, with 70% of Long Island wells found to have at least trace amounts of the contaminant, and several with many times above the

RESILIENCE & INNOVATION

Beyond financial, regulatory, and emerging contaminant challenges, New York has experienced a wide range of extreme weather events. They vary from hurricanes to severe winter storms and regional impacts of prolonged cold conditions. These events impact water system infrastructure in a wide range of ways and support the need for resilient and redundant design practices.

Drinking water resiliency refers to the ability of water infrastructure systems to withstand and recover from natural and man-made disturbances. Resilient infrastructure systems are flexible, agile, and able to recover after unanticipated disruption. Incorporating resiliency into drinking water infrastructure projects is not a new concept for water systems. When planning new projects, it is standard practice for water systems to perform analyses to support well-informed decisions new State standard of 1 ppb. Local water districts on Long Island recently announced they already had spent \$150 million to plan, construct and run the advanced treatment systems needed to remove 1,4-Dioxane and PFAS from groundwater, with hundreds of millions of dollars more to be spent over the next six years. The aggressive investment in this issue comes at a cost beyond the obvious upfront monetary outlay. Expenditures to address these concerns came at the expense of investment in other necessary elements of the water system. The combined estimated statewide capital cost for removing these emerging contaminants is estimated at over \$1.5 billion. This cost is an example of an unforeseen and unplanned investment that further highlights why over time we must continue improving the financial capacity. Even as existing infrastructure is upgraded, new and daunting challenges will arise.

that lead to smart, sustainable projects. Water systems have long been forward-looking since the lifespan of many infrastructure projects can be 50-100 years. Resiliency should continue to be incorporated upfront in the planning and design of every project. The Safe Drinking Water Act (SDWA) requires community water systems serving more than 3,300 persons to conduct a risk and resilience assessment of their water systems. Following the completion of the assessment, water systems must develop or update their emergency response plans (ERPs). As of February 2022, nearly all water systems have complied with the assessment, with only 11% of small systems (Serving Populations of 3,301 to 49,999 People) still outstanding. This further demonstrates that small systems are often most in need of support complying with regulatory mandates.

Drinking Water



RECOMMENDATIONS TO RAISE THE GRADE

Federal/State Funding for all regulatory-driven changes.

Water Utilities are issued additional financial burden in order to comply with new and evolving regulations. Any regulatory change (especially pending lead service line (LSL) replacement requirements) should be accompanied by funding packages to offset the new financial obligations.

Regulatory Requirements for Asset Management Implementation and development of "Best Practices Guide" for utilities.

The Guide should encompass technical, managerial, and financial components. This would particularly help smaller utilities that do not have the experience or resources for asset management implementation utilizing in-house services.

Provide technical support for municipalities who don't have the resources to evaluate and plan for the needs of their systems.

Raise Awareness for the True Cost of Water

Educating the public and policymakers about the value and true cost of water. Access to reliable and safe water requires effort, expense, and infrastructure. Current New York State water rates do not reflect the true cost of reliably conveying and treating water. Replacing antiquated pipes and treatment equipment will require significant local investment, and users should be aware of what their water rates will fund. Rates have often been kept artificially low at the expense of taxpayers and at the detriment of the systems.

Increase funding opportunities for water main replacements and tax exemption for large projects.

Projects that are centered around replacing deficient or functionally obsolete water mains do not typically score well with funding agencies. There should be a metric or a separate funding arm of the New York State Environmental Facilities Corporation Drinking Water State Revolving Fund (NYSEFC DWSRF) that goes directly for replacement of water mains of all sizes.

Promote tax cap exemption for water infrastructure programs so communities can fund projects at the necessary levels.

Implement an Engineering Planning Grant (EPG) program through NYSEFC DWSRF Program.

This "EPG" Program has proved successful for the NYSEFC Clean Water State Revolving Fund (CWSRF) Program in that it awards grants to fund engineering reports for a given utility. These engineering reports are the baseline for applying for larger grants and low-interest funding programs. These reports often help offset the technical and managerial capacity limitations of smaller utilities.

Provide additional incentive programs for small utility systems to consolidate into existing or proposed utility authorities.

Increased regulations, asset management/infrastructure planning, etc., puts an increasing burden on small systems with limited resources. Pooling resources and expanding the rate base make funding more achievable and improves technical and managerial capacity.

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Drinking

Water

Drinking Water



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Otisco Lake Water Treatment Plant, Marcellus, NY

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EXECUTIVE SUMMARY

Public parks benefit the New York State economy by generating over \$40 billion in consumer spending for the state each year and directly supporting 313,000 jobs. Parks also improve resilience to climate change and create habitat for species diversity. Moreover, COVID-19 changed the public's behavior, lifestyles, and work cycles that led to an increased dependency on parks. Against this backdrop, NYS parks funding decreased 6% in 2021 as compared to 2020. New York State Office of Parks, Recreation and Historic Preservation (OPRHP) has determined the need for additional recreational facilities, primarily in urban areas. The NY Parks 2020 initiative resulted in \$900 million to parks between 2010 and 2020. To restart similar growth, innovative funding such as the Restore Mother Nature Bond Act and a greater emphasis on public-private partnerships is needed.

INTRODUCTION

Public open space offers the opportunity for all people to enjoy the benefits that come from time spent in nature. New York State is known for its unparalleled parks and open spaces, from New York City's iconic Central Park to the awe-inspiring Niagara Falls. Parks enjoyed by New Yorkers and visitors alike are owned and operated by the state, counties, and municipalities, to name just a few entities.

The State's robust and varied network of trails are a critical component of these spaces. Trails pass through all regions; they border rivers, cross the countryside, traverse cities, and lead users to unique natural wonders.

When people recreate, they improve both their health and support the state's economy. International and outof-state visitors who come to visit the natural beauty of Niagara Falls or other scenic areas in NYS help support nearby restaurants, lodging facilities, and car rental companies. Bikers along the Empire State Trail support convenience stores, bike shops, eateries, bed and breakfasts, and inns. Visitors to the State's many freshwater and marine beaches support Main Street businesses, private recreation providers, and other local entities. Approximately 52% of NYS residents participate in some form of non-motorized recreation annually. This generates approximately \$41.8 billion in consumer spending in the state each year, directly supporting 313,000 jobs, providing \$14 billion in wages and salaries, and producing about \$3.6 billion in State and local tax revenue, according to the Outdoor Industry Foundation, an advocacy group.

CONDITION & CAPACITY

New York State Office of Parks, Recreation and Historic Preservation (OPRHP) has estimated the need for additional recreational facilities in NYS Counties using the relative index of need (RIN) based on a database of known outdoor recreation sites in the state (SCORP, 2019). The RIN indicates both the need for additional facilities and the need to repair deteriorating conditions at existing facilities The RIN is calculated for fifteen recreational activities such as relaxing in parks, swimming, bicycling, etc. The RIN is presented as a value on a scale of 1 to 10. The higher the value, the greater the need. Note that:

 A RIN of three or less indicates that the county-wide recreation needs for an activity are generally being met but there may exist pockets of recreation deficiency.

Overview

Activity Analyses



The RIN table uses a scale of 1 to 10 to represent the county-wide ratio of recreation demand to recreation supply. A RIN of 1 indicates areas where recreation needs for a given activity are generally being met, and 10 indicates areas with the greatest need for an activity relative to recreation supply.

The choropleth maps in this section show the same data for recreation activities shown in the RIN table, with need represented by a scale of color: green = 1, or counties with lowest need (i.e., supply is adequate), and red = 10, indicating areas with the greatest need for facilities offering that activity. This format makes it easy to see where there is a need for the targeted activities in the State, and where demand for specific recreation activities are being adequately met.

Legend (left) shows color equivalents of items shown on RIN Table for choropleth maps below.



Walking for Enjoyment (86.6%—represents the total survey sample)

Trail Activities

Walking, jogging and day hiking was the most popular activity category from the 2018 Public Outdoor Recreation Survey (PORS) among all respondents, and those ages 65-85 (86.2%). (See Table 3.8 for outdoor recreation participation of those ages 65-85.) This activity encompasses well over half of the total activity days of all recreation activities measured. (See Table 3.9.) Trails are an important component of active transportation such as biking and walking. According to the American Public Health Association using active transportation can lead to a decreased incidence of cancer, cardiovascular risk and obesity with better mental health.

In the spring of 2018, OPRHP surveyed park professionals to better understand the needs of park managers at the State, DEC, and county levels (SCORP, 2019). More than half of park professionals surveyed agree that a variety of trails (56%) and low impact activity areas (54%) are in demand. The need for trails within 30 minutes of home was the second choice among all respondents. Conversely, park professionals indicated a low need for golf courses and downhill hill winter sport activities. These findings illustrate a need for more low-impact recreation facilities to meet the requirements of an aging population. As noted above, it's likely demand for trails and low impact activity areas has grown substantially since the onset of the COVID-19 pandemic.

 A RIN of four or greater indicates a need for additional recreation facilities within a county. Need may reflect the lack of facilities, or the need to repair existing facilities.

The RIN analysis results vary by activity but generally indicate a need for recreational facilities in urban areas. The average RIN across the fifteen recreational activities was 6.3 for Albany County, 6.0 for Erie County, 7.5 for Kings County and 7.0 for Bronx County illustrating the need for additional facilities in these urban areas. The need for walking trails in urban areas is shown in the map below. "Walking for Enjoyment" RIN values of four or greater were calculated for the counties containing and near each urban center in NYS. The top three issues park professionals feel most strongly about are:

- More money should be spent on public park maintenance and repair.
- 2. The quality and condition of programs and facilities are being adversely impacted by budget and staff reduction.
- 3. The government should increase spending for outdoor recreation facilities (e.g. pools, marinas, trails, campgrounds).

O&M, FUNDING & FUTURE NEED

Funding to operate and maintain park infrastructure comes from a variety of sources, including federal grants, state general revenue, user fees, and private donations. The FY 2021 NYS budget contained \$372 million in funding for OPRHP, a decrease of 6% below FY 2020. (SCORP, 2020).

The State's outdoor recreation plans are also funded by federal and state programs. Over the past decade, greenway trail projects received more than \$40 million through state and federal grant programs including the Transportation Alternatives Program (TAP), Congestion Mitigation and Air Quality Improvement Program (CMAQ), Recreational Trails Program (RTP), Environmental Protection Fund (EPF) Parks grants and others.

The NY Parks 2020 initiative leveraged private philanthropy and other public dollars to invest in state parks. New York's parks and trail systems continue to benefit from public-private partnerships as well as philanthropic gifts. For example, the Ralph Wilson Jr. Foundation announced in 2018, a \$100 million investment to develop parks and advance regional trail systems in Western NY. This funding is currently being used to study trail connections in the cities of Buffalo and Rochester as well as longer trail corridors spanning New York's Southern Tier region. Another example is the Empire State Trail that included projects completed In 2020, New York State was hit by the COVID-19 pandemic that changed public behavior, lifestyles, and work cycles creating an increased need for park and trail capacity. During this time, public open space and recreation became an essential public health resource. Other more unexpected impacts emerged during the pandemic such as the explosion in bicycle sales in the U.S., as people discovered that cycling provided a means to stay active while maintaining social distance guidelines (Greenway Trails EIS, 2021).

by State and local partners connecting 750 miles of bike/hiking route from NYC to Canada, Albany to Buffalo that was completed in December 2020. In total, public and private funding from the NY Parks 2020 Plan has contributed close to \$900 million in state park improvements, including replacing outdated equipment, improving facilities and increasing access for people with disabilities.

Research indicates that demand for parks will likely outweigh available dollars. OPRHP reports a capital backlog of \$1 billion, and this figure does not account for parks owned by municipalities or counties. Going forward, the status of funding for public recreation facilities is far from certain. While larger economic impacts from the COVID-19 pandemic are not yet known, funding for recreation may be affected. Thus, a broad pool of funds will be required to support NYS parks and trails.

The \$3 billion Restore Mother Nature Bond Act is scheduled to be on the ballot in November 2022. The Act will support park programs by connecting streams and waterways, right-sizing culverts and dams, restoring freshwater and tidal wetlands, reclaiming natural floodplains, restocking shellfish populations and upgrading fish hatcheries, preserving open space, conserving more forest areas, and replanting more trees. This Act will provide much needed funding for some aspects of revitalizing parks and trails.

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RESILIENCY & INNOVATION

Parks play an important role in both the physical and ecological resiliency of NYS. In recent years, flooding, wind, and storm surges have increasingly impacted communities. Most notably Hurricane Ida in September 2021 left parts of the state in wreckage due to heavy flooding. As climate patterns become less predictable, there is a pressing need for outdoor recreation facilities to assess and retrofit their physical infrastructure. There is an expected increase in the use of greenspace by the public during warm months to cool off by providing shade and access to swimming.

Open space and outdoor recreation areas play a crucial role in increasing the state's resiliency. Parks, forests, wetlands and other green spaces help to absorb stormwater and act as buffers and are therefore a key component of a comprehensive approach toward designing more resilient communities. Our community's resiliency can also be improved by incorporating features beyond those associated with park features. Outdoor recreation providers can also contribute to the state's resiliency by incorporating green infrastructure such as bioswales, green roofs, and permeable pavements at their facilities, installing living shorelines in areas prone to ocean flooding, and using "green" practices and materials, an increasingly critical component in building resilient, sustainable communities.

The geology of NYS creates habitats that support a rich species diversity. In many areas, habitat loss and fragmentation has been a cause of decline for many native plants and animals. As sea levels rise along the Atlantic coast, Great Lakes, and up the tidal Hudson River, many of these native species will be under increased threat.

Recreation planning should maintain unfragmented open space and habitat corridors. Planning efforts must take into consideration pressures on specific species and ecological communities from development, invasive species, and climate change. Long-term recreation planning should consider that sea-level rise will trigger inland, upland, up-slope and northward migrations of native species and ecosystem types. Important first-step planning tools for this purpose are provided by the NYS Natural Heritage Program.



Turtle pond in Central Park in New York City

AA

Public Parks



RECOMMENDATIONS TO RAISE THE GRADE

- Pass the Restore Mother Nature Bond Act.
- Increase use of innovative funding such as the public-private partnerships.
- Build parks and assure maintenance of parks and trails that serve urban areas.
- Strive to make all parks facilities and programs accessible to everyone by making the parks walkable, connecting parks by trails, making public transit accessible, and making the parks accommodating to those of all ages, incomes, abilities, and community-specific needs.
- Seek opportunities to use open space recreation areas to increase the State's storm and climate change resiliency.

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EXECUTIVE SUMMARY

Recent supply chain issues and widely reported congestion at the nation's busiest port complexes underscore the criticality of New York State's port infrastructure. As New York prepares to deliver on green power goals focused on offshore wind generation, its critical port assets will be required to play a dual role: enabling the massive offshore developments to progress, while continuing the ports' traditional function as the gateway for the state's economy. In general, most of the ports in the state have adequate highway and on-dock rail access and are dredged to depths between 25–50 feet. Most ports are in the process of adding additional capacity. Wharf conditions range widely, from good to poor. However, aging infrastructure and limited funding represent challenges that will need to be overcome.

BACKGROUND

New York State's ports are critical to serving its economy and population. They generally enable two primary functions: international cargo gateway serving the country, and receipt/export for local/regional/in-state distribution.

Ports across the state are managed by port authorities established under state law, regional economic development corporations, or are privately owned. No single state agency has oversight over all publicly funded ports in New York State (NYS). Private entities generally operate the terminals within a port that provide the function of cargo and goods movement.

Federally designated marine highways connect NYS ports to other states and Canadian destinations along the Atlantic Coast and the St. Lawrence Seaway/Great Lakes.

This Report Card examines the publicly funded ports and terminal facilities in NYS, with a focus on publicly managed freight transport ports. It does not include privately owned facilities, nor does it cover the State's canal system or waterfront facilities dedicated to recreation, marinas, and ferry transit.

"The New York/New Jersey Harbor (NYNJH) is a vital economic resource for both the local economy and the entire US economy due to the vast quantity of imports and exports handled by the numerous ports in this waterway. As with most ports, there is a significant, recurring expense associated with dredging the navigation channels to the authorized depths." -U.S. Army Corps of **Engineers**

Cargo passes through NYS ports from many international destinations; the ports' hinterland includes all of NYS, much of the Eastern U.S., and Canada. Indeed, the Port of New York and New Jersey is the second-largest container port complex in the United States, after Los Angeles-Long Beach. Increasingly NYS ports are also positioning to service the offshore wind energy sector.

See Figure 1 for a list of Port facilities in NYS with current and projected freight tonnages.



FIGURE 1. MARINE HIGHWAYS AND PORTS IN NEW YORK STATE.

Map source: USDOT Maritime Administration, from New York State Freight Plan (NYSDOT, August 2019, p. 40)

(varies)	127,044,497	-4%		containers liquid hulk dry hulk	
			Not listed	containers, liquid bulk, dry bulk, break bulk, autos, wind energy, CMSW [4]	
t Authority	20,848,367	-12%	1,793	containers, autos, project cargo	
New York New Jersey PANYNJ)	107,160,568	-1%	22,579	containers, CMSW	
w York City conomic velopment Corp. IYCEDC)	522,806	-49%	118	wind energy	
bany Port District ommission (APDC)	4,577,369	-52%	1,242	dry bulk (agricultural, scrap iron, road salt), liquid bulk (petroleum), break bulk, project cargo (wind energy)	
gdensburg iridge and t Authority (OBPA)	34,330	-65%	16	dry bulk (agricultural, road salt, minerals), break bulk / project cargo (wind energy, transport. equip., military)	
t of Oswego Authority (POA)	252,960	-38%	116	dry bulk (agricultural), break bulk (aluminum), project cargo (wind energy)	
	New Jersey PANYNJ) w York City iconomic velopment Corp. IYCEDC) bany Port District ommission (APDC) gdensburg ridge and t Authority (OBPA) c of Oswego Authority (POA)	New Jersey DANYNJ)107,160,568w York City iconomic velopment Corp. IYCEDC)522,806bany Port District ommission (APDC)4,577,369gdensburg ridge and t Authority (OBPA)34,330cof Oswego Authority (POA)252,960	New Jersey DANYNJ)107,160,568-1%W York City iconomic velopment Corp. IYCEDC)522,806-49%bany Port District ommission (APDC)4,577,369-52%gdensburg ridge and t Authority (OBPA)34,330-65%cof Oswego Authority (POA)252,960-38%	New Jersey DANYNJ)107,160,568-1%22,579W York City iconomic velopment Corp. IYCEDC)522,806-49%118bany Port District ommission (APDC)4,577,369-52%1,242gdensburg ridge and t Authority (OBPA)34,330-65%16co Oswego Authority252,960-38%116	

TABLE 1. PORT THROUGHPUTS IN NEW YORK STATE.

tons.

[1] Many ports experienced a significant but transitory drop in 2020 throughput due to impacts of the COVID-19 pandemic. (For example, Oswego's throughput dropped 25% year over year from 2019 to 2020.) It is expected that the official data for 2021, not yet available at time of publication, will reflect strong growth above the 2020 data.

[2] Port of New York and New Jersey tonnages include public and non-public terminals around New York Harbor, including those in New Jersey. USACE data collection combines statistics between the two states.

[3] Values for subsectors listed include neighboring facilities along the same channels, corresponding to USACE-catalogued waterways as follows: Red Hook – Buttermilk Channel, NY; Howland Hook – New York and New Jersey Channels, NY and NJ; South Brooklyn Marine Terminal – Bay Ridge and Red Hook Channels, NY.

[4] CMSW, or containerized municipal solid waste, is barged intra-harbor and transferred to rail at Howland Hook. Data source: US Army Corps of Engineers (2015–2020).

The Port of New York and New Jersey, located on New York Harbor and overseen by the Port Authority of New York and New Jersey (PANYNJ), is one of the nation's leading ports for container, auto, and bulk cargos. While PANYNJ's Port facilities are located on both sides of New York Harbor, this report only addresses those located in New York State: Red Hook Container Terminal and Howland Hook Marine Terminal (on Staten Island). Another agency, the New York City Economic Development Corporation (NYCEDC), administers the South Brooklyn Marine Terminal (SBMT), a regional port targeting the growing wind energy sector. Container throughput at New York terminals was 429,348 lifts in 2021, almost doubling the pandemic-depressed 2020 volumes and up 80% overall from 2015. [Sources: PANYNJ monthly cargo volumes and 2016-2021 Annual Reports.] Other New York Harbor terminals, especially the petroleum and chemical terminals responsible for a large portion of the port's throughput tonnage, are privately owned and operated.

The Port of Albany-Rensselaer, administered by the Albany Port District Commission (APDC), is located on

CONDITION & CAPACITY

The condition and capacity of NYS's ports varies with the age and function of each facility. In general, most of the ports in the state have adequate highway and on-dock rail access and are dredged to depths between 25–50 feet. Wharf conditions range widely, from good to poor.

Red Hook's channel depth is 40 feet. Its capacity is restricted: landside capacity is limited without a rail connection and with road linkages requiring transit over local streets and congested urban freeways; the facility is also constrained by yard size and footprint. Moreover, the berths are limited by depth and condition of infrastructure. Condition is poor and deteriorating with limited upkeep and marine borer activity. Some of the wharf areas are derated from live load due to deterioration.

Howland Hook comprises the primary international container gateway in NYS, though smaller than competing facilities in New Jersey. The facility is generally in good condition. Vessel size is limited to 1100 feet length overall [Source: Deep Draft Advisory] and 50-foot draft. The on-dock intermodal yard (ExpressRail Staten Island) features seven tracks and connects to Conrail.

SBMT is an 88-acre site located on the Bay Ridge Channel with a total berth length of 1300 feet. It was built in the 1960s. There are three warehouses on the pier, but the site does not have any permanent cargo handling equipment. Condition is fair; it is understood that it the Hudson River. The Port of Ogdensburg, administered by the Ogdensburg Bridge and Port Authority (OBPA), is the first U.S. port heading upriver on the St. Lawrence Seaway. The Port of Oswego, administered by the Port of Oswego Authority (POA), is located on Lake Ontario, accessible to the Great Lakes as well as the Atlantic via the St. Lawrence Seaway.

Access to all ports is year-round, although the St. Lawrence Seaway (providing oceangoing vessels access to Ogdensburg and Oswego) is typically closed from January to March each year due to ice conditions.

will require investment and upgrade work for SBMT to become part of the offshore wind ecosystem. SBMT is linked directly to the Long Island rail network (New York & Atlantic) and has access to the national rail network (Conrail) via a cross-harbor car float, New York New Jersey Rail (NYNJR).

The Port of Albany-Rensselaer has a channel depth of 32 feet. The Port of Albany-Rensselaer has 5,400 feet of berth, with 500 feet of future berth in design with additional warehousing and open storage space. Heavy lift on-dock rail connects to the Port of Albany Railroad Corporation, which provides switching rail service to CSX and Canadian Pacific railroads, and Norfolk Southern intermodal facility located in proximity.

The Port of Ogdensburg has a 1,280-foot-long berth at the standard St. Lawrence Seaway depth of 27 feet. The facility has over 125,000 square feet of warehousing including agricultural and industrial storage. On-terminal rail connects to CSX via the Port-owned New York & Ogdensburg Railway (NYOG). Rail capacity is limited due to two bridges with tonnage restrictions.

The Port of Oswego, with a channel depth of 26 feet, has 1,900 feet of berth with 26.5 feet draft and 1,100 feet of berth space with 14 feet draft; various storage options (warehouse, open air, and domes for bulk cargo); and dockside rail with mainline service by CSX.

OPERATIONS & MAINTENANCE, FUNDING, & FUTURE NEED

NYS ports' most exigent needs fall into three categories: development to serve offshore wind; channel improvements to serve increasingly large vessels; and the replacement of aging infrastructure.

NYS's drive toward offshore wind development will require improvements to existing port infrastructure. SBMT is targeted for investment from NYS, New York City, and private partners, to become an offshore wind turbine staging facility and operations and maintenance hub; funding will be required for dredging and infrastructure improvements.

Global container shipping trends translate into constantly increasing vessel sizes; this is highlighted by the increasing number of third-generation post-Panamax (PPX3) vessels arriving in New York Harbor since 2015. New York Harbor, which was recently deepened to 50 feet, may be further deepened to 55 feet; a USACE study is underway regarding this multi-billion-dollar undertaking. As the primary major international container terminal in NYS, Howland Hook will require further channel deepening to remain relevant in this era, especially as container ships beyond the original channel design size are experiencing limitations transiting the Kill Van Kull. Conversely, existing channel access to Red Hook is sufficient given its landside constraints and its niche in serving container trade routes that are primarily worked by smaller vessels. Oswego also expects larger ships and has submitted a harbor deepening application to USACE.

Aging wharf infrastructure, especially along New York Harbor, poses a threat to port capacity. PANYNJ has identified a capital need of \$20 billion to replace "missioncritical, timber-supported wharf structures vital to marine cargo activities at five port facilities", titled the Wharf Replacement Program. The funding needs for this program greatly exceed identified funding sources. At Red Hook, the deteriorating infrastructure has already impacted the facility's capacity to handle goods. Almost \$80 million was allocated to replace and rehabilitate piers at Red Hook under the PANYNJ 2017–2026 Capital Plan; however, it is uncertain if this allocation will be maintained following the COVID-19 pandemic and financing needs of other PANYNJ departments. Wharf inspection is also required at Ogdensburg, with repairs likely necessary. Each port has identified plans for expansion and future enhancement.

PANYNJ recently released its Port Master Plan 2050, which presents a bold vision for the port's future. It includes ambitious plans to expand facilities and prepare for rapidly changing trends in the industry – including ever-increasing vessel sizes. Howland Hook is expected to grow and require additional capacity, including the possibility to expand ExpressRail Staten Island.

Port of Albany-Rensselaer plans an 80-acre expansion, adding 25% to the 400 acres of the present facility. The entire site would be devoted to fabricating offshore wind towers, the nation's first dedicated offshore wind towermanufacturing facility.

The Port of Ogdensburg has developed a \$24.2 million capital expansion program. Over the next ten years outside and inside storage areas and berthing capacity will be expanded and cargo-handling equipment will be replaced or upgraded. Further funding is required for rail bridge replacement and locomotive purchase.

The Port of Oswego has current maintenance and improvement projects including dock repairs and reconstruction, restoration of connector road to the intermodal site, and quadrennial maintenance dredging. The Port of Oswego further intends to deepen its harbor; double intermodal site railcar storage capacity; add a warehouse facility and 700-foot dock extension; and complete USACE breakwater repair projects totaling over 10,000 feet.

NYS ports have access to various sources of funding. Federal funding includes RAISE grants (formerly TIGER and BUILD). State funds include the NYS Passenger and Freight Rail Assistance Program (PFRAP) grant program, intended to provide "rail and port capital investments to preserve and enhance the State's major trade and passenger corridors." [Source: NYSDOT 2021 Rail and Port Grants Solicitation.]

Funding for offshore wind-related improvements is available at state and local levels. Ports supporting construction, operations, and maintenance for offshore wind installations have special requirements beyond much of the State's existing port infrastructure, which can include extra-heavy quayside loading, berth protection for special vessels, and expansive laydown spaces (SBMT concept rendering shown below). NYS, through NYSERDA, has offered \$200 million for offshore wind port infrastructure upgrades [source: NYSERDA] and New York City and NYCEDC have announced a \$191-million wind program funding plan over 15 years [Source: City of New York]. However, these funding sources are insufficient for extraordinary capital program needs such as wharf replacement.

FIGURE 4. SBMT CONCEPT RENDERING FOR OFFSHORE WIND HUB. SOURCE: EQUINOR, FROM BKLYNER.



PUBLIC SAFETY, INNOVATION, & RESILIENCE

The need for resilient ports has been highlighted over the past decade: beginning with Superstorm Sandy in 2012, and through present with the COVID-19 pandemic and a critically stressed supply chain.

NYS's ports' workers and plans are generally resilient; many of NYS's ports already have disaster recovery plans, with PANYNJ as an excellent example. However, the ports' infrastructure is not yet resilient – plans exist for hardening, but more must be done in many places. PANYNJ is a future leader in this area, with a department for sustainability and a set of Climate Resilience Design Guidelines. There is a trend toward electrification of operations and on- or near-site renewable generation, with some ports adopting a net-zero energy goal.

Among other resiliency improvements, ports need to raise critical infrastructure (especially electrical facilities and control rooms) to minimize the impacts of water level rise. This was made clear during Superstorm Sandy; however, almost ten years later, many projects to mitigate the impact of sea level rise and storm surge in NY Harbor have never left the drawing board.



Ports



RECOMMENDATIONS TO RAISE THE GRADE

ASCE NYS Council makes the following recommendations to raise the grade:

- Establish routine inspection and maintenance programs at all port facilities, and/or continue to perform cyclical structural integrity condition inspections and repairs to piers and wharfs.
- Secure outside funding sources for wharf and berth replacement.
- Continue planning and secure funding for New York Harbor deepening and channel improvements, including to Howland Hook Marine Terminal, to guarantee future capacity.
- Carry out resilient / climate change adaptation risk assessments as a first step toward understanding and defining exposures and improving resiliency. Disaster recovery plans may be an early outcome of these.
- Consider formalizing approach to design-build contracting in line with industry best practices.

DEFINITIONS

APDC	Albany Port District Commission
CMSW	containerized municipal solid waste
CSX	CSX Transportation, freight railroad
OBPA	Ogdensburg Bridge and Port Authority
PANYNJ	Port Authority of New York and New Jersey
POA	Port of Oswego Authority
PPX	(of a vessel) post-Panamax; greater in size than the old Panama Canal locks
RAISE	Rebuilding American Infrastructure with Sustainability and Equity grant program
NYS	New York State
NYCEDC	New York City Economic Development Corporation
NYSERDA	New York State Energy Research and Development Authority
SBMT	South Brooklyn Marine Terminal
ton	long (shipping) ton, equal to 2,240 pounds
USACE	U.S. Army Corps of Engineers



Ports

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EXECUTIVE SUMMARY

There are over 3,300 miles of rail lines that move passengers and goods in 62 counties and 62 cities throughout New York State. The freight railroads – four large Class I railroads and 36 regional and short-line railroads – own and maintain the backbone of track infrastructure in the state. Amtrak owns and operates 150 miles of track along the Northeast Corridor route that runs from Washington, DC to Boston, MA. Overall, freight rail transportation is well positioned to deliver the key services expected by New York customers, while Amtrak's Northeast Corridor faces a \$38 billion backlog of maintenance. The Gateway Program, a series of projects aimed at adding passenger capacity under the Hudson River and into Penn Station, is beginning to move forward, with capacity and condition improvements expected. Meanwhile, Moynihan Train Hall opened in 2020, bringing Penn Station – the busiest railway station in North America – into the 21st century. Many of the 650,000 daily Penn Station passengers can now share this spacious and modern facility.

The undeniable public benefits of rail transportation can be leveraged well into the future if New Yorkers at all levels demonstrate the necessary commitment to the life line offered by their rail system.

BACKGROUND

CSX, one of the seven Class I railroads in the U.S., is the major rail freight operator in New York. CSX employs close to 60% of the New York railroaders and maintains about 85% of active tracks in the state. Amtrak, three other Class I freight railroads, and several Class II and Class II smaller freight railroads also own and operate rail track in the state. The National Railroad Passenger Corporation, Amtrak, provides intercity service for passengers traveling in New York and throughout the United States and Canada. Most of Amtrak service operates CSX and other rail freight infrastructure, apart from the Northeast Corridor service. The Northeast Corridor is Amtrak's route that runs from Washington, DC to Boston, New York. The route crosses New York and includes Penn Station (New York Pennsylvania Station), and 150 mi. of track that Amtrak owns and operates. In 2019 Penn Station served more than 600,000 daily passengers making it the busiest transportation facility in the western hemisphere.

The New York commuter railroad infrastructure (MNR, LIRR, NJT) and tourist rail services are addressed by the Transit Section (of the 2022 NY Infrastructure Report Card).

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CAPACITY

Freight

Four Class I freight railroads, CSX, CN, CP, NS, and 36 Regional and Short-line Railroads (Class II and III) operate in 62 New York State counties and 62 cities. These railroads employ over 3,700 individuals mostly in the large yards, such as Albany, Buffalo, Syracuse, Binghamton, and New York City. There are also several smaller yards around the state. The freight trains carry about 77 million tons of freight in 2 million rail carloads annually (Ref 1).

There are 3,279 miles of track across the state, ranking New York as the fifteenth rail network by mileage in the U.S. in 2017 (Ref 5). CSX is the major rail freight operator in New York maintaining over 2,800 mi. of active tracks (Ref. 13). Most of the freight railroads in America are privately owned and have little to no government financial assistance from the government financially (Ref 8).

Amtrak

Amtrak continues to serve Northeast Corridor (NEC) rail passengers at capacities that are approximately the same or less than early 1900s. Between 1903 and 1917 various railroad segments were linked together into the NEC that continues to be in use today.

On Jan. 01, 2021 Moynihan Train Hall welcomed its first passengers, bringing Penn Station into the 21st century. Many of the 650,000 daily Penn Sta. passengers can now share this spacious and modern facility. Yet high speed rail and system expansion remain aspirational goals for Amtrak given the historic predicament of inadequate funding.

Opportunities for system expansion are limited until New York rail is in a place of stability following the postpandemic recovery.



Glass roof of the Moynihan Train Hall, New York City



Railroad tracks line crossing. New York.

CONDITION

Freight

The freight railroads originated 8 million carload tons and terminated 18 million tons of freight in 2019. (Ref. 2).

Freight railroads continued to provide vital transportation services to each of the 62 cities and 62 counties (Ref. 2) by upgrading an aged infrastructure and investing in the ongoing maintenance required by the heavy rail cars operating up to 40 mph (FRA Class 3 track). In 2021 CSX spent an average of \$72,000 per mile on its infrastructure. (Ref.19)

The public recognizes inadequate rail infrastructure as a threat to the connectivity of the New York mobility network.

Amtrak

Decades of inadequate capital investment and backlogs of renewal/maintenance work brought most of the NEC passenger rail infrastructure to the end of its normal service life and beyond. The 15-year plan Connect 2035 (Ref. 21) identifies the critical infrastructure needs for state of good repair and NEC modernization requirements. Portal Bridge, Hudson and East River tunnels, Moynihan Phase II, and Pelham Bay Bridge stand out as critical needs for Amtrak's New York City Metro territory. The public recognizes inadequate rail infrastructure as a threat to the connectivity of the New York mobility network. A more recent emphasis on the state of good repair, maintenance, renewals, and capital investments managed an improved public safety and enhanced rail system resiliency.

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FUNDING / FUTURE NEEDS

Freight

CSX reports consistent and significant recent investments in its infrastructure. The 2008 NYSDOT Rail Needs Survey, the latest available (Ref. 15), identifies \$1.8 billion in total project costs on the NYS CSX infrastructure system (2009-2028). CSX reports spending \$146 million in 2015 in New York infrastructure (Ref. 13), and the \$15 billion investment across its national network over past seven years (Ref. 14).

Recently, the state legislature passed a bill giving a property tax relief to the land tracks run on (Ref 6). Additionally, the Passenger and Freight Assistance Program allows for companies to apply for grants to improve the safety of grade crossings. Government agencies and municipalities can apply for the Industrial Access Program, to be awarded a maximum or \$1 million (Ref. 26).

Amtrak

Amtrak's 2022 FY federal grant request of \$500 million for the 150 mi. of the NY Northeast Corridor is in line with the previous requests in the last three years. Enacted funds in the prior 3 years were about half of the requests (Ref. 9). Prior to the pandemic, Amtrak raised ticket sale prices and was was projecting zero federal funding needed for operations by late 2020.

Amtrak's Gateway Program is a series of projects aimed at adding capacity under the Hudson River and into Penn Station. Various projects are under the purview of agencies in New Jersey and New York. In New York, the Hudson Tunnel Project, which seeks to replace the old Hudson River rail tunnel damaged during Hurricane Sandy, is in environmental review. On the New Jersey side, funding was announced for the Portal North Bridge in 2021, representing a major step for bringing aging passenger rail infrastructure to a state of good repair.

The FY 2022-2024 NEC Plan reports a 44% overall funding gap that remains to be closed both for Amtrak's state of good repair and special projects. (Ref. 22)

The recently-passed federal Infrastructure Investment and Jobs Act (IIJA) provides \$6.5 billion for Amtrak's Northeast Corridor, and \$12.6 billion for the national network. Threats to the adopted budget include unfunded or deferred capital investments and maintenance that accelerate the decline of the aging infrastructure. Service delays, increased maintenance, and major service disruptions are also part of these common adverse consequences. Return to prepandemic ridership levels is slow and not guaranteed.

The current funding level of passenger rail is at best an adequate stop-gap measure to maintain service for New York for 1.3 billion rail passengers annually (including regional, commuters, and transit). Needs outpace funding especially for renewals, state of good repair, and maintenance. The \$6.5 billion provided by IIJA is dwarfed by the NEC backlog of \$38 billion to reach a state of good repair.(Ref. 23)

Funding streams, including operating revenues (such as farebox) and the post-pandemic recovery of ridership continue to be among the decisive factors linked to the survival of the uniquely extensive freight/ rail passenger system in New York and, most likely, a bellwether (a key indicator for the future) for this industry in the U.S.

OPERATION AND MAINTENANCE

Freight

Freight railroads maintained a healthy investment level dedicated to maintenance and renewal of infrastructure (as noted in Sec. 3C) that carry freight speed (max 40 mph) trains.

Amtrak

Amtrak 2022 Grant Request (Ref. 7) identifies 2020 operating revenue as \$2.3 billion (down 32% from 2019)

which would cover about 30% of the operating cost.

Railroad industry experiences labor shortages that were exacerbated by the competitive the post pandemic labor market. (Ref. 27). Operations and maintenance will continue to lag and affect recovery in the absence of adequate qualified labor. Recruiting and training of needed rail workers requires renewed policies and support by Congress, unions, educational institutions, and other stakeholders.

PUBLIC SAFETY

Freight

Since 2008, railroads have invested in the GPS enabled safety technology that can stop a train and prevent collisions is known as Positive Train Control (PTC). PTC will reduce the rail-related fatalities and other accidents related to human error. CSX reported full PTC system implementation at the end of 2018 as required by Federal Railway Administration (FRA). The compnay's safety performance was ranked as the top major freight railroad in recent years (Ref. 14).

Unfortunately, PTC will not change driving behavior, which was the leading cause of 70% of the 274 fatalities at highway grade crossings in 2017. One of New York State's past projects was to eliminate several unnecessary grade crossings to prevent any accidents between vehicular traffic and trains (Ref 6).

Freight trains (especially double stacked cars) require a

RESILIENCE

In Sept. of 2021, Hurricane Ida exposed the vulnerability of rail operations to flooding, particularly Amtrak. Service was stalled and restoration was slow and patchy. The 2021 funding commitment for the Gateway Program is bringing Amtrak closer toa resilient Hudson tunnel, which was damaged in 2012 from Superstorm Sandy. higher under-clearance than passenger trains; this makes overpasses vulnerable to damage from rail car strikes. There are past, present, and future projects to protect the public safety by raising these bridges and overpasses.

Amtrak

As of Aug. 2020, Amtrak implemented Positive Train Control on all owned or controlled tracks.

The ongoing Gateway Project (Ref. 23) would restore rail safety by providing two new tracks under the Hudson River, rehabilitating existing Hudson Tunnel, and relieving Penn Station overcrowding by building new tracks and platforms.

Nevertheless, an aging infrastructure that is maintained to freight standards poses a heightened risk to failure and serious accidents including derailments which are a low probability but an unacceptable risk to the rail passengers.

Post Sandy in New York City, railroads made flooding protection (planned barriers at East River, and Hudson tunnels) and resilience measures high-priority. Progress is slow and post-disaster recovery remains a challenge.

INNOVATION

Freight

CSX adopted Precision Scheduled Railroading (PSR) which shifts focus from moving trains to moving cars. The stated objective of generating efficiencies for customers has yet to be achieved. Efficiencies emerged mainly for the railroads that were able to continue reductions in workforce while delays, and safety concerns are yet to be worked out.

Freight Rail has recently been marketing more to individuals who can load items into a intermodal freight car. This service expansion benefits families moving, and shippers of smaller goods across the country while providing an eco friendly option. (Ref 16)

Amtrak

Scanning cars in transit, and aerial inspections using drones are among the innovations Amtrak is experimenting with. These methods would provide more accurate and granular data that is the basis of more efficient maintenance, and investment decisions employing modern asset management techniques.

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Rail



Rail infrastructure is capital intensive but it delivers considerable economic benefits to congested or under-served areas making it a sound investment of public dollars.

The need to expand the currently ineffective funding base with an equitable, and predictable (dedicated) funding source is paramount. Here are a few next steps to consider.

- Establish and legislate sustained public investments capitalizing on the socioeconomic, environmental, and other benefits of rail transportation. A renewed commitment to rail transportation would be a sound basis for economic growth and prosperity by allowing rail industry to fairly compete and provide quality transportation services.
- Redefine the role and quantify the benefits of rail transportation in the larger context of a sustainable, economical, and diverse transportation mosaic that is required for a thriving New York and US economy. Rail mobility is reducing chronic metropolitan/urban congestion, it is green and sustainable, and it has been a proven launching pad for land and economic development.

For example, shifting heavy trucks to rail will improve security and resilience of the New York transportation network in the post 9/11 environment.

Currently the NYC heavily traveled bridges such as George Washington and Verrazzano Narrows carry trucks only on the upper level due to security concerns. (The heavy trucks accelerate deterioration of the bridge upper decks as measured by Weigh-In-Motion techniques).

- Support and stimulate educational and training programs that address the long term labor availability. The rail industry relies on attracting and training the labor force that is a match for the evolving technologies and demands of a modern, efficient, safe, and reliable rail transportation system.
- Reverse the erosion of the service core by dedicating funding to critical maintenance, and state of good repair work.
- Reduce fragility of the global supply chain by stimulating development of local alternatives.
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Rail



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2022 REPORT CARD FOR NEW YORK'S INFRASTRUCTURE www.infrastructurereportcard.org/NewYork



EXECUTIVE SUMMARY

New York's vast network of over 240,000 lane-miles of roadways connect communities and provide a critical economic function. Deferred maintenance has resulted in rough roads, congestion, and safety deficiencies - with drivers footing the bill. While 55% of New York's major highways are rated in excellent or good condition, the remaining nearly half are considered to be in poor or fair condition.

The combination of rough roads and congestion costs motorists a total of \$7.7 billion statewide annually – that's \$759 per driver in NYC, \$423 in Albany, and \$568 in Syracuse.

The outlook for funding from federal and state sources has improved in the near-term, however, long-term fixes to existing dedicated funds, or new funding streams, are still sorely needed to return the system to a state of good repair. Equally important as bridging the funding gap, improving New York's roads will also require: enhanced collaboration and innovation, improved project delivery, resilience strategies, and investments in workforce development.

CONDITION & CAPACITY

The New York State Department of Transportation owns and maintains roughly 15,000 miles (38,000 lanemiles) or 13% of centerline mileage statewide. According to the latest statewide condition report of the road miles maintained by the NYSDOT in 2020, 17% of state road surfaces were excellent, 38% were good, 35% fair, and 10% were poor. For comparison, at the time of the last Report Card for New York's Infrastructure (2015), 14% of state road surfaces were excellent, 49% were good, 27% were fair, and 10% were poor.



FIGURE 1: ROAD CONDITIONS, ROADS MAINTAINED BY THE STATE OF NEW YORK

2022 REPORT CARD FOR NEW YORK'S INFRASTRUCTURE www.infrastructurereportcard.org/newyork Importantly, this data includes only roads owned and maintained by the State of New York. Roads maintained by local municipalities make up more than 85% of the total centerline miles in New York. Data on the condition of local roads is collected at the local level, but there is no statewide database available. A review of previous studies and limited available data suggests that local roads are generally in worse condition than those maintained by NYSDOT.

New York motorists are left paying price when the

roads are in poor or mediocre conditions as these may include potholes, rutting or rough surface conditions. Poor road conditions contribute to additional vehicle operations costs (VOC) including accelerated vehicle depreciation, additional vehicle repair costs, increased fuel consumption and increased tire wear. According to TRIP, a national transportation research nonprofit organization, these cost motorists a total of \$7.7 billion statewide annually – that's \$759 per driver in NYC, \$423 in Albany and \$568 in Syracuse.

TABLE 1: VEHICLE OPERATING COSTS PER MOTORIST AND TOTAL GALLONS OF FUEL WASTED ANNUALLY AS A RESULT OF DRIVING ON DETERIORATED ROADS

Location	Additional Vehicle Operating Cost	Gallons of Fuel Wasted Due to Rough Roads	Gallons of Fuel Wasted Per Driver
Albany - Schenectady - Troy	\$423	8,336,182	21
Binghamton	\$244	1,859,462	12
Buffalo - Niagara Falls	\$420	14,734,709	20
New York - Newark - Jersey City	\$759	363,516,328	40
Poughkeepsie - Newburgh - Middletown	\$513	9,486,598	24
Rochester	\$375	11,977,403	18
Syracuse	\$568	11,900,915	29
Utica	\$313	2,144,833	15
New York Statewide	\$7.7 Billion	391,627,101	32

(Source: TRIP)

TRIP also found that New York has 5th worst rated Interstate pavement condition in the country at 6% in poor condition, while the nations average is 3%.

Congestion also impacts New York's drivers, especially in the downstate region. New York City has a population of 8.8 million people, nearly half of the state. According to TRIP, each driver wastes 92 hours per year sitting in traffic. New York City area drivers waste approximately 300 million gallons of fuel, equating to 38 gallons of fuel wasted per driver. A similar study was done by INRIX - a traffic data analytics company - and to no surprise, NYC was the most congested city in the country, about 100 hours lost due to congestion, even though there was a 27% drop from 2019, before the COVID-19 pandemic.

Location	Hours Lost to Congestion	Annual Cost Per Driver	Gallons of Fuel Wasted Due to Congestion	Gallons of Fuel Wasted Per Driver
Albany - Schenectady - Troy	49	\$736	7,341,000	21
Binghamton	16	\$348	1,231,000	7
Buffalo - Niagara Falls	48	\$965	14,094,000	23
New York - Newark - Jersey City	92	\$1,947	323,712,000	38
Poughkeepsie - Newburgh - Middletown	37	\$608	3,908,000	19
Rochester	40	\$769	8,574,000	20
Syracuse	18	\$378	3,437,000	8
Utica	17	\$353	871,000	7
	New York Statewide		264,586,094	N/A

TABLE 2: ANNUAL HOURS AND FUEL LOST TO CONGESTION AND CONGESTION COSTS PER DRIVER

(Source: TRIP)

TABLE 3: MOST CONGESTED URBAN AREAS IN THE U.S.

2021 U.S. Rank (2020)	Urban Area	Delay 2021 (2020) [2019] (Hours per Driver)	Compared to Pre- COVID	Cost Per Driver	Cost per City	Downtown Trips
1 (1)	New York	102 (100) [140]	-27%	\$1,595	\$8.3B	-18%
2 (3)	Chicago	104 (86) [145]	-28%	\$1,622	\$5.8B	-21%
3 (2)	Philadelphia	90 (94) [142]	-37%	\$1,404	\$3.3B	-22%
4 (4)	Boston	78 (48) [149]	-47%	\$1,223	\$2.3B	-23%
5 (9)	Miami	66 (35) [81]	-19%	\$1,028	\$2.6B	-20%

(Source: INRIX)

The demand for freight has also increased tremendously. The value of freight shipped by trucks to and from sites in New York is expected to increase by 108% by 2045. To quantify the impact of traffic congestion on truck-borne freight, the American Transportation Research Institute (ATRI) prepares an annual list of the Top 100 Truck Bottlenecks. In the 2021 ranking, New York contained six of the Top 100 Bottlenecks. Only six states contained more chokepoints for trucks.

OPERATION & MAINTENANCE

Road resilience is dependent on a program of corrective, preventive, and demand maintenance as well as a capital program of new construction/rehabilitation including capital maintenance projects.

Given the context of an environment where the needs outweigh available funding resources, NYSDOT has embraced a Preservation First approach to maintaining transportation assets. This strategy prioritizes activities that maximize the service life of existing infrastructure assets over expansion or enhancement of the highway network. The current strategy and level of investment has not yet resulted in a state of good repair. State of good repair is the condition state of the system that can be maintained in perpetuity at the lowest annual cost.

Nearly 9 out of 10 miles of roadway in New York are owned and maintained by local governments. With cash-strapped budgets, all municipalities heavily rely on Federal and State funding to perform annual maintenance projects. To their credit, many local governments maximize available resources by implementing shared services agreements. In 2021, the State budget included long-awaited increases to State funding programs including the Consolidated Highway Improvement Program (CHIPS), PAVE-NY, Extreme Winter Recovery, and a new State Touring Routes program.

While New York's agencies responsible for maintaining roads are performing their work well considering the limited funding for accomplishing the work at hand, the proposed capital programs concede that scarcity of resources will result in a decline of pavement condition and resilience of certain major elements of the system. As agencies defer maintenance activities, the cost of returning the assets to a state of good repair only increases (Figure 2).





FUNDING

From 2014 to 2018, the federal government provided \$1.28 for road improvements in New York for every \$1.00 state motorists paid in federal highway user fees, including the federal gas tax. According to NYSDOT, the most significant funding risk for roads is the uncertainty of future of federal funding. Federal aid covers more than 40% of NYSDOT's capital program and approximately 56% of on and off-system construction. Fortunately, some intermediate relief and certainty has been provided with the federal Infrastructure Investment and Jobs Act (IIJA). The five-year bill will provide New York with \$11.6 billion for federal-aid highway programs. This funding is expected to help with state of good repair projects, in particular.

However, longer term, the solvency of the Highway Trust Fund at the state and national level remains an issue. Both of these funds are supported by taxes on gasoline and diesel. The average fuel efficiency of

FUTURE NEED

New York's FY 2022-23 Budget included a new fiveyear \$32.8 billion Capital Plan for NYSDOT. For FY 2023, the plan appropriated \$200 million for Operation Pave Our Potholes, new state and local program that commits \$1 billion over the five-year plan. The budged appropriated \$578 million for local highway and bridge projects under the Consolidated Local Street and Highway Improvement Program (CHIPS) and Marchiselli program. It also maintained funding levels for existing local highway aid programs; \$150 million through the PAVE NY program and \$100 million for the State Touring Routes program. In addition to maintenance activities supported through highway and bridge construction contracts, the FY 2023 Executive Budget also called for more than \$466 million in non-winter preventive and demand maintenance activities, equipment, and facilities for highways and bridges. Preventative activities extend the life of a road or bridge and are cost-effective alternatives to major reconstruction.

U.S. passenger vehicles increased from 22.6 miles per gallon in 2010 to 24.9 miles per gallon in 2019; thus, the federal gas tax is decreasing in value not only due to inflation, but increased motor vehicle efficiency. The federal gas tax was last raised in 1993. New York has a variable-rate State gas tax; a portion of the tax is adjusted on an annual basis, according to changes in wholesale gas prices. In 2021, there was a small decrease in State tax, and in 2022 a raise of a couple cents. The current State gas tax of 48.22 cents per gallon is above the US average of 36.83 cents per gallon. In 2022, in order to provide consumer relief, the enacted state budget included a suspension of a portion of the state fuel taxes from June 1, 2022 through December 31, 2022, with a commitment from Governor Hochul to replace estimated lost revenue for the Dedicated Highway and Bridge Trust Fund from the State General Fund.

The Office of the State Comptroller released a series of Reports in 2005, 2009, and 2014 on The Dedicated Highway and Bridge Trust Fund. All call into question the Fund's ability to serve as the centerpiece of the State system for the construction and maintenance of more the 113,000 miles of highway and over 17,400 bridges in New York.

The Dedicated Highway and Bridge Trust Funds is no longer fulfilling its original mission. The Fund was originally conceived to provide a dedicated stream of revenues for investments in New York's transportation future, the Fund now is primarily devoted to repaying past years' borrowing and supporting current operating expenses. As a result, critical highway and bridge projects are at increased risk as the State continues to face overall fiscal challenges.

Specifically, there is a need to invest additional funding to return pavement conditions to a State of Good Repair. The following table presents funding allocated to pavement projects since 2015.

TABLE 1: ACTUAL PAVEMENT-RELATED
EXPENDITURES (NYSDOT-ADMINISTERED) [13])

Year	Amount (in millions)
2015	\$394
2016	\$555
2017	\$701
2018	\$765
2019	\$653
2020	\$810

Source: NYSDOT Pavement Condition Reports

As of 2020, the cost to address all treatment needs on the NYSDOT highway system was \$5.8 billion, down from a \$5.9 billion need in 2019, and equal with the needs estimate from 2018. The category of these needs is presented in the chart below, as of 2020.

Regarding local roads, the most recent comprehensive needs assessment was published in 2013, by the New York State Association of Town Superintendents of

PUBLIC SAFETY

A total of 6,124 people were killed in traffic crashes in New York from 2015-2020. In 2020, New York had 1.02 traffic fatalities for every 100 million vehicle miles traveled. Prior to 2020, traffic fatality rates in Highways. That report estimated total pavement needs on local roads to be \$32 Billion for the 15-year period ending in 2030. The report identified an annual spending gap of \$1.3 Billion for local roads and bridges. A 2022 report by the Office of the State Comptroller identified that local government spending on local roads, when adjusted for inflation, declined by 7 percent between 2010 and 2020 – meaning the spending gap that existed in 2013 may be even greater today.

New York had decreased for four consecutive years. Unfortunately, traffic fatalities spiked in 2020 but the fatality rate remained lower than the national average of 1.02 fatalities for every 100 million miles traveled.

Year	Total Fatalities	Fatality Rate per 100 Million Vehicle Miles Traveled
2015	1,136	0.89
2016	1,041	0.85
2017	1,006	0.81
2018	964	0.78
2019	931	0.75
2020	1046	1.02

TABLE 2: TRAFFIC FATALITIES IN NEW YORK 2015-2020

Source: FHWA

2022 REPORT CARD FOR NEW YORK'S INFRASTRUCTURE www.infrastructurereportcard.org/newyork To address safety, New York updated their highway safety program in 2017. Current emphasis areas a due to recent crash trends that involve serious or fatal injury crashes include:

- Intersections
- Lane departure
- Vulnerable users
- Age-related
- Road user behavior
- Speed

Specific countermeasures and plans were identified to lower these crash trends moving forward. Additionally, a Pedestrian Safety Action Plan with action steps is being put forth to install pedestrian safety improvements during a two-year plan, with the first year on stateowned roadways and the second year through project solicitation. The Highway Safety Improvement Program has additional safety targets until 2022, with funding set aside for the emphasis areas described in the New York Strategic Highway Safety Plan.



Interstate 81, Binghamton, NY

RESILIENCE & INNOVATION

Storms, floods, droughts, and other natural hazards are combining with sea level rise, new temperature and precipitation norms, and other effects from climate change to increase the vulnerability of the nation's transportation systems. The United States experienced a record-breaking 22 billion-dollar natural disaster events in 2020. To varying extents, all damaged or disrupted the operations of transportation infrastructure vital for emergency services, evacuations, and the movement of supplies.

Design Guides are one example of how resilience may become part of the routine practices of transportation agencies.

Recently, NYSDOT revised their Highway Design Manual, Chapter 8 on Highway Drainage. The changes included:

- Updating the Allowable Headwater to meet guidance from the New York State Flood Risk Management Guidance for Implementation of the Community Risk and Resiliency Act. With this change, the allowable headwater criteria have changed for culverts on critical and non-critical roadways as well as those spanning tidal waterways.
- "Design Flood Frequencies (in years) for Drainage Structures and Channels" has been revised to reflect community risk and resilience standards for local roads.

Over the last 10 years, NYSDOT has also furthered their *GreenLITES Program*, which integrates sustainability

principles into transportation by using the building industry's LEED system as a model.

New materials and technology are helping roads become more sustainable and resilient, such as greater use of permeable paving materials to reduce storm runoff, as well as the use of recycled materials in pavements. The use of Warm Mix Asphalt is increasing in certain parts of the state where the Asphalt only needs to rise to 200 degrees Fahrenheit, as opposed to 325 degrees, which then reduces the amount of energy needed for Asphalt production along with deceasing emissions fumes and odors.

NYSDOT also has a robust asset management system. Some MPO's in the state also assist the local transportation agencies in managing their assets.

Innovation, representing new processes, materials, methods, technologies or tools, is vital for Departments of Transportation to improve results and outcomes. NYSDOT has adopted Every Day Counts (EDC), as a way to promote and support innovation, developing new and better ways of getting highways planned, designed, built and maintained. They also have the Technology and Innovation Deployment Program (TIDP), which includes three initiatives: accelerated innovation deployment (AID), second strategic highway research program (SHRP2), and accelerated implementation and deployment of pavement technologies. The TIDP relates to all aspects of highway transportation including planning, financing, operation, structures, materials, pavements, environment, and construction.

Roads

RECOMMENDATIONS TO RAISE THE GRADE

For New York to improve its grades, there are several themes that require our collective focus – these include addressing the funding gaps, improving project delivery, enhanced collaboration, providing for a skilled workforce, and strengthening our communities.

Specific actions for each of these themes,

- 1. Addressing Funding Gaps
- Support federal efforts to increase funding for the Highway Trust Fund
- Evaluate New York's primary funding source for maintaining and improving highways and bridges the gasoline tax structure, such as adjusting for inflation (no increase since 1996; \$1 in 1996 only buys \$0.59 today a 41% decrease in buying power); or consideration of a mileage-based user fee.
- Consider wider use of value capture techniques.
- 2. Improved Project Delivery
- Maximize use of existing funding by increasing project delivery options to reduce project costs and reduce delivery time. For example, enabling legislation for construction manager/general contractor project delivery can reduce overall project risks, thereby reducing costs.
- Early evaluation of project delivery options to determine most appropriate project delivery method based on project goals and objectives (e.g., evaluation between design-bid-build, indefinite delivery/indefinite quantity, construction manager/ general contractor, design-build, and public private partnerships). Several tools exist to assist in these evaluations.
- Utilize a formal risk management process for larger projects throughout project delivery, to reduce project threats and enhance project opportunities.
- Adopt proven innovations by incorporating into state and local agency practice through formal process and procedures, such as the Federal Highway Administration's Every Day Counts innovation program – such as 3D/4D/5D modeling, Project Bundling, Targeted Overlay Pavement Solutions, Reducing Rural Roadway Departures, Safe Transportation for Every Pedestrian and e-Construction.
- 3. Enhance Collaboration
- State agencies collaborating with local agencies, local agencies collaborating with other local agencies, by providing technical assistance, and bundling projects to gain efficiencies.
- Asset owners, designers, and contractors utilizing their strengths working together to develop solutions by utilizing appropriate project delivery methods and improved risk management practices.

Roads



RECOMMENDATIONS TO RAISE THE GRADE (CONT.)

4. Workforce

- Support trade schools and workforce development for contractors.
- Provide increased opportunities for disadvantaged business enterprises to improve the industry capacity.
- Encourage high school students to consider the infrastructure industry, including trade schools and civil engineering programs.
- 5. Strengthening Communities, Improving Quality of Life
- Improving communities by improving infrastructure considering resiliency, sustainability, extreme weather, the social environment- equity, and the economic environment in all actions.
- Enhance safety, particularly at the local level through increased use of roundabouts, pavement safety edge, and rumble strips (edge and centerlines).
- Utilize road diets (fewer lanes), and addition of bicycle and pedestrian facilities. Address micro-mobility users.



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Roads

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EXECUTIVE SUMMARY

Improper management of municipal solid wastes (MSW) can result in significant impacts to public health. Fortunately, over the past 50 years, New York's state government, local governments, and private companies have developed facilities and programs that provide the highest level of protection of public health and the environment while at the same time establishing sustainable recycling trends. Based on data from the 2018 Annual Reports from New York State's (NYS) solid waste management facilities there are 53 lined landfills in the state and 16 to 25 years of excess capacity. New Yorkers generated about 5.12 pounds of MSW per person per day, a rate 4% higher than the national average of 4.9 pounds per person per day. Continued efforts are required to further reduce, reuse, and recycle materials before they become waste products. Since the 2018 data recycling rates have leveled off or even decreased slightly. Efforts should focus on expanding waste diversion; increasing recycling markets and technologies considering the China National Sword policy; and preventing and managing toxics and emerging contaminants in the waste stream.

CONDITION & CAPACITY

NYS's solid waste management facilities managed a total of more than 36 million tons of materials and waste, with about a third being disposed in landfills. New Yorkers generated about 5.12 pounds of MSW per person per day, a rate 4% higher than the national average of 4.9 pounds per person per day.1 The overall amount of waste landfilled in NYS decreased steadily between the late 1980s and early 2000s and has remained constant since then with 12.4 million tons (37%) of waste disposed in NYS landfills. The number of landfills has been significantly reduced from 348 (mostly unlined) in the 1980s to only 53 (lined) today which are categorized by waste type disposed:

- 26 municipal solid waste (MSW) landfills (everyday wastes from households, industries, and commercial establishments).
- 10 Industrial/commercial waste landfills (coal ash, paper mill sludge and similar materials).
- 12 Construction and demolition (C&D) landfills (debris from building or destruction projects).
- Five Long Island landfills, one of which is a combustion ash monofil.



But even with a decrease in the number of landfills and combustors, the state has an estimated remaining permitted capacity of 16 to 25 years, based on the 2018 landfill annual reports. Even with the state's goal of selfsufficiency, NYS still depends on privately owned facilities in other states for the disposal of 5.8 million tons per year, mostly commercial solid waste from NYC. The 2018 landfill annual report indicates the NYS's MSW recycling rate was 18%, well below EPA's estimated national recycling rate of 32.1%. Since 2018 NYS communities report recycling recovery rates have become stagnant and/or decreasing. The overall recycling rate was 36% including composting which comprises about half of that total. Organics diversion and recycling has increased significantly in recent years. There are 10 Municipal Waste Combustors (MBCs) in the state which process 3 million tons of waste per year (8.5%).

Materials and Waste Management in New York State



O&M

Since 1988 NYS's solid waste regulations required very conservative environmental containment systems to provide for long-term isolation of waste protecting water and air resources from the interred waste. These regulations have gone through numerous enhancements improving upon the design, construction, operation, and closure requirements ensure that the best protections are advanced. In 2018 all 26 active MSW landfills were double lined and 24 of those facilities had active landfill gas collection systems with landfill gas to energy (LFGTE) plants. NYS Lined landfills have collected more than 700 million gallons of leachate for proper treatment. These lined landfills account for a total of more than 2,500 acres of lined footprint in protecting the State's groundwater resources. Over 8.5 billion cubic feet of landfill gases were

FUNDING & FUTURE NEED

Tipping fees vary across the state and are a function of the services provided by each planning unit. Some facilities offer discounted or scaled tipping fees based on the volume of waste delivered to the facility. Most planning units provide similar services, but for smaller planning units those costs are distributed over a lower waste tonnage or over a smaller number of participants which increases those rates. Many planning units have some form of flow control and dictate the waste management approach and level of recycling. Therefore, it is difficult to compare tipping fees across the state.

The future need is in support of the municipal solid waste management hierarchy of Reduce, Reuse and Recycle. In NYS, the primary focus areas are increasing organics diversion, recycling, and extended producer responsibility (EPR). Based on the significant fraction of organic waste in the state's solid waste stream, in 2019, New York State passed the Food Donation and Food Scraps Recycling Law which is intended to spur collected and destroyed through flaring, with another 16.2 billion cubic feet of landfill gas being used to generate 716,345 megawatt-hours of electricity.

The New York State Department of Environmental Conservation (NYSDEC) Division of Materials Management has instituted an "Inactive Landfill Assessment Program" which evaluates drinking water impacts from for emerging contaminants for over 1,900 inactive landfills. Clean Water Act monies were committed to this program for conducting the evaluations and this work has been summarized in a 2021 report that is available on the DEC's website at: https://www.dec.ny.gov/docs/materials_minerals_pdf/ inactivelandfills2021.pdf

the development of organics recycling infrastructure. Organics diversion from landfills has also been enhanced and supported by the NY State's climate act, the Climate Leadership and Community Protection Act (CLCPA). The Waste Advisory group under the Climate Action Council has recommended additional diversion of organics from landfills, beyond the criteria in the Food Donation and Food Scraps Recycling Law, to address climate change. To support the development organics diversion and recycling, DEC has provided \$5.1 million in state grants since 2015:

Entity	Funding Amount
Feeding NYS	\$ 2.8 million
Small Food Relief Organizations	\$ 1.1 million
Municipalities	\$ 1.2 million

COMPOSTING FACILITIES IN NEW YORK STATE



https://www.rit.edu/affiliate/nysp2i/organic-resource-locator

Since 2015, New York State has dedicated over \$100 million through the Environmental Protection Fund (EPF) to support municipal waste recycling programs. This state funding has been made available to local communities primarily through the NYSDEC Municipal Waste Reduction and Recycling (MWRR) Grant program for eligible municipal projects including recycling capital projects involving equipment or facilities, recycling education and coordination projects, and household hazardous waste collection programs.

In order to enhance NYS's recycling the NYSDEC undertook a series of stakeholder meetings to address the impediments to recycling which identified recycling education, improving recycling markets, eliminating contamination, and solving glass recovery problems were identified as the primary areas of focus.

New York's existing EPR laws have contributed to significant gains in state landfill diversion. These mandated programs require manufacturers of specific, potentially hazardous products, to establish a convenient system for the collection, handling, and recycling or reuse of such products, at no cost to the consumer at the point of return. Since their inception over 922 million pounds of electronic waste, 2,371,899 lbs. of rechargeable batteries and 38,778 mercury-containing thermostats have been collected for reuse or recycling.

Additional legislative proposals for state EPR and product stewardship programs have been introduced and considered for such materials as carpet, mattresses, solar panels, primary batteries, household hazardous waste, packaging, and paper products, etc., all of which should be managed in an environmentally sound way that avoids taking up unnecessary state landfill space.

Even with these accomplishments, NYS realizes that the overall efficiency, safety, and sustainability of waste materials management systems can be improved. Longterm strategies, such as EPR and product stewardship programs, organics separation and recycling are needed to move into the future. Some future goals include and are in concurrence with those in the New York State Solid Waste Management Plan:

 Continue the shift the focus to sustainable management programs. Shift from "end-of-pipe" techniques to looking "upstream" on how materials that would otherwise become waste could be more sustainably managed.

- Continue to develop and promote EPR legislation.
- Continue to expand educational efforts for the public on waste prevention, reuse, recycling and organics separation and management.
- Lead by example and provide technical assistance and outreach to develop sustainable materials management programs.
- Continue to develop reuse, recycling and composting infrastructure, and end-use markets.
- Offer incentives or funding support for development of new technologies for energy recovery and organics separation and recycling.
- Minimize greenhouse gas emissions and promote landfill gas conversion to energy.



Otisco Lake, Marcellus, NY

PUBLIC SAFETY, INNOVATION, & RESILIENCE

The performance of NYS's operating landfills continues to be excellent in protecting public safety and the environment. The volume of leachate collected from lined landfills and treated, and landfill gas collected and managed has been documented earlier in this Report Card. The 2018 New York State Drug Take Back Act mandates that manufacturers establish, fund, and manage a Department of Health approved drug take back program for the safe collection and disposal of unused drugs, free of charge to the consumers and pharmacies. NYS has established a postconsumer architectural paint collection program.

Other efforts that will require innovation to further provide public safety and increase resilience will be focused on toxics reduction including emerging contaminants. Many chemicals are highly persistent in the environment and as a result can accumulate in soil and groundwater. These emerging contaminants are collected in leachate and are often not being treated for and are not easily removed through typical wastewater treatment systems and as a result are released to the environments (surface water). New York is working on the programs that limit the amount of toxic chemicals in household cleaners and personal care products and in children's products. Efforts are also underway to regulate Per- and Polyfluoroalkyl Substances (PFAS).

To bolster NYSDEC's efforts to promote enhanced recycling in NYS, Memorandums of Understanding were crafted for various State University of New York (SUNY) schools to take on priority areas of concern for stakeholders. Over \$12 million from the EPF is supporting four Universities working on a series of initiatives that will help municipalities and businesses streamline the recycling process, lower costs, and improve public outreach strategies:

- University at Buffalo is researching plastics recycling markets and behavioral science focusing on recycling outreach and education messaging and methods.
- College of Environmental Science and Forestry at Syracuse University has established the NYS Center for Sustainable Materials Management. A comprehensive plan encompassing recycling markets, EPR, green procurement, recycling alternatives for

low grade paper and expanded public outreach are now well underway. The Center also unveiled the new "Recycle Right NY" campaign on Earth Day 2021 www.recyclerightny.org.

- Stony Brook University is undertaking a statewide waste characterization study which will determine the efficiency of current recycling programs across the state as well as the types of materials remaining in the waste stream.
- Alfred University is focusing on improving markets for glass cullet from material processing facilities and will establish a glass innovation center at the school for companies to bench test new methods for improving the quality and recyclability of glass cullet.

NYS State agencies and authorities are leading the way in purchasing products that meet approved green purchasing standards. This program developed green purchasing specifications that mitigate health and environmental risks from the use or release of toxic substances; and minimize the volume and toxicity of packaging. NYS agencies spent over \$212 million purchasing green products in fiscal year 2019-2020.



Lake Ontario Water Treatment Plant, Oswego, NY



Solid Waste



RECOMMENDATIONS TO RAISE THE GRADE

New York State continues an excellent record of managing traditional MSW in lined landfill systems. Going forward the focus must be to continue to identify, support and fund initiatives in:

- reducing waste generation
- diverting waste from landfills
- reusing and recycling products before they become waste.

Innovation will be required as part of these initiatives and to continue to protect human health and the environment.

SOURCES

USEPA, Facts and Figures about Materials, Waste and Recycling

Compilation of 2018 Annual Reports for New York State Waste Management Facilities 2015 New York State Report Card

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EXECUTIVE SUMMARY

New York's more than 100 transit systems face challenges as they grapple with significant maintenance backlogs, the need to become more resilient, and a push to transition away from fossil fuels. Transit systems across the state operate over 16,000 revenue vehicles, more than 1,700 miles of subway and rail track, over 150 miles of tunnels, tens of thousands of stations, bus stops, and landings, and much more. While many agencies have made significant progress over the last decade in modernizing and updating their infrastructure, there continue to be significant needs, and significant escalation in capital costs continue to keep pace with or exceed new revenue sources, exacerbating an already large funding gap. Today, capital investment needs total approximately \$64 billion through 2024. New York City's Metropolitan Transportation Authority must grapple with a \$62.1 billion state-of-good-repair backlog across its 12-county service region. Upstate and suburban transit agencies will need to address a \$1.7 billion backlog through 2024. Funding is needed to replace thousands of vehicles that will be beyond their service life, modernize subway and commuter rail infrastructure, improve ADA accessibility, transition to zero-emission technology, and much more.

INTRODUCTION

New York is the most transit intensive state in the nation, with nearly 10 million trips per day pre-pandemic. The Metropolitan Transportation Authority (MTA), which operates subway, bus, and rail services in the 12-county New York City metropolitan region is the largest transit authority in the nation, and there are more than 100 smaller transit systems operated by regional authorities, municipalities, and private carriers throughout the State. These smaller systems carried more than 500,000 riders a day in 2019¹. New York's transit infrastructure is expansive, diverse, and old. The system includes over 16,000 revenue vehicles, more than 1,700 miles of subway and rail track, thousands of overpasses and tunnel structures (including over 150 miles of tunnel), tens of thousands of stations, bus stops, and landings, hundreds of facilities for maintenance and administration, and support facilities for power, signal and communications, pumps, and ventilation plants.

The COVID-19 pandemic continues to have a significant impact on transit ridership and revenue throughout the state. Although ridership may take several years to fully recover, transit infrastructure continues to operate, serving essential trips and passengers returning to the office. These assets continue to require require regular investment to replace over-age vehicles and keep facilities in a safe, usable condition. Transit vehicles are the largest and often the most visible capital components. However, there are many other important, often unseen, supporting facilities that are just as essential for dependable and efficient transit service.

CONDITION

Infrastructure investments can be categorized into two areas: core investments (to replace assets and improve the state of good repair to maintain existing service levels) and capacity expansion investments (to increase service capacity or expand networks). The refurbishment and replacement of rolling stock represents a highly visible component of core investment and infrastructure spending. One measure of the unmet core investment backlog is the number of transit vehicles that are near or beyond the end of their service life. Older buses and rail cars are costly to maintain, less reliable, and put pressure These include passenger facilities, maintenance yards and shops, and a growing array of technology focused on improving passenger communication, safety, and system efficiency.

on existing finances to keep them running. As of 2019²:

- There were more than 5,300 revenue vehicles in New York (representing 26% of all vehicles statewide) beyond their end of service life.
- Without additional investments, up to 42% of revenue vehicles statewide are expected to be beyond their service life by 2025, including 64% of vehicles operated by upstate and suburban agencies.

FIGURE 1: PERCENTAGE AND NUMBER OF PUBLIC TRANSIT REVENUE VEHICLES IN NEW YORK STATE PAST THEIR END OF SERVICE LIFE WITHOUT ADDITIONAL INVESTMENT



In the New York City metro area, the MTA continues to face a significant state of good repair backlog, most notably in subway ventilation and repair shops. While the MTA has significantly reduced the backlog of assets beyond their service life (especially for service delivery assets), progress in other areas has been slower. Investments funded through the MTA's current 2020-2024 Capital Program are expected to improve State of Good Repair across multiple categories. Table 1 represents the expected percentage of MTA assets considered in a State of Good Repair following the completion of the 2020-2024 Capital Program.

While progress towards State of Good Repair continues,

the MTA also continues to grapple with the challenge of addressing significant backlogs in many major asset categories, as well as the need to expand step-free access to the subway system—only 25% of subway station platforms were ADA accessible as of 2019. While there has been a significant investment in funding for accessibility in recent years, this represents one of the MTA's most significant needs.

TABLE 1: MTA ASSETS IN A STATE OF GOOD REPAIR³ FOLLOWING 2020-2024 CAPITAL PROGRAM

Asset Class	NYCT	Bus Co.	LIRR	MNR
Trains & Buses	100%	91%*	89%*	84%*
Stations	86%		92%*	73%
Track	100%		94%	70%*
Line Structures	98%*		85%	42%
Communications	90%		82%	64%
Signals	82%*		69%*	64%
Power	73%		54%	44%
Shops and Yards	49%	96%*	65%	45%
Pumps	100%			
Elevators/ Escalators	100%*			
Tunnel Lighting	71%			
Ventilation	48%			
Facilities/Parking			81%*	72%
Major Terminals			51%	30%

Categories marked with a * have at least a 10 percentage-point improvement in state of good repair condition during the 2020-2024 period

OPERATIONS & MAINTENANCE

New York's transit network is forecasted to need upwards of \$64 billion in capital investment through 2024. New York State Public Transit Association's (NYPTA) 5-year Capital Program for Upstate and Downstate Transit forecasted \$1.2 billion in future capital needs for upstate transit systems and \$0.6 billion for suburban downstate systems in order to maintain infrastructure in a state of good repair and make strategic investments through 2024. MTA's extensive transit network is estimated to need \$62.1 billion in transit investments through 2024 across its 12-county service region.

Core Needs	MTA⁴	Upstate ⁵	Suburban Downstate ⁶	Total need
Vehicle Costs	\$12,043	\$435	\$462	\$12,940
Facility Costs	\$15,410	\$175	\$62	\$15,647
Other Capital Costs	\$15,901	\$142	\$34	\$16,077
Total Core Need	\$43,355	\$752	\$558	\$44,665
Capacity Expansion	MTA2 ²	Upstate ³	Suburban Downstate ⁴	Total need
Vehicle Costs	\$1,424	\$41	\$5	\$1,470
Facility Costs	\$5,781	\$263	\$0	\$6,044
Other Capital Costs	\$2,271	\$113	\$0	\$2,384
Network Expansion	\$9,243	\$0	\$0	\$9,243
Total Expansion Need	\$18,719	\$417	\$5	\$19,141
Total Capital Need	\$62,074	\$1,169	\$563	\$63,806

TABLE 2: ESTIMATED CAPITAL FUNDING NEEDS (\$ IN MILLIONS) (THROUGH 2024)

The replacement of revenue vehicles represents the primary capital need for upstate and suburban downstate transit systems, requiring \$897 million in investment through 2024 to replace 1,718 vehicles. An additional \$46 million in funding is required for upstate and suburban transit systems to purchase new vehicles for expanded services. The MTA has also committed to spending \$9.7 billion on revenue vehicles through 2024, with plans to purchase over 2,000 new subway cars, 2,400 buses, and approximately 200 rail locomotives and passenger coaches.

Maintaining the MTA's expansive network of passenger facilities, shops, yards, and track structures represents its largest core funding need, and is expected to require at least \$15.4 billion in investment through 2024. Upstate and suburban systems are expected to need an additional \$237 million in investment for facility repairs through 2024.

The remaining core infrastructure needs of \$16.1 billion (\$15.9 billion for the MTA, \$176 million for upstate and suburban systems) would replace other capital assets including fare collection systems, communications and signal equipment, and power infrastructure. Bringing the NYC Subway's aging signal infrastructure back into a state of good repair represents the single largest underfunded capital need, with \$5.4 billion in additional funding needed to bring the signal systems just to a state of good repair, not even considering the need to modernize and expand Communications Based Train Control to expand capacity, an effort that will require billions of additional dollars.

CAPACITY

Most of New York's transit systems have generally concentrated their efforts on keeping existing assets in a state of good repair, however, significant investment is needed to expand access to mass transit across the State, especially in congested areas in and around New York City. These capacity expansion projects include purchasing additional vehicles and constructing new facilities. Expansions to the State's subway and rail

FUNDING

New York's mass transit agencies—and particularly the MTA—are relying on significant sources of Federal, State, and dedicated tax funding to advance their state of good repair and capacity expansion efforts. The MTA's 2020-2024 Capital Program, as proposed, identified \$51.5 billion in funding, its largest program ever and

systems represent tremendous undertakings that require significant investment and time. Projects currently under construction or proposed include the second phase of the Second Avenue Subway, Metro-North service to Penn Station, the upgrade of subway signaling systems to Communications Based Train Control, further expansion of bus lanes and Select Bus Service in New York City, and the completion of East Side Access.

\$20.5 billion more than was committed in the prior five years⁷. Upstate and suburban transit agencies have identified \$713 million in available funding. These funding estimates were developed several years prior to passage of the Infrastructure Investment and Jobs Act.

Source	MTA ⁸	Upstate ⁹	Suburban Downstate ¹⁰	Program funding
Federal Formula	\$7,500	\$71	\$84	\$7,655
Federal Other	\$3,180	\$11	\$120	\$3,311
New York State	\$3,000	\$266	\$74	\$3,340
Local Match	\$0	\$10	\$40	\$50
Local Other	\$3,00011	\$27	\$10	\$3,037
Central Business District Tolling	\$9,000 ¹²	\$0	\$0	\$9,000
Sales/Mansion Tax	\$1,300 ¹³	\$0	\$0	\$1,300
MTA Bonds & PAYGO	\$9,292 ¹⁴	\$0	\$0	\$9,292
Total Funds Available	\$36,272	\$385	\$328	\$36,985

TABLE 3: PROGRAMMED FUNDING FOR CAPITAL NEEDS (2020-2024)

The MTA's 2020-2024 Capital Program relies on significant new funding sources passed into law as part of New York's FY 2020 state budget. Specifically, the budget authorized the MTA to implement a new Central Business District Tolling program (also known as congestion pricing) which was expected to generate enough revenue to support \$15 billion in bonding capacity. Together with an additional \$10 billion in bonding capacity supported by revenues from a sales tax on internet sales in New York City and a mansion tax on properties valued at \$25 million or more, these new revenue sources account for most of the MTA's extra spending power.

However, there are significant doubts that the full extent of these new revenue sources will be realized in a timely manner. The implementation of congestion pricing initially expected to begin in January 2021—has been delayed. Congestion pricing is currently not expected to be ready until at least 2023, delaying the availability of these revenues. Further, the proceeds from the internet sales tax and mansion tax has been limited so far—in

FUTURE NEED

When comparing estimated investment needs with expected available resources, New York's mass transit network faces a \$26.6 billion capital funding gap through 2024. While the MTA has been able to make progress the first two years, the MTA reports receiving just \$461 million of the \$10 billion expected to be made available for the 2020-2024 Capital Program¹⁵.

Additionally, the MTA's very heavy reliance on debt service to fund its capital program also threatens the stability of many of these funding sources. With nearly \$50 billion in debt outstanding on its books at the end of 2021¹⁶, higher borrowing costs due to continued reduced ridership as well as an uncertain economic outlook fueled by concern over inflation and the recovery from the pandemic could result in less funding available for capital projects.

towards addressing its state of good repair backlog over the last decade, growing core needs across the MTA network account for more than half (\$16.4 billion) of this shortfall.

	МТА	Upstate	Suburban Downstate	Statewide Total
Total Capital Needs	\$62,074	\$1,169	\$563	\$63,806
Total Funds Available	\$36,272	\$385	\$328	\$36,985
Funding Gap	(\$25,802)	(\$784)	(\$235)	(\$26,821)

TABLE 4: PROJECTED CAPITAL FUNDING GAP (THROUGH 2024)

New York's major transit agencies have not published updated capital spending plans since the beginning of the COVID-19 pandemic. The COVID-19 pandemic and recent Federal legislation presents both significant challenges and opportunities for New York's transit networks. The rapid onset of the COVID-19 pandemic in early 2020 and the impact on the finances of many agencies and municipalities caused many transit operators to put capital spending efforts on hold, delaying progress on upcoming commitments which will likely result in further cost escalation or deterioration in condition. On the other hand, the recently passed Federal infrastructure Investment and Jobs Act (IIJA) is anticipated to result in approximately \$11 billion in new capital funding to transit operators in New York State. These new federal resources may help transit systems across the state to address some of the backlog of state of good repair needs and pursue priority system expansion projects.

The most significant threat to the capital funding gap is the significant escalation in capital construction costs, particularly on MTA projects. A 2018 report on transit construction costs by the Regional Plan Association¹⁷ stated that "New York's exorbitant costs have raised serious concerns about its ability to afford heavy rail, and has eroded the public's confidence in the MTA." With cost escalations keeping pace with or exceeding new revenue sources, the capital funding gap will likely only continue to grow.

INNOVATION

Many New York transit operators are beginning the transition to zero-emission vehicles, introducing a new aspect of capital investment in transit, requiring significant new investments to purchase new battery electric vehicles and the supporting infrastructure (charging equipment, facility power upgrades, etc.) that goes along with them. These costs are not yet fully known and represent a significant additional investment need not anticipated several years ago.

The MTA has committed to operating a fully zeroemission bus fleet by 2040¹⁸. Currently, 60% of the MTA's bus fleet is diesel powered, however it plans to invest in 475 new battery electric buses through 2024. The pace of battery electric bus adoption will ultimately be limited by the investment in the required supporting infrastructure. The MTA is planning upgrades to 7 bus depots to accommodate battery electric buses, though it is unclear if their capital investments are on pace to build out adequate facility capacity to meet their stated goal¹⁹. The MTA has initiated a pilot study to determine the feasibility of replacing existing diesel-powered equipment on the commuter rail lines with batteryelectric multiple unit trains²⁰. While a pilot program is underway, it is unclear whether or not MTA intends or would be able to scale this solution to the entire network.

The State set a goal for five²¹ of its largest non-MTA bus systems to transition 25% of their fleets to zero-emission by 2025 and 100% by 2035²². Transitioning the State's entire public transit bus fleet to zero-emission vehicles is estimated to require at least an additional \$9.3 billion in investment²³ beyond what would be required for in-kind replacement, not considering the additional costs for supporting infrastructure, which would easily add several billions in additional costs.

The most significant threat to the capital funding gap is the significant escalation in capital construction costs, particularly on MTA projects. A 2018 report on transit construction costs by the Regional Plan Association 17 stated that "New York's exorbitant costs have raised serious concerns about its ability to afford heavy rail, and has eroded the public's confidence in the MTA." With cost escalations keeping pace with or exceeding new revenue sources, the capital funding gap will likely only continue to grow.

RESILIENCE AND PUBLIC SAFETY

Following the impacts of Hurricane Sandy in 2012, \$10.5 billion was set aside for recovery and resiliency projects across the MTA network²⁴. These investments, coupled with updated flood design standards²⁵ have strengthened the MTA's resilience to coastal flooding. Despite these efforts, New York's mass transit operators remain vulnerable to precipitation-based flooding. Extreme precipitation, along with extreme heat and wind-related hazards, are expected to become more frequent and intense with climate change²⁶. The resilience of transit systems to natural hazards is becoming increasingly important as the effects of climate change become more severe²⁷. As demonstrated by significant flood events in summer 2021²⁸, there remains a significant short-term need for additional investments in climate resilience.

As transit agencies increasingly rely on electric buses, their resilience will depend on the resilience of the electric grid, which is at present more sensitive to severe and extreme weather events than the supply of diesel fuel, particularly in upstate regions where transmission lines are especially vulnerable to wind-related hazards²⁹. As such, additional investment in increasing the resilience of the power grid, both to natural hazards and malicious attacks³⁰, will be increasingly important for transit. Additional research and investment in on-site power generation or energy storage at electric bus depots will be needed to ensure resilience of bus operations to natural hazards and disruptive events.

Transit



RECOMMENDATIONS TO RAISE THE GRADE

- Adequately fund state of good repair to reduce the associated backlog
- Address significant escalations in capital costs to narrow the gap between investment needs and funding available
- Adequately fund vehicle fleets and associated infrastructure improvements in order to achieve the goal of zero emission vehicles
- Assess vulnerability and align capital improvements to increase the resiliency of transit systems to extreme heat, precipitation, and electric grid disruptions
- Prioritize transit investments in order to encourage sustainable land-use decisions

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Transit

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EXECUTIVE SUMMARY

There are over 35,000 miles of sewers in New York State. Approximately 40% are more than 60 years old and about 10% were built before 1925. Aging sewer infrastructure leads to increased infiltration and inflow, broken pipes, clogging, exfiltration, and equipment failures. These occurrences can stress systems that are already at or near their capacity and can cause combined sewer overflows. While significant investments have occurred, including \$18.2 billion in funding since 1990 from the New York State Environmental Facilities Corporation through the Clean water State Revolving Fund and recovery funds after Superstorm Sandy, infrastructure continues to age and is in need of renewal. At a minimum New York State needs to invest at least \$38 billion now to meet the current deficit and at least 10 times that over the next 20 years to repair existing systems, meet increasing demand, and meet Water Quality Standards. Additionally, approximately 25% of the State population is serviced by onsite wastewater systems, which are also aging and in need of maintenance.

CONDITION & CAPACITY

According to the New York State Department of Environmental (NYSDEC), of New York State's over 35,000 miles of sewers, approximately 40% are more than 60 years old and about 10% were built before 1925. Aging sewer infrastructure leads to increased infiltration and inflow (1&1), broken pipes, clogging, exfiltration, and equipment failures which exacerbates systems that are already at or near their capacity and can cause combined sewer overflows (CSOs), sanitary sewer overflows (SSOs), and/or non-compliance. CSOs and SSOs are the release of partially treated or untreated sanitary waste which can contaminate surface waters and threaten public health. The aging infrastructure also causes Utility Operators to prioritize manpower and budget on reactionary measures as opposed to planned maintenance (precautionary). Ideally, Utility Operators would expend 10% of manpower and budget on reactionary measures and 90% on planned maintenance (precautionary), but many see that comparison much closer to 50%/50%.

The vast majority of discharge data that the NYSDEC receives are within the limits specified in the facility's State Pollutant Discharge Elimination System (SPDES) Permit. During the state fiscal year 2019/2020 nearly 98% of the data reported to the NYSDEC was compliant with the limits of the SPDES Permit. For that same time period however, 24% of New York State's 337 major-class facilities met a Significant Non-Compliance Criteria at least once. This has, in general, been consistent over the past 10 years.

According to the 2018 Section 305(b) Water Quality Report approximately 25% of the State population is serviced by onsite wastewater systems. In that same report, inadequate and failing systems including cesspools and septic systems (most over 50 years old) are identified as being a major or contributing source in 27% of waterbodies assessed as "impaired" as conventional onsite septic systems were not designed to remove nitrogen. In response to these systems that are failing and/or unable to remove nitrogen or other pathogens, the Clean Water Infrastructure Act of 2017 established the State Septic System Replacement Fund to assist in funding to replace existing failing onsite wastewater treatment systems which have significant environmental impacts. This is especially a concern in

FUNDING & FUTURE NEED

Modern wastewater infrastructure first began in the U.S. around the end of the 19th and beginning of the 20th century. The Clean Water Act of 1972 brought wastewater treatment across the country and up to a standard of at least secondary treatment. With this mandate came federal grants, supplemented with state grants, leaving municipalities to contribute the remaining 10-30%. The level of municipal funding has increased at greater than the inflation rate since the Clean Water Act, but federal and state funding has decreased and shifted from grants to loans, placing additional financial obligations on municipalities in the future.

The specific legal and financial set-up of wastewater utilities varies between municipalities, ranging from a fully integrated department within government to a separate entity with the government functioning as the business owner. Local funds come from taxes and sewer fees, and these funds are sometimes separate (for example like Enterprise Funds) from municipal budgets. The discretionary nature of local funding and potential for political control over funding can disincentive long-term capital investments or require lumpy funding from general funds and bonds as political cycles are more short-term than civil asset lifespans, focusing sewer-specific funding on base operating expenditure. This can result in cost, reactive capital works. There is also less incentive to invest if a municipality is only responsible for non-revenue generating portions of wastewater infrastructure, such as collection systems, while another organization is responsible for treatment. These factors have all contributed to funding shortfall for wastewater

low lying areas where waste from failing septic systems only has a short distance to travel to impact the ground and surface waters such as in Suffolk County where there are over 250,000 cesspools as of 2017 (another 110,000 septic systems exist as well). Suffolk County has identified cesspools and septic systems as the largest single cause of degrading water quality and has in recent years, been addressing this through the Suffolk County Subwatersheds Wastewater Plan in an effort to replace failing septic/cesspool systems and expand sewers/ treatment capacity.

infrastructure, compounded by increasing standards and the fact that much of the initial civil infrastructure from the Clean Water Act is now reaching the end of its useful life.

The 2012 wastewater infrastructure funding gap, as quantified in the 2012 Clean Water Needs Survey was \$31.4 billion for New York State. Without an updated Clean Water Needs Survey the wastewater infrastructure funding gap can be calculated by adjusting for inflation and assuming the funding to needs gap remains similar. By adjusting for inflation, the 2021 wastewater infrastructure funding gap is approximately \$38 billion for New York State.

New York City (which generates half the flow in the State) released a Ten-Year Capital Strategy for Fiscal Years 2022-2031 in April of 2021 which identified a need of \$8.5 billion for Water Pollution Control to improve the quality of the City's waterways and to comply with mandates imposed by the Clean Water Act.

These numbers demonstrate that the current finance operations of wastewater in New York are not providing enough money to address growing expenditure needs. The current situation places nearly all financial responsibility on the municipality, either directly or through loan repayments. In recent years New York State has funded new and provided additional funding for existing Grant Programs. The Federal Government recently enacted the Infrastructure Investment and Jobs Act (IIJA) which will preserve the loan program but will also provide funds for grants and principal forgiveness which will greatly help in providing a down payment on the funding gap. Significant funding will still be required of local resources as well as provide for 100% of the operation and maintenance cost of new and existing facilities. At this time it is estimated by ASCE that the 2022 Clean Water New York State Revolving Fund will receive an estimated allotment of approximately \$198 Million.

In order to project future needs, municipalities can use asset management to manage infrastructure investments

OPERATION & MAINTENANCE

Certified operators are instrumental in operating the Water Resources Recovery Facilities (WRRF) and providing the experience and understanding needed in asset management discussion to shape future plans. There is a national trend of aging and retiring operators

PUBLIC SAFETY

The 2013 Sewage Pollution Right to Know (SPRTK) requires Publicly Owned Treatment Works and Sewer Systems to notify the New York State Department of Environmental Conservation (NYSDEC) and the public of untreated and partially treated sewer discharges. Violations are handled through the Permit Program and Consent Decrees or Administrative Orders. This information including reports of discharges are updated daily and accessible to the public through the NYSDEC website at https://www.dec.ny.gov/chemical/101187. html. The number one reported reason for discharge was wet weather conditions (rain/snowmelt) in 2020. These discharges pose a threat to public safety by negatively impacting water quality, leading to bacterial over the medium and long-term, balancing risk, opportunity and shaping future funding arrangements at all levels of government through increased understanding of the need. This can include anticipated future needs for resiliency, climate adaptation and major changes in technology due to innovation. The DEC and EFC conducted a pilot program in 2015 for asset management at municipal works and are currently developing materials to be released for public use.

with fewer operators applying for certification year after year, which is also reflected in New York. Operators are aware and knowledgeable about the needs of WRRF, even if they are unable to make specific plans to address those issues.

contamination, promoting harmful algae growth and reducing oxygen levels in the water.

According to the Office of the NYS Comptroller there are currently about 800 CSO outfalls in New York State and approximately 6.5 billion gallons of untreated combined sewer and stormwater were released in 2017 due to CSOs. To address these ongoing concerns the New York City DEP has entered into a Long Term Control Plan with the NYSDEC in 2012 to reduce CSOs which is currently ongoing with significant progress made and much more planned. Other municipalities such as Albany have also adopted and implemented plans. Others have adopted Green Infrastructure such as Onondaga County in its "Save the Rain" Program.

RESILIENCE

As a result of Superstorm Sandy in October 2012 and other high profile storm events such as Hurricane Irene in 2011, public and political attention has been brought to the vulnerability of New York State's wastewater infrastructure to natural disasters and climate change/ rising sea level. Nassau County, one of the hardest hit communities from Superstorm Sandy, has received over \$830 Million from FEMA since the storm to implement flood and storm hardening projects including protecting the Wastewater Collection and Treatment infrastructure to the 500-year flood elevation. These projects also included the replacement/upgrade of existing wastewater collection and treatment systems such as replacing units with submersible systems. The New York State Environmental Facilities Corporation (EFC) which is the organization in NYS that administers federal and state funding in wastewater loans and grants, required that all projects funded through the Storm Mitigation Loan Program (SMLP) follow strict Elevation Criteria to ensure that new infrastructure is protected to flood hazards anticipated in the future plus varying degrees of freeboard. This will ensure that in future events the same damage does not occur.

As natural disasters increase in frequency and intensity, focus and funding must be maintained to ensure that the infrastructure is better prepared in the future. Strong modeling, policy and structures are required to create and implement a future-proof wastewater system.



INNOVATION

While protecting water quality is the primary goal of wastewater treatment, there are other governmental priorities that wastewater infrastructure affect. Chief among secondary concerns is climate change, particularly energy consumption. This is reflected in the effort to rename facilities Water Resource Recovery/Reclamation Facilities (WRRF). Utilities can reduce greenhouse gas emissions and energy costs through energy efficient measures. They also have the potential to produce energy, primarily from anaerobic digestion to generate biogas as well as in installing solar panels on their vast acreage. Biogas is a controversial issue at the state level because it is used in the same ways as geological natural gas, and supporting biogas infrastructure could be supporting natural gas infrastructure and hindering the move from fossil fuels, or at least it can be perceived that way. A lack of funds for innovating technology is stymieing the ability of utilities to affordably improve treatment.

Wastewater



RECOMMENDATIONS TO RAISE THE GRADE

- Develop asset management capabilities for institutions/utility operators by expanding the DEC and EFC pilot program, completing the DEC asset management guidance materials for public use, and supporting asset management training through professional organizations such as ASCE, NYWEA (New York Water Environment Association) and IAM (The Institute of Asset Management)
- Provide funding to create, as well as require, Capital Improvement Plans and Capacity, Management, Operation and Maintenance (CMOM) Programs
- An adequate, consistent, and affordable funding stream achieved with rate payer studies, and 'ring-fencing' wastewater revenue or utilizing enterprise funds to cover the full cost of operation, maintenance, capital costs and innovation, possibly by regulating rates through a state commission for public and private utilities. Affordability is essential and may require additional funding or tiered rates
- Increasing labor and technical resources for utilities through facilitating utility consolidation, improved operator training and certification, and increased research and development investment
- Additional federal grants and loans, including reauthorizing WIFIA, and AWIA
- Support the 2022 Clean Water Needs Survey currently being undertaken and continue reauthorization of the Clean Water Needs Survey in the future.
- Continue to promote the shift from failing onsite septic systems to wastewater collection and treatment through education, public outreach, legislation, and funding opportunities.
- Technical and financial support for cross-sector collaboration in energy, biosolids and resource recovery

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