New York State Comptroller
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Severe Weather Events and Resiliency in New York State

October 2025

Message from the Comptroller

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This month marks the 13th anniversary of Superstorm Sandy's landfall, causing catastrophic damage to property, lives and livelihoods. The incidence of extreme weather events is growing and impacting an increasing share of New Yorkers. We remember the thousands of flooded homes, the power outages and the loss of life associated with Sandy, Irene, Isaias, Ida and Lee. Fortunately, these cataclysmic named storms are still relatively rare. Increasingly, however, we are experiencing flooded subway tunnels in Manhattan, flooded roadways in Westchester and Long Island, or destroyed and damaged homes in Oneida from storms without a name.

Some have called the more frequent incidence of damaging storms the new normal, but the scientific community and our experiences tell us that this is just the beginning if we aren't successful in reducing emissions of greenhouse gases globally. It is troubling that as Americans lose their homes, property and even their lives, the federal government is attempting to claw back funding that was awarded to assist communities in making the upgrades to drainage infrastructure, early warning systems and other resilience investments that could prevent these tragic losses.

Fortunately, New Yorkers approved the Clean Water, Clean Air and Green Jobs Environmental Bond Act, which is providing funding to support resilience investments and efforts to reduce the greenhouse gas emissions that are leading to increased instances of extreme weather. New York State and its municipalities are also pursuing a number of other efforts to promote a more resilient New York, as discussed in this report. But New York cannot and should not have to shoulder the whole burden for resilience upgrades.

As New York moves forward with the New York State Adaptation and Resilience Plan, it must consider the need to upgrade our infrastructure, homes and businesses to better resist extreme weather, as well as the need for federal partners to help make the costs of necessary projects more affordable for New Yorkers. The impacts of climate change are not just a problem for New Yorkers, or isolated to a few states, but a danger to all Americans.

I hope you will find this report on weather-related disasters affecting New York State interesting and informative.

Thomas P. DiNapoli
State Comptroller

Table of Contents

Executive Summary

While New York has experienced significant destruction of property and loss of life from extreme weather events in both the 20th and 21st centuries, in recent decades such events have become more frequent and more damaging.[1] These changes are consistent with patterns observed worldwide and which are widely understood to be due to changes in the climate caused by increasing concentrations of greenhouse gases in the atmosphere.[2]

This report utilizes data produced by the National Oceanic and Atmospheric Administration (NOAA), the Federal Emergency Management Agency (FEMA) and the National Flood Insurance Program (NFIP), as well as analysis in the New York State Hazard Mitigation Plan, to examine trends in incidence of damaging weather, the costs of recovery and efforts to mitigate the impact of these weather events. Among the major findings are:

- Severe weather events tracked by NOAA are increasing in incidence in New York and certain types of events, including thunderstorm-related damaging wind and flash flooding, are also increasing.
- Controlling for inflation, NOAA has found that weather-related disasters causing $1 billion or more in damage have occurred at an increasing rate since 1980.
- Since 1998 there have been an average of 2.5 weather events each year resulting in federal Disaster or Emergency declarations with authorized assistance in real 2024 dollars averaging $958.6 million per year in New York.
- NOAA Storm Data shows that there have been 594 deaths in New York from severe weather between 1996 and 2024. Heat and extreme heat events are responsible for most deaths with 122, followed by rip currents with 62 and flash flooding events with 57 deaths.

Studies on the long-term economic impacts of extreme weather show that persistent reductions in economic growth and welfare follow the damage these events can cause. The New York State Hazard Mitigation Plan – based on a review of both incidence of weather-related disasters and the related damage – finds that the expected annual loss from disasters affecting the State is nearly $1.4 billion. On the other hand, climate resilience expenditures are held to reduce costs of cleanup and rebuilding by as much as $6 for every dollar spent and to reduce economic damages by as much as $7 for every dollar spent.[3] This information supports the need for investments in both mitigation of the root causes of climate change and the resilience of communities to disasters.[4]

New York State has dedicated $1.1 billion of the $4 billion Clean Water, Clean Air and Green Jobs Environmental Bond Act to projects to restore natural drainage features like flood plains and wetlands that can help control stormwater and projects to protect infrastructure from floods. Through August 2025, $129.7 million in restoration and flood risk reduction projects have been awarded. Corporate and municipal entities are also undertaking such resiliency investments, which are essential for the protection and future economic growth of our region.

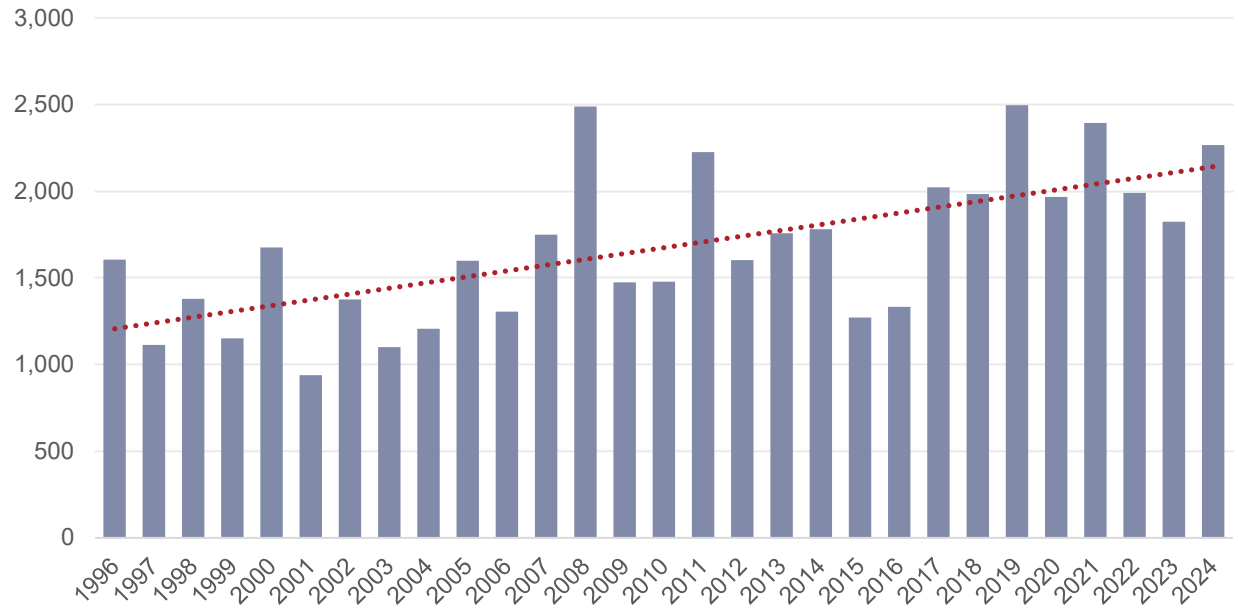
Weather Events

The National Oceanic and Atmospheric Administration (NOAA) publishes storm data that can be used to evaluate trends in the occurrence of weather events significant enough to be the subject of National Weather Service warnings. It captures a wide range of weather events severe enough to cause loss of life, injuries, significant property damage or disruption of commerce, or set records.[5] These events are compiled from reports by trained observers, often National Weather Service staff, and verified, if possible, with radar data.[6]

The NOAA Storm Dataset reports incidence of powerful weather in “episodes” and “events.” Episodes are weather patterns that generally affect a region of the state, while events are recorded as the results of these weather patterns in a county or a portion of a county. An episode will typically have one or more associated events. For example, on August 28, 2011, during Hurricane Irene (Irene), there were seven episodes and 209 events recorded in New York.[7]

As shown in Figure 1, from 1996 through 2024, while there is variability from year to year, events have increased over time, with three out of the four years with the highest numbers of severe weather events occurring in 2019 (2,498), 2021 (2,395) and 2024 (2,268).

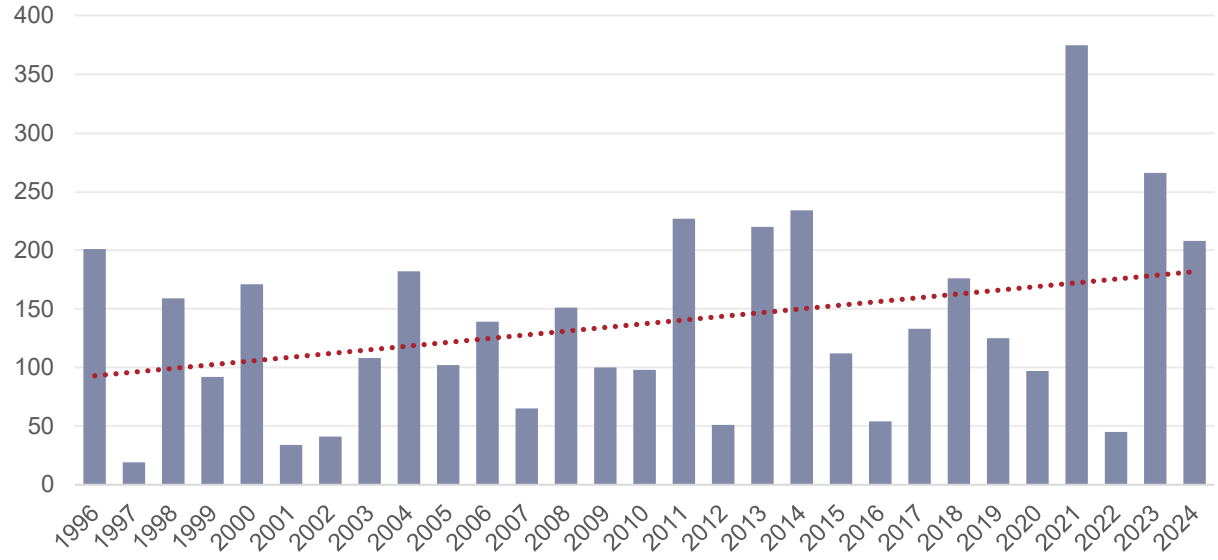
Figure 1
Storm Events Recorded by NOAA in New York, 1996-2024



Source: NOAA Storm Data

Among types of events, winds associated with thunderstorms were the most common type of severe weather, with 14,824 incidents recorded, followed by hail (4,315), flash floods (3,985), winter weather (3,817) and winter storms (3,714). These five types accounted for 63.1 percent of all events.

Figure 2
Flash Floods Recorded by NOAA in New York, 1996-2024

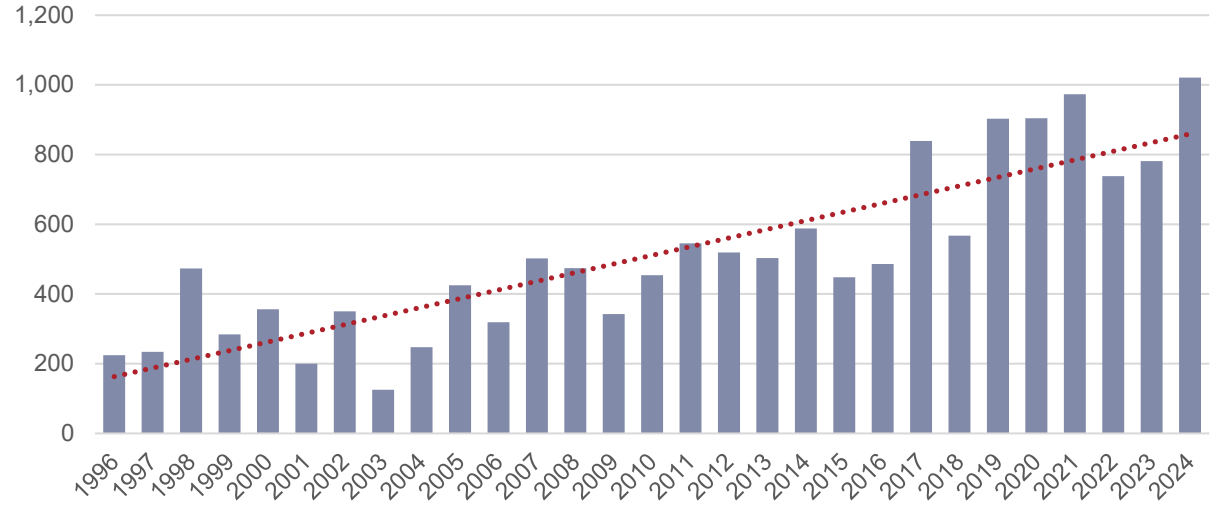


Source: NOAA Storm Events Database

Since 1996, there has been a trend of increases in annual numbers of flash floods occurring in New York (Figure 2). As with the overall number of events (Figure 1), the largest numbers of events occurred in recent years, with the first, second and sixth largest numbers of flash floods occurring in the last four years.

Thunderstorm wind events also show a significant increase over the period. The seven years with the largest number of these events all occurred in the last eight years.

Figure 3
Thunderstorm Wind Events Recorded by NOAA in New York, 1996-2024

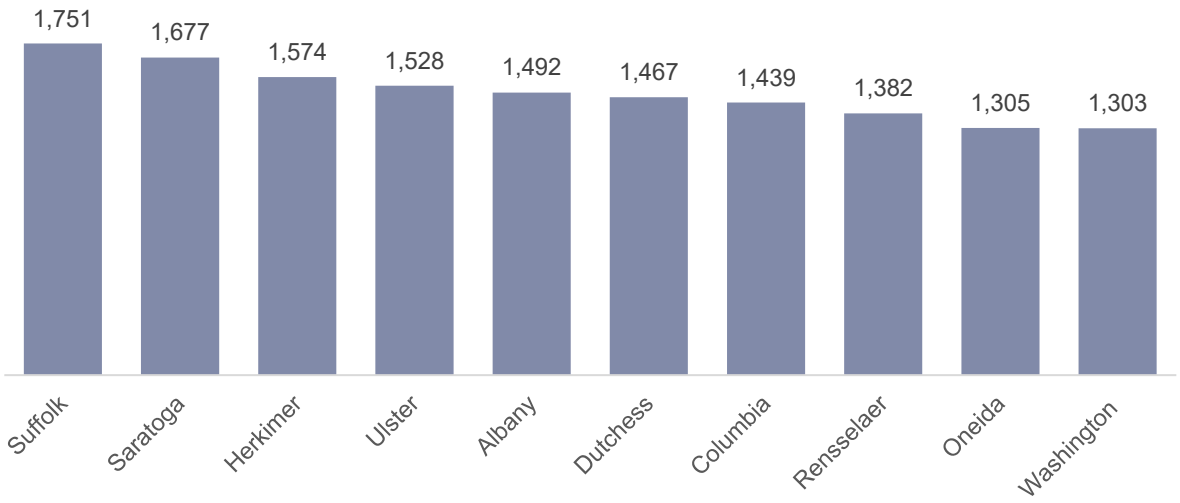


Source: NOAA Storm Events Database

Events by County

While all New Yorkers are impacted by severe weather events, the weather events captured in NOAA Storm Data have been heavily concentrated in a handful of counties, as shown in Figures 4 and 5.

Figure 4
Ten New York Counties with the Highest Number of Severe Weather Events Recorded by NOAA, 1996-2024



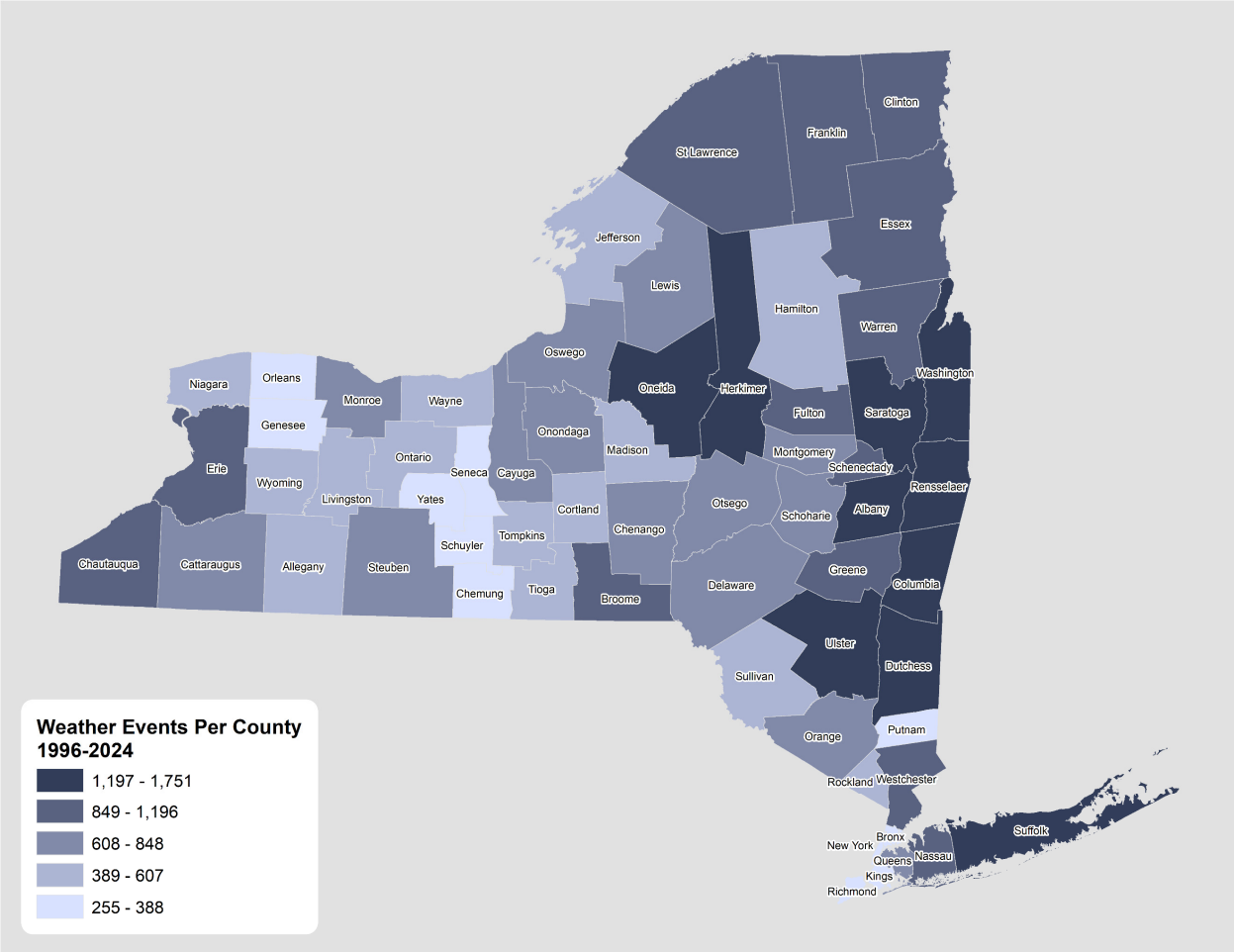
Source: NOAA Storm Events Database

Based on NOAA Storm Data, Suffolk County experienced the highest number of severe weather events during the period reviewed. Other counties experiencing the largest numbers of events include areas in the Hudson and Mohawk Valleys, North Country and in Western New York. Schuyler County experienced the fewest recorded events during this time (255).

These results are consistent with the findings of the Fifth U.S. National Climate Assessment (NCA) published in 2023, which found the number of days with five inches of rain or greater increased by 103 percent in Northeastern states between 1958 and 2022, resulting in increased flooding.[8] The Assessment also finds that the Northeast is facing longer and more severe heatwaves and paradoxically, given the increases in precipitation, more drought.

Across all U.S. states, there has been an overall increase in extreme weather, but regions are affected differently. For example, the Southeast has experienced more billion-dollar disasters than other regions and is one of the regions most affected by tropical cyclones, while the Southwest has experienced increases in extreme heat events and related mortality as well as surface and groundwater reductions and increased wildfire risk.[9]

Figure 5
Total Severe Weather Events Recorded by NOAA, By New York Counties, 1996-2024



Source: NOAA Storm Events Database

Economic and Human Impacts

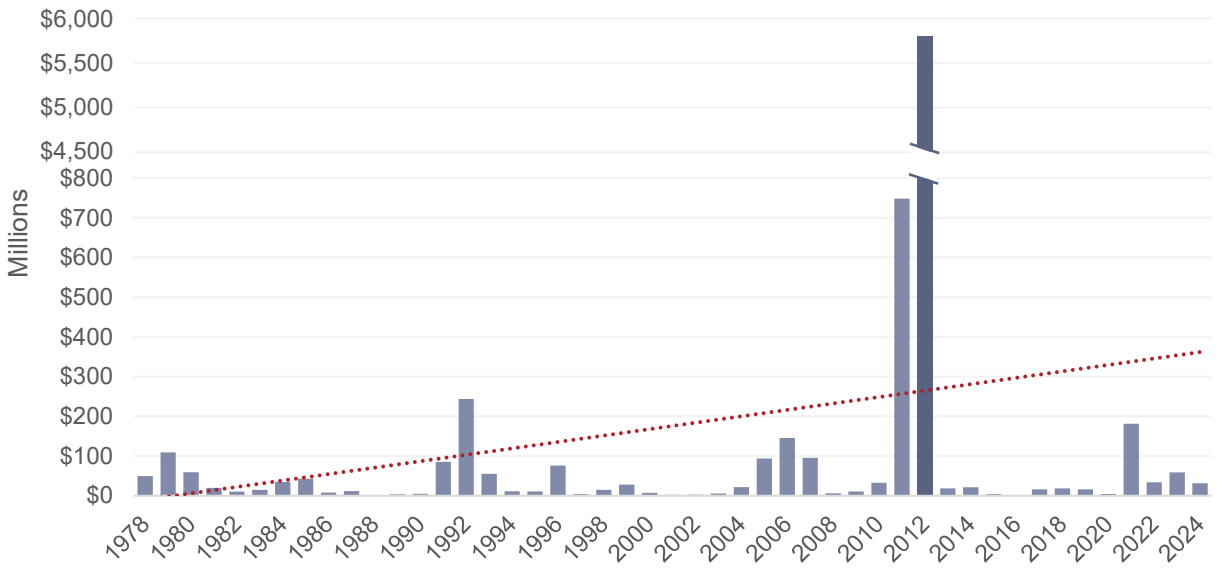
There is no single data source that captures the total cost of disaster recovery. Some sources capture the number and types of weather events well, but not the fiscal impacts of those events. Other data sources capture the costs of recovery well, but only for specific types of weather events (e.g. flooding), or from a single funding source. Multiple data sources are needed to create a more complete understanding of the frequency, severity and fiscal impacts of natural disasters in the state, and even so, the information is likely incomplete.

Property Damages from Storms

The NOAA storm data inconsistently records the value of damage caused by severe weather events; however, controlling for inflation, NOAA has found that weather-related disasters causing $1 billion or more in damage have occurred at an increasing rate since 1980. In the 1980s there were 82 days between one of these highly damaging events on average, whereas between 2020 and 2024 there were an average of 16 days between these events.[10] Damage figures from NOAA show that the events which caused the most property damage in New York are flash flooding ($2.5 billion), flooding ($1.2 billion), thunderstorm wind ($294 million), and high wind ($228 million).[11]

Data reported by the National Flood Insurance Program (NFIP) provide information about claims filed with the program; however, only approximately 3 percent of New York buildings are covered by NFIP, as only structures in floodplains and other areas of high risk of flooding are required generally to have these policies.[12] NFIP data on policies held in New York shows that from March 2024 through March 2025, New Yorkers held an average of 168,062 NFIP policies.[13]

Figure 6
Amount in 2024 Dollars Paid for Building Damage by NFIP in New York, 1978-2024



Source: FEMA, National Flood Insurance Program

Controlled for inflation, data on claims paid by the NFIP in New York shows an increasing trend in the amount of money paid to remediate flood-damaged buildings. The data show a large degree of variation from year to year, but four of the five highest payouts occurred since 2006. The highest, by far, were claims related to Superstorm Sandy (Sandy) in 2012, which amounted to $5.8 billion. (Greater detail on the effects of Sandy are noted in Appendix B.) As noted, NFIP policies only cover about 3 percent of buildings in New York and the NFIP payouts associated with Sandy are a fraction of total damages estimated at $32.8 billion.[14]

Figure 7
Top 5 Years for NFIP Payouts for Buildings, Contents and Code Compliance, New York

Year	Total Claims in Real 2024 $	Share of 1978 -2024 Claims	Major Storms
2012	$5,805,795,440	70.2%	Superstorm Sandy
2011	$748,423,476	9.0%	Hurricane Irene and Post Tropical Storm Lee
1992	$243,806,344	2.9%	Severe Thunderstorms, Floods and Tornadoes
2021	$181,218,644	2.2%	Hurricane Henri and Tropical Storm Ida
2006	$145,272,794	1.8%	Severe Storms and Flooding

Note: Major storms are provided for context and payments resulting from those storms do not equal total payments for that year.

Source: FEMA, National Flood Insurance Program

In real dollars, NFIP payments in 2012 represent over two-thirds of the value of all claims in the 47 years between 1978 and 2024 with claims paid for damage due to Sandy representing almost all 2012 payments. Payments made in compensation for damages due to Sandy comprise 70.0 percent of payments of all claims (1978-2024) paid. Irene and Post Tropical Storm Lee (Lee) were also significant storms. All but one of these high impact years have occurred since 2000.

Nassau and Suffolk Counties stand out as the top recipients of NFIP payments from 1978 to 2024, close to 40 and 20 percent, respectively. In 2025 property owners in these counties also had the most NFIP policies with 25.1 percent of insured New York properties being in Nassau County and 18.0 percent in Suffolk. Property values in Nassau County are some of the highest in the state and both counties have relatively large populations, which may explain the high value of claims paid. [15] Suffolk County also has the highest number of severe weather events in NOAA Storm Data, which may also play a factor, and both counties are at risk of coastal storms.

Figure 8
Top 10 New York Counties for NFIP Payouts for Buildings, Contents and Code Compliance

County	Total Claims (in Nominal Dollars)	Share of Total NY Claims, 1978 - 2024
Nassau	$2,280,289,686	39.8%
Suffolk	$1,112,738,419	19.4%
Queens	$704,900,579	12.3%
Kings	$328,602,847	5.7%
Richmond	$281,761,240	4.9%
Westchester	$270,650,671	4.7%
Broome	$138,313,088	2.4%
New York	$120,390,697	2.1%
Tioga	$61,209,791	1.1%
Rockland	$45,309,397	0.8%

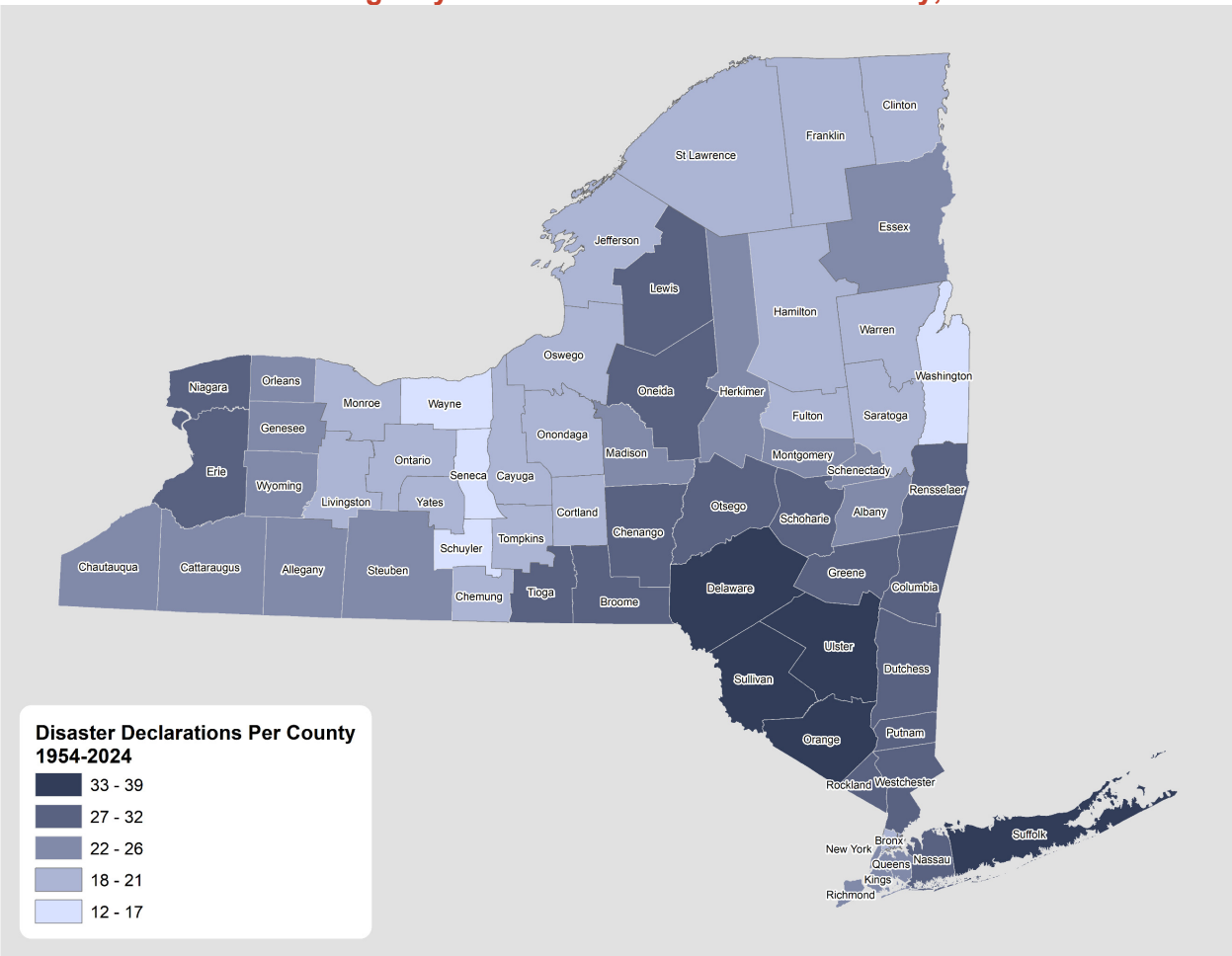
Source: FEMA, National Flood Insurance Program

Declared FEMA Disasters

The Robert T. Stafford Disaster Relief and Emergency Assistance Act authorizes the President to issue emergency and disaster declarations and to provide federal assistance in those instances where disasters exceed the ability of state and local governments to respond or recover from a disaster.[16] Disaster declarations by FEMA address the largest disasters affecting U.S. communities—storms and floods, as well as pandemics and other damaging events with a very small probability of occurring in any given year. It is important to note that funding approved for FEMA disaster declarations does not comprise the full cost of damage associated with the disaster.

Since 1998, there have been 67 weather-related disaster or emergency declarations affecting New York or an average of 2.5 per year, with authorized assistance totaling close to $25.9 billion in 2024 dollars, an average of $958.6 million per year.[17] In 2024 dollars, the years in which New York disasters received the largest amounts of authorized disaster aid include 2012 at $20.8 billion, 2011 at $1.5 billion, 2021 at $657.0 million, 2006 at $630.8 million and 2020 at $516.7 million. Those were noteworthy years for weather-related disasters in New York, with intense rainstorms leading to severe flooding in the Catskills in 2006, Irene and Lee in 2011, Sandy in 2012 and Tropical Storm Isaias (Isaias) in 2020.

Figure 9
Federal Disaster and Emergency Declarations Per New York County, 1954-2024



Source: FEMA, Disaster Declarations.

Impact from Heat Events

The costs of recovering from some of these severe weather events are readily apparent. When flooding or high winds damage property, the destruction is highly visible, and there are repair costs that may appear in insurance claims and other records. For others, like heat waves, data on the costs are not as available.[18] In part this may be because deaths, injuries and financial impacts related to heat waves are often unreported or unrecognized as being heat-related.[19] Under-reporting, or misattribution of heat-related deaths is more likely in low income, or middle-income communities and countries.[20]

A report from the California Department of Insurance estimated premature death-imposed costs of between $77 million and $2.2 billion in seven extreme weather events studied.[21] Other costs from heat include reduced labor-productivity and impacts on the dairy industry. The California report estimated that lost work time costs in the heat events studied ranged from $7.7 million to $210 million, and found that heat waves had reduced the amount of milk that cows produced and led to increased mortality among the cows.[22] Heat also plays a role in increasing drought, by increasing the atmospheric evaporative demand, and increasing the drying of soils and

plants, particularly under conditions of low humidity.[23] The buildup of heat in the atmosphere also allows the atmosphere to hold more water vapor, supporting increased intensity in precipitation and is implicated in changes in weather patterns leading to more powerful storms, in addition to more prolonged and intense heatwaves.

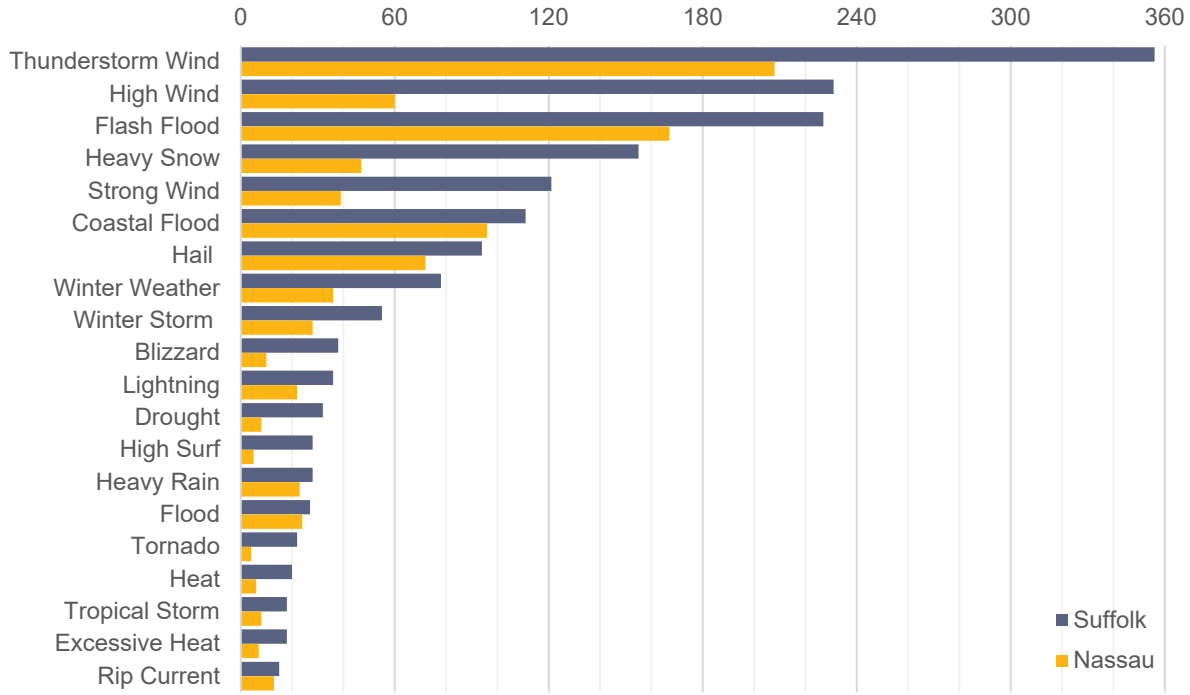
Weather-Related Mortality

NOAA Storm Data shows that in New York there have been 594 direct and indirect deaths from severe weather between 1996 and 2024. Heat and extreme heat were responsible for the most deaths with 122 direct deaths. Rip currents led to 62 deaths in the years evaluated, followed by flash flooding, resulting in 57 deaths, high winds which resulted in 42 deaths, coastal floods which led to 40 deaths, and blizzards which resulted in 39 deaths. Given that NOAA Storm Data underestimates monetary damages from certain weather events, it is possible that the information on death resulting from these events is also an underestimate.

Severe Weather on Long Island

Stony Brook University's School of Marine and Atmospheric Sciences have found that Long Island's geography makes it particularly vulnerable to storm surges and high winds.[24] Some of the highest elevation areas of the Island are found to be relatively safe, while the low-lying coastal towns face "extreme risk."[25] This risk analysis is borne out by NOAA Storm Data and data on payments from the NFIP. Among New York State Counties, Suffolk County has the largest numbers of damaging weather events (1,751) identified by NOAA's Storm Database, Nassau is 22nd with 899. Figure 10 shows the most prevalent event types for each county.

Figure 10
Most Prevalent Severe Weather Events in Suffolk and Nassau Counties, 1996-2024

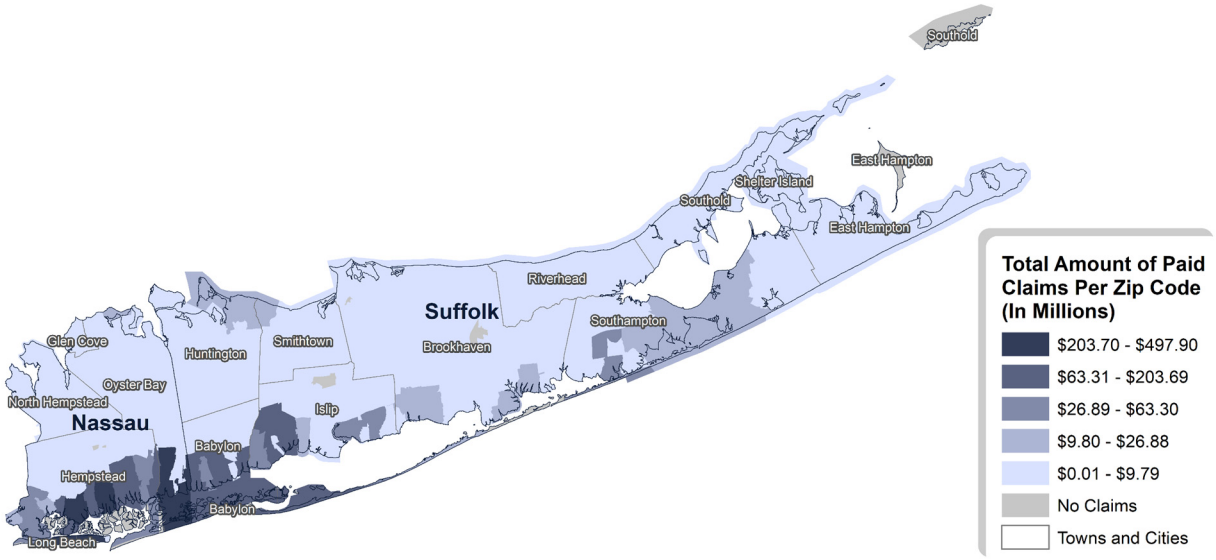


Source: NOAA Storm Events Database

Considering all weather events, both counties show that incidence of extreme weather events is increasing. In Suffolk County the average number of total events increases each decade from 46.5 for 1996-2005 to 56.6 for 2006-2015 to 80 for the nine-year period from 2016-2024. In Nassau County, total events follow a similar pattern, with averages increasing from 19.9 to 36.2 for the first two 10-year periods and increasing to 37.6 for the last 9 years.

Among New York counties, NFIP claims data shows that between 1978 and 2024 Long Island properties received the largest amount of payments from this program totaling close to $3.4 billion in nominal dollars, or 59.2 percent of total payments received in the state during that period. Nassau received the highest amount of payments with close to $2.3 billion while Suffolk received the second highest amount with $1.1 billion. Payments associated with Sandy represent a large majority of these payments equaling 87.9 percent of Nassau County payments and 77.7 percent of Suffolk County payments.

Figure 14
Long Island NFIP Payments by Zip Code, 1978-2024



Source: FEMA. National Flood Insurance Program

The location of Nassau and Suffolk on the coastline makes them more vulnerable to flooding threats associated with sea level rise.[26] New York State has 2,625 miles of coastline including tidal waters.[27] Suffolk County has 980[28] of these miles or 37.3 percent while Nassau County has 60 miles.[29] Long Island's coastal location and the large influence of Sandy on NFIP flooding claims in New York State help explain the large amount of NFIP payments received by claimants in these counties.

Between 1978 and 2024, Long Island counties were among the top counties in the state experiencing impacts from Stafford Act declared disasters and emergencies. During this period, Suffolk was named in 36 disaster and emergency declarations while Nassau was named in 31, respectively the third and seventh most impacted counties after Delaware County (39) and Ulster County (37).

Unprecedented Severity of Recent Events

While the most powerful New York storms are still fortunately rare, as severe weather events occur more frequently, the likelihood increases that they will occur together in a uniquely destructive manner. Analysis of the impacts of greenhouse gas emissions by the United Nations Intergovernmental Panel on Climate Change finds strong evidence of "widespread and substantial impacts and related losses and damages" due to increasing concentrations of these substances in the atmosphere.[30] The Department of Environmental Conservation has called Climate Change a "threat multiplier."[31] While the NOAA Storm Data demonstrates that some forms of extreme weather are increasing in incidence, studies of Irene, Lee and Sandy show that when several extreme events coincide it can lead to highly destructive storms.[32] As the 2024 report of the New York City Panel on Climate Change states: "Climate change is increasing the frequency of extreme precipitation events and elevating sea levels, increasing the likelihood of compounding either one of these flood drivers by the other."[33]

Long-term trends of increasing precipitation and sea level rise may be contributing to producing the unprecedented impacts of some extreme events. Analysis conducted for the New York State Climate Impacts Assessment found that from 1901 to 2020, average precipitation has increased in New York at a rate of .46 inches a decade, while over the last 40 years the rate of increase has been 1.19 inches per decade.[34] When this observation is considered in the context of the increase in extreme precipitation events observed in the NCA—with an increasing portion of the region's precipitation falling in days with 5 inches or more of rain—an increasing amount of total rainfall is occurring in large events.

City University of New York geographers evaluating Irene (August 28-29, 2011) and Lee (September 5-9, 2011) concluded that these storms were among the largest precipitation events, and produced the top stream flow event in the Catskill Mountains since 1880 when records began to be kept.[35] At that time, two nearly back-to-back extreme precipitation events followed an extremely wet summer leading to unprecedented destructive flooding.[36]

Another analysis evaluated the impact of anthropogenic sea level rise on the damages caused by Sandy.[37] This analysis found that the 9.6 centimeters of sea level rise attributable to climate change in 2012 caused an additional approximately $4.2 billion in damages in New York, as well as exposing an additional 45,000 people and 18,900 structures to coastal flooding than would have otherwise been the case without the increase in sea level.[38] Including New Jersey and Connecticut raises the attributable damage to $8.1 billion and the increased exposure to people and property to 70,600 and 36,300 respectively.[39]

While events as extreme and damaging as Irene, Lee or Sandy are not frequent, the combination of impacts such as increasing precipitation, sea level rise, and the intensity of more common storms, such as thunderstorms, can magnify the damage of all types of weather events that result, and make damaging events more likely.[40]

Climate Resilience

State Support for Resilience

The New York State Hazard Mitigation Plan – based on a review of both incidence of weather-related disasters and the related damage – finds that the expected annual loss from disasters affecting the State is $1.39 billion. Although in any one year these costs could be more or less, they only represent costs to restore damage to life, property and infrastructure from these events.[41] To mitigate the risks to life and property from these events, the State has recognized that it must invest in measures to help buildings and vital infrastructure survive more extreme weather. The U.S. Chamber of Commerce estimates climate resilience expenditures reduce costs of cleanup and rebuilding by as much as $6 for every dollar spent and economic damages by as much as $7 for every dollar spent.[42]

Actions taken to address flooding risks may include upgrading water handling infrastructure, raising, hardening, or even moving buildings and other infrastructure away from coasts and flood zones as well as constructing flood walls and other barriers to flooding to protect infrastructure and structures that cannot practically be moved. Actions taken to withstand high winds may include cutting vegetation in electric utility right of ways to protect distribution and transmission systems or undergrounding these systems and incorporating construction techniques to prevent damage to buildings.

In the aftermath of Irene, Lee and Sandy, New York State used federal Community Development Block Grants for disaster recovery to establish a program to create the New York Rising Buyouts and Acquisition Program.[43] The program was allocated $656 million to purchase homes that were damaged by Irene, Lee or Sandy and were vulnerable to damage in the future.[44] A total of 1,289 properties were acquired through this program.[45] The program distinguished between buyouts, which must be demolished and maintained as open space and acquisitions, which could be rebuilt. Over 78 percent of acquisition properties were located in Nassau and Suffolk Counties, while over 71 percent of buyout properties were located in Staten Island.[46]

The Clean Water, Clean Air and Green Jobs Environmental Bond Act (Bond Act) passed by State voters in 2022 allocates funding that can help municipalities with investments to upgrade infrastructure to address severe weather impacts of climate change. The Bond Act includes $1.1 billion for restoration and flood risk reduction projects. Eligible restoration projects include efforts that preserve or enhance the capacity of floodplains, wetlands and streams to mitigate flooding by absorbing, slowing and transmitting storm water. Eligible flood risk reduction projects include buyouts of structures facing high risk of flood damage as well as projects to move roads out of flood prone areas and projects to right-size drainage infrastructure to handle increased storm flows and/or raise buildings and infrastructure to make them less vulnerable to flooding.[47] The home buyout program, called Blue Buffers, is administered by New York State Homes and Community Renewal (HCR) has been allocated $250 million and is seeking applicants.[48] Through August 2025, $129.7 million in restoration and flood risk reduction projects have been awarded under the Bond Act.

In addition, State programs such as Climate Smart Communities (CSC) or the Smart Growth Countywide Resiliency Program (SGCRP) assist municipalities in identifying the hazards they face from climate change and in developing climate adaptation plans to address these hazards.[49] Municipalities that participate in the CSC or SGCRP may be eligible for grants made available through the Environmental Protection Fund or the Bond Act.

New York State is currently in the process of developing a comprehensive Statewide adaptation and resilience plan. The plan is intended to "establish a coordinated strategy to increase resilience, build adaptive capacity across New York communities, and develop tools and resources to help communities thrive in a changing climate."[50]

New York City

In 2007, New York City undertook a comprehensive infrastructure planning process that resulted in PlaNYC, a long-term infrastructure and sustainability strategy. In 2013, an update of PlaNYC identified costs associated with responding to threats from climate change—that included upgrades required for the MTA and utilities as well as recovery costs from Sandy—at approximately $19.5 billion, $26.4 billion in 2024 dollars.[51]

One important resilience project is storm water management. In 2017, New York City developed a pilot resiliency plan for a frequently flooded portion of Queens. The Cloudburst Resiliency Planning Study explored the use of "blue-green" infrastructure, which incorporates urban drainage systems (the blue) with vegetation systems that can hold water until it infiltrates into the ground, or is taken up by plants (the green).[52] The study finds that implementation of a plan designed to manage a 100-year storm would cost around $370 million, but would reduce the annual costs of flooding in the area by 75 percent.[53]

According to the New York City Department of Environmental Protection (DEP), sewers in Manhattan and Staten Island are capable of managing stormwater from storms with rainfall intensity of up to 1.75 inches an hour.[54] This capacity is designed to manage storms with a 20 percent probability of happening in any year in New York City, or what is sometimes called a five-year storm.[55] Due to climate change, the DEP now believes that to address the stormwater dropped by a five-year storm it must upgrade the capacity of its stormwater system to manage 2.1 inches of rain per hour.[56] The DEP estimates that projects required to meet this standard in priority areas that are already experiencing flooding will cost the City $30 billion and take 30 years at the City's current level of investment in stormwater projects.[57]

Improving the capacity of the New York City stormwater management system can be a matter of life and death. On September 1, 2021, the remnants of Post Tropical Storm Ida caused intense rainfall throughout the New York City metropolitan area, dropping 3.15 inches per hour on Central Park at its peak.[58] This rainfall overwhelmed stormwater drainage capacity resulting in severe flooding, causing 13 reported fatalities, 11 of which were individuals and families that drowned in basement apartments.[59] In evaluating the causes of the storm-related deaths, FEMA identified undersized stormwater drainage systems as a contributing factor.[60]

Motivated by the catastrophic damage caused by Sandy, in 2022, the Army Corps of Engineers, the New York State Departments of State and Environmental Conservation, the New York City Mayor's Office of Climate and Justice and the New Jersey Department of Environmental Protection completed a draft feasibility study to protect the New York-New Jersey Harbor area

from a coastal storm. The draft plan identified a set of storm surge barriers, navigable gates and deployable flood barriers to help prevent flood damage and loss of life in areas around the harbor that are vulnerable to flooding.[61] The construction cost associated with the preferred option identified in the plan is approximately $52.6 billion which would be split 65/35 between the federal government and New York and New Jersey.[62] The public review period on the plan ended on August 25, 2025.[63]

Currently, the New York City Department of Parks is pursuing the East Side Coastal Resiliency project, which will establish flood barriers between East 25th Street and Montgomery Street, at a cost of $1.45 billion and the Hugh L. Carey Battery Park City Authority is pursuing coastal resiliency projects at a cost of approximately $1.6 billion.[64]

In 2024, New York City began a climate budgeting process to assess progress toward meeting its resiliency and emission mitigation goals, seeking input from City agencies on climate-related funding requests and projects to advance these goals.[65] New York City's 2026 fiscal year budget includes $12 billion in capital funding for projects to mitigate flood risk and $2 billion for projects to reduce heat risk.[66]

Local Governments

In 2023 the Office of the State Comptroller surveyed 353 local governments that were certified by the State as Climate Smart Communities asking for actual and planned climate resilience spending between 2017 and 2026. Ninety-five municipalities responded reporting actual and anticipated expenditures of approximately $757 million in local funds to address climate change-related hazards, with anticipated State and federal contributions totaling $182 million and $171 million, respectively.[67]

Metropolitan Transportation Authority

The Metropolitan Transportation Authority's 2025-2029 Capital Plan identifies five activities to address climate change. One of these steps, purchasing 500 zero-emission buses and installing charging infrastructure at bus depots, would reduce greenhouse gas emissions, but the other four are intended to make the MTA infrastructure more resilient to the extreme weather due to climate change: improving stormwater protections; improving ventilation to reduce excessive heat; protecting 20 miles of the Hudson Line from sea level rise and stormwater runoff and protecting vehicular bridges by adding dehumidification systems to bridge cables.[68] Just two of these actions, improving stormwater protections ($700 million) and protecting the Hudson Line ($800 million) are projected to cost a combined $1.5 billion dollars.[69]

Utilities

New York's electric utilities are also vulnerable to extreme weather. On August 4th, 2020, Isaias hit New York State, causing 1.5 million utility customers, many of which were in Suffolk County, to lose electric service.[70] While 90 percent of service was restored after four days, full-service restoration was not achieved until August 12.[71]

Overhead distribution and transmission lines are vulnerable to damage from high winds, flooding and icing during winter storms. In 2013, in the aftermath of Sandy, the State enacted

legislation requiring utilities to submit emergency plans to the Public Service Commission (PSC) for review and requiring utilities to restore service in a reasonably prompt timeframe in the aftermath of storms.[72] This was followed in 2021 with a requirement for electric utilities to conduct a climate vulnerability study and prepare a climate resilience plan under the supervision of the PSC.[73]

In addition, increasing temperatures can threaten the electric grid by increasing demand for electricity to run air conditioners, while also reducing the efficiency of generators like gas turbines, or solar panels, and increasing the resistance of distribution and transmission lines.[74]

Figure 15
Planned Investor-Owned Utility Resilience Investments Over 5, 10 and 20 Years, with Revenue Required from Rate Payers for the First 5 Years
(Dollars in Millions)

Utility	5 Years	10 Year	20 Year	5 Year Rate Impact
Con Ed	$654.4	$2,200.0	$5,300.0	$139.7
National Grid	$243.0	$566.0	$1,389.0	$55.3
NYSEG	$514.4	$318.0	$547.0	$141.8
RG&E	$181.2	$174.0	$297.0	$42.9
Central Hudson	$28.2	$50.4	$90.6	$2.5
Orange and Rockland	$184.1	$173.9	$467.4	$66.0
Total	**$1,805.3**	**$3,482.3**	**$8,091.0**	**$448.2**

Note: These plans are subject to approval by the PSC, which may require changes. In addition, recovery of these planned expenditures are determined in rate cases before the PSC, which may also require changes.

Source: Utility Climate Resilience Plans Required by Public Service Law Section 66 Subdivision 29.

New York State's electric utilities plan to spend $1.8 billion over the next five years, rising to $8.1 billion over 20 years, to make the State's electric grid more resilient to the increasing incidence of extreme weather due to climate change. These expenditures are projected to require utility customers to pay an additional $448.2 million through 2030.[75]

Long-Term Toll of Recovery

As the review of severe weather events from the NOAA Storm Data shows, some counties in New York suffer more of these events than others. This creates the risk that these counties may be economically disadvantaged compared with counties experiencing fewer severe weather events. While most of these events are not major disasters like Sandy, Irene, or Lee, there is evidence that even relatively minor destructive events can have serious long-term financial impacts on households and communities.[76]

Research into the long-term economic impacts of tropical cyclones found that incomes failed to fully recover after 20 years in the impacted population.[77] This analysis found that the strongest storms produce larger and longer enduring losses than financial crises and occur more frequently.[78] Repeated exposure to hurricanes can cause these income losses to accumulate over time.[79]

A study published in 2020 evaluated the impacts of weather-related natural disasters on credit scores, mortgage delinquency and foreclosure, debt in collections and credit card access and debt in areas hit by disasters by looking at these variables immediately before a disaster strikes and observing impacts over a four-year period following the disaster.[80] The study found that negative impacts grew over the four-year period, particularly in the case of credit scores, and that the impact is more pronounced in the case of smaller (called “medium”) disasters for most of the variables.[81] The study attributed the larger negative impacts of these disasters to a tendency for larger disasters to receive more federal assistance.[82] Generally communities of color and communities exhibiting lower pre-disaster credit scores faired more poorly across the board.[83]

Conclusions and Recommendations

It is clear that New York is facing serious and costly impacts from severe weather, and that severe weather events are increasing in frequency. In addition, there is research that indicates that the communities affected by this weather suffer lags in recovery that may permanently reduce their economic potential compared to communities that are not suffering these impacts. It is likely that the frequency and intensity of extreme weather will continue to increase for the foreseeable future.[84]

Estimates by the U.S. Chamber of Commerce are that $1 in resilience spending may reduce economic loses from a disaster by as much $7 and $6 in clean up and rebuilding costs. Without extraordinary action by national governments, global greenhouse gas emission trends indicate that warming is likely to surpass the 1.5 degrees Celsius limit set as a goal in the Paris Agreement.[85] This will make resilience spending an important strategy to protect lives and property, as well as to reduce disaster recovery expenditures from the increasingly severe weather likely to result.

Extreme weather episodes affect all states, and every effort should be made by the U.S. Congress to facilitate federal support for climate mitigation and resilience investments. However, efforts to reduce greenhouse gas emissions and even efforts to harden infrastructure to withstand severe weather are being severely curtailed at the federal level. One significant example is the recission of funding under the Inflation Reduction Act. As this report by the Office of the State Comptroller shows, some of the projects that were awarded funding in New York were for resiliency initiatives in disadvantaged communities, but these funds were frozen and the U.S. Environmental Protection Agency is working to claw this funding back.[86]

Moreover, recent proposals to modify FEMA disaster assistance programs would quadruple the per-capita losses required for disasters to qualify for assistance.[87] These proposals could further disadvantage residents in areas experiencing medium level disasters that were found to already face severe recovery challenges. In addition, FEMA has cancelled programs which provide resilience funding and attempts are being made to claw back funds from states and municipalities that have received this funding.[88] This could prevent at-risk communities from making investments that could prevent or mitigate property damage, as well as deaths and injuries, while lowering recovery costs. Both of these policies are likely to worsen prospects for economic recovery and the degree to which any recovery approaches the pre-disaster economic condition in the aftermath of a disaster.[89] While these policies are only proposals at the moment, they could also put counties that experience a higher proportion of severe weather events than their neighbors at a greater disadvantage.

As the State works on its adaptation and resilience plan, it is extremely important for New York to assess vulnerabilities, develop plans to mitigate these vulnerabilities and commit to implementing these plans. Plans should clearly lay out a timeline and costs associated with implementation, as well as the revenue sources expected to facilitate these investments. To facilitate communities' ability to access resilience funding in the Bond Act, the State should partner with local communities on projects, and redouble its efforts to assist municipalities in planning and developing cost-effective initiatives to mitigate extreme weather events. It is also

important for the State to provide adequate oversight to ensure that projects are completed in a timely and affordable way.

Based on New York's experience with severe rain events and storms since 2000, capacity for storm water management may need to be upgraded in New York's urban areas. Also, given the experience with severe flooding events, both State and local officials should give serious consideration to planning for protecting lives and properties at existing development in flood plains and to limit further development or reconstruction of homes in these areas. The Blue Buffers Program provides an opportunity to move at-risk properties out of harm's way, save lives and significantly reduce recovery costs from one of New York's most common and damaging severe weather events—flash flooding. HCR should prioritize this program and work with local officials to help recruit participants. Serious attention should be given to these issues in the case of disadvantaged communities located in areas that may be at greater risk, such as those in flood plains.

New York State businesses, municipalities, State government and residents are currently facing significant costs to harden buildings, infrastructure and other vital assets to prevent damage from increasingly severe weather events. As subway stations, roadways, homes and businesses continue to flood, the timeliness of these investments and their capacity will determine the extent to which the State can mitigate increasing damage to property and loss of life.

Appendix A: Data Sources

There is no single dataset that captures the total cost of disaster recovery. Some sources capture the number and types of weather events well, but not the fiscal impacts of those events. Other data sources capture the costs of recovery well, but only for specific types of weather events (e.g. flooding), or from a single funding source. Multiple data sources are needed to create a more complete understanding of the frequency, severity, and fiscal impacts of natural disasters in the state, and even so, the information is likely incomplete.

National Oceanic and Atmospheric Administration

This National Oceanic and Atmospheric Administration (NOAA) storm data is used to evaluate trends in the occurrence of weather events significant enough to be subject to Weather Service warnings. It captures a wide range of weather events, in 55 categories.[90] To be included, the weather phenomena must be severe enough to cause loss of life, injuries, significant property damage or disruption of commerce, or be rare, such as record maximum temperatures or precipitation. These events are compiled from reports by trained observers, often National Weather Service staff, and verified, if possible, with radar data.[91] While the data include estimates of the costs of damage occurring with events, there are significant underestimations for some events with known costs. For example, damages shown for New York in NOAA Storm Data from weather events associated with Sandy were approximately $17 million, when total repair and response damages estimated for New York were $32.8 billion.[92] For this reason, the NOAA data is only used to track the incidence of certain weather patterns.

National Flood Insurance Program

Data reported by the National Flood Insurance Program (NFIP) contains a variety of information about claims filed with the program. Because this information includes the date and year in which the insured loss occurred, the amount of the payout and the state in which it occurred it allows analysis showing the dollar value of paid claims by year. The claims data is indicative of the relative degree of damage caused by flooding in the state, but does not represent comprehensive damage from flooding, as only a small percentage of New Yorkers hold these policies. Generally, only structures in floodplains are required to have these policies.[93] NFIP data on policies held in New York show that from March 2024 through March 2025, New Yorkers held an average of 168,062 NFIP policies.[94] NFIP rules generally require each building to have a separate policy,[95] and while there are few sources for the number of buildings in the state, the New York State Energy Research and Development Authority (NYSERDA) estimates that New York has approximately 6 million buildings,[96] meaning that approximately 3 percent of New York buildings are covered by NFIP policies.

FEMA Disaster Declarations

FEMA reports information for presidential disaster declarations under the Robert T. Stafford Disaster Relief and Emergency Assistance Act, including authorized programs for Public Assistance to state and local governments as well as some non-profit groups, Individual Assistance to impacted households and Hazard Mitigation Assistance, to support long term disaster risk reduction.[97] FEMA publishes a list of disaster declarations that includes the amount

of funding approved for the assistance of impacted communities on its website.[98] From this, a list of disasters declarations issued between 1998 and 2024 was compiled, including the total funds approved by year. It is important to note that funding approved for FEMA disaster declarations does not comprise the full cost of damage associated with the disaster. For declared disasters FEMA regulations state that the federal share of funding will be "not less than 75 percent of eligible work," and require that state and local governments expend a "reasonable amount of funds to alleviate the disaster, for which no federal reimbursement will be requested."[99] In addition, funding approved for declared disasters will generally back out funding that may be available from other federal programs, other disaster relief organizations and is exclusive of insured losses.[100]

Appendix B: The Impacts of Sandy

One of the most extreme examples of severe weather was the October 2012 landfall of Sandy. Sandy is an example of how the impacts of climate change act as "threat magnifiers," and in the case of Sandy produce unprecedented damage to infrastructure and economic disruption.[101] In addition to weather events of unprecedented magnitude, there is also strong evidence that this threat magnification effect is increasing the destructiveness of more commonly experienced weather.

After causing damage to the islands of Jamaica, Cuba and the Bahamas, Sandy made landfall as a post-tropical cyclone near Brigantine, New Jersey on the evening of October 29, 2012. The storm had a sustained wind speed of approximately 80 miles per hour and a barometric pressure of 945 millibars, one of the lowest readings ever recorded north of North Carolina in the U.S.

Sandy's wind field measured 870 nautical miles (1,001.18 miles) and drove a gigantic storm surge with damaging waves on shore in New Jersey, New York City, Long Island and Connecticut. The highest storm surge measured in New York was at Kings Point with 12.65 feet above normal tide levels while surge levels of 9.56 feet and 9.4 feet were measured at Bergen Point West Reach on Staten Island and the Battery respectively. This storm surge arrived on top of an astronomical high tide which magnified its impact resulting in storm tides of 14.5 feet in Staten Island and 14.3 feet in Kings Park. Rainfall also contributed to flooding with inundations above ground level reaching up to 9 feet in Staten Island and Manhattan, up to 6 feet in Brooklyn, Queens and Long Island, up to 5 feet in the Hudson River Valley and up to 4 feet in the Bronx and Westchester County.[102]

The storm caused extensive damage to infrastructure, flooding 8 MTA tunnels and destroying the South Ferry-Whitehall Street subway station. It took several weeks to restore subway service between Manhattan and Brooklyn. An estimated 305,000 homes were destroyed in New York State, with approximately 100,000 homes damaged or destroyed on Long Island. On Staten Island blocks of homes were destroyed in Midland, New Dorp and Oakland Beach. Extensive damage to the electric grid, as well as to rail, road and marine infrastructure was widespread throughout the affected region. In Nassau County the Bay Park Sewage Treatment Plant was flooded by storm surge and extensively damaged.[103]

As many as 8.6 million electric customers lost service throughout the U.S. including more than 1 million LIPA customers.[104] Power was still being restored to LIPA customers more than two weeks after the storm and in some areas of Coney Island power was not restored until December. Approximately 10,000 customers in Nassau County could not have power restored due to structural damage.[105] The power outages shut down refueling stations, with stations that still had electric service, or backup power quickly running out of fuel, resulting in gasoline rationing.[106] Over its course, Sandy killed 147 people, including 48 in New York State. Most of the deaths in New York were due to storm surge, but falling trees also caused some deaths.[107] Total damage in New York State is estimated at $32.8 billion.[108]

Appendix C: Grant Awards for Restoration and Flood Risk Reduction from the Clean Water, Clean Air and Green Jobs Bond Act

Project Name	County	Awards (USD)
Binghamton Flood Wall Improvements	BROOME	$4,000,000
Whitney Point Closure Gate Upgrade	BROOME	$5,000,000
Olean Levee/Bank Stabilization	CATTARAUGUS	$6,000,000
Owasco Flats Wetland Restoration	CAYUGA	$252,436
Hoffman Creek Reservoir Dam Repair	CHEMUNG	$1,300,000
Elmira Relief Well Replacement	CHEMUNG	$6,000,000
Batavia Kill Reconnection	DELAWARE	$400,719
Fish Creek Habitat Restoration and Enhancement	DELAWARE	$1,000,000
Springville Dam Aquatic Restoration	ERIE	$1,000,000
Ralph C. Wilson Jr. Centennial Park Coastal Shoreline Project	ERIE	$10,000,000
Bartlett Carry Dam Repair	FRANKLIN	$1,000,000
South Branch Moose River Reconnection	HAMILTON	$566,310
Herkimer Closure Gate Upgrade	HERKIMER	$8,000,000
Boyd Dam Restoration	LEWIS	$1,000,000
Hemlock Lake Dam Restoration	LIVINGSTON	$1,000,000
Manhattan Waterfront Greenway Project	NEW YORK	$43,000,000
Crystal Lake Dam Removal	ORANGE	$2,500,000
Dam Restoration	ORANGE	$2,000,000
Dam Restoration	ORANGE	$2,340,488
Dam Removal	OSWEGO	$410,000
Oneonta Creek Reconnection	OTSEGO	$337,600
Butler Creek Reconnection	OTSEGO	$476,800
Lake Carmel Dam Rehabilitation	PUTNAM	$2,500,000
Dam Reconstruction	PUTNAM	$2,500,000
Philips Brook Dam Removal and Restoration	PUTNAM	$1,000,000
Kronk Brook Culvert Replacement Project	RENSSELAER	$213,953
Berry Brook Reconnection	SULLIVAN	$864,864
Binnewater Reservoir Dam Rehabilitation	ULSTER	$1,945,600
Kleine Kill Habitat Restoration	ULSTER	$600,000
Loon Lake Dam Repair	WARREN	$896,000
Glenwood Lake Dam Repair	WESTCHESTER	$607,912
Westchester County Flood Resilience Infrastructure	WESTCHESTER	$21,000,000
Total	**-**	**$129,712,682**

Note: Grants as of August 2025.

Source: NYS DEC

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