NJTPA
Connecting
Communities

NJTPA NORTH JERSEY TRANSPORTATION PLANNING AUTHORITY

APPENDIX I: Resilience Improvement Plan

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CONNECTING COMMUNITIES APPENDIX I: NJTPA RESILIENCE IMPROVEMENT PLAN

OCTOBER, 2024

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1) Overview and Purpose

The North Jersey Transportation Planning Authority (NJTPA) has developed this Resilience Improvement Plan (RIP), in collaboration with the Port Authority of New York and New Jersey (PANYNJ), to meet the objectives of the Federal Highway Administration's (FHWA) Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation (PROTECT) Program. In accordance with PROTECT Program RIP guidance (23 U.S.C. 176(e)), the NJTPA's RIP provides a risk-based assessment of vulnerable transportation assets in relation to immediate and long-term transportation planning.

As directed under 23 U.S.C. 176(e), this plan accomplishes the following:

- **Encompasses immediate and long-range planning activities and investments.** Both the **Systemic Approach to Transportation System Resilience** and **Project List** sections describe the region's immediate and long-range planning activities and investments.
- **Demonstrates a systemic approach to surface transportation system resilience.** The plans and activities highlighted in the **Systemic Approach to Transportation System Resilience** section showcase the region's thorough approach to transportation system resilience.
- **Displays consistency with state and local hazard mitigation plans.** This consistency is described in the Completed and Existing Resilience Improvement Planning Efforts subsection of the **Systemic Approach to Transportation System Resilience** section.
- **Includes a risk-based assessment of vulnerabilities to current and future weather events and natural disasters.** Descriptions of the NJTPA's, agency partners', and subregions' risk-based assessments of vulnerabilities are highlighted in the **Systemic Approach to Transportation System Resilience** section. These assessment summaries include the asset types, hazards, and temporal scopes studied.

As appropriate, this plan accomplishes the following:

- **Describes an improved ability to respond promptly to natural disasters and extreme weather preparedness.** This is addressed in the final paragraph of this subsection.
- **Describes codes, standards, and regulatory framework.** Examples of codes and standards are provided in the **Systemic Approach to Transportation System Resilience** section. The regulatory framework at the state and national level is provided in **Figure 2**.

- **Considers natural infrastructure.** The benefits of combining hard surface transportation assets and natural infrastructure (i.e., green infrastructure)[1] are provided in the **Project List** section.
- **Assesses community infrastructure.** An assessment is included in the discussions of state and county hazard mitigation plans in the **Systemic Approach to Transportation System Resilience** section.
- **Uses a long-term planning method.** The work highlighted in the **Systemic Approach to Transportation Resilience** section demonstrates the use of a long-term planning horizon.

The NJTPA's RIP identifies and seeks to mitigate a comprehensive range of risks and vulnerabilities at regional, county, and local levels, with the overall goals of improving system reliability and applying a unified approach to surface transportation system resilience. The efforts detailed below highlight activities undertaken by the NJTPA, its county and city member subregions, and partner agencies in the region.

This RIP dovetails with New Jersey's Hazard Mitigation Plan (HMP) and will be amended into the current NJTPA's Long-Range Transportation Plan (LRTP) by the end of January 2025. It will also be incorporated into the LRTP update, which is underway. The NJTPA's current LRTP has a planning horizon of 2050.

[1] According to the International Institute for Sustainable Development (IISD), nature-based infrastructure, sometimes referred to as "green infrastructure" or "natural infrastructure", refers to areas or systems that harness nature to provide infrastructure services for people, the economy, and the environment. *What is NBI?* https://nbi.iisd.org/what-is-nbi/

Incorporating this resilience-focused planning document into the LRTP will help the NJTPA and the northern New Jersey region be better prepared to respond to natural disasters and other future events. The planning studies detailed in the **Systemic Approach to Transportation System Resilience** section show the in-depth analysis and community engagement work being conducted by entities across the region. These efforts are allowing decision-makers and the public to think critically about the region's risks and vulnerabilities and to develop additional programs and capital projects to address these risks and vulnerabilities.
The **Project List** section is an important component of the RIP as it shows how the region is putting its capital dollars to work towards resilience.

2) About the NJTPA

The NJTPA[2] is the federally authorized Metropolitan Planning Organization (MPO) for the 13-county northern New Jersey region (**Figure 1**). The NJTPA serves a region of 7 million people, one of the largest MPO regions in the country. The NJTPA evaluates and approves proposed transportation improvement projects. It also provides a forum for cooperative transportation planning efforts, sponsors transportation and planning studies, assists county and city planning agencies, and monitors the region's compliance with national air quality goals. The 20-member NJTPA Board of Trustees is composed of local elected officials from each of the region's 13 counties and from the region's two largest cities, Newark and Jersey City. The board also includes representatives from the Governor's Office, the New Jersey Department of Transportation (NJDOT), the Port Authority of New York and New Jersey (PANYNJ), and New Jersey Transit (NJ TRANSIT), as well as a citizens' representative appointed by the Governor. The NJTPA's host agency is the New Jersey Institute of Technology.

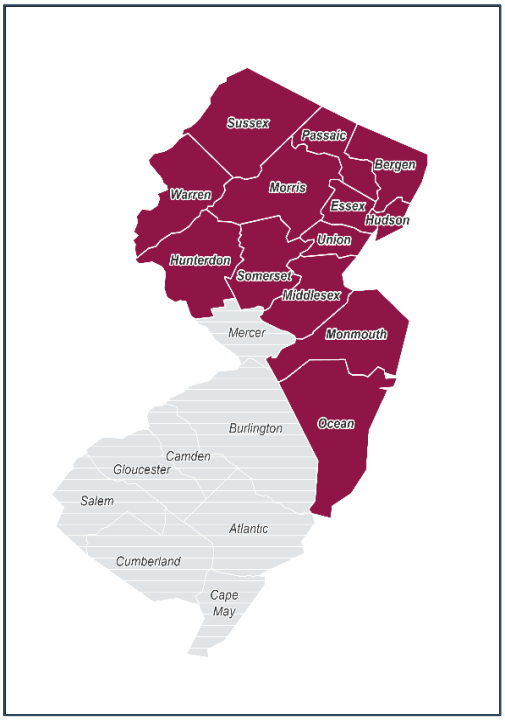

Figure 1: Map of the NJTPA's jurisdiction.

Resilience planning has been integrated into the NJTPA's work for more than a decade. In 2010, the NJTPA headed an interagency Climate Change Vulnerability and Risk Assessment project supported by a grant from the Federal Highway Administration (FHWA). The primary objective of this project was to pilot FHWA's Vulnerability and Risk Assessment Conceptual Model using New Jersey as a case study, providing both feedback for the advancement of the national framework as well as developing greater awareness and understanding of the potential impacts of climate change on transportation infrastructure in New Jersey. The study team, comprised of interagency partners, provided recommendations to FHWA and New Jersey agencies for improving future work with the Vulnerability and Risk Assessment Conceptual Model. Interagency partners gained an improved understanding of the complex challenges of

[2] North Jersey Transportation Planning Authority (NJTPA). Home. https://www.njtpa.org/home

resilient transportation planning and were presented with the opportunity to incorporate resilience planning into their own decision-making processes.

The NJTPA has continued building on this work in the context of state and federal resilience policies, as shown in **Figure 2** on the following page.

The NJTPA recognizes that climate resilience is linked to climate change mitigation, which aims to reduce greenhouse gas emissions. In parallel with resilience planning efforts, the agency has conducted various related activities, such as data collection, strategy development and project implementation.

Figure 2: Timeline of federal and state resilience policy enactment.

3) Regional Environmental Conditions and Stressors

The State of New Jersey is susceptible to multiple impacts of climate change. To synthesize research on the wide-ranging impacts of climate change in the state, the New Jersey Department of Environmental Protection (NJDEP) released the *New Jersey Scientific Report on Climate Change*[3] in 2020, the *New Jersey Climate Change Resilience Strategy*[4] in 2021, and the *Climate Change Impacts on Human Health & Communities: Addendum to the Scientific Report on Climate Change*[5] in 2022. Anticipated climate change impacts in New Jersey include the following:

- **Rising Temperatures.** New Jersey is warming faster than the rest of the Northeast United States and the world. The average annual temperature in northern New Jersey has increased by 3.6 °F (2.6 °C) since 1895, compared with a 1.5 °F (0.8 °C) increase in global average annual temperatures during the same period. Heatwaves are expected to impact larger areas, with greater frequency and longer durations, by 2050. Secondary impacts are expected to include deteriorated air quality.
- **Increasing Precipitation.** Annual precipitation in New Jersey is expected to increase by 4 to 11 percent by 2050. The intensity and frequency of precipitation events are also anticipated to increase because of climate change. Over the last 50 years, New Jersey experienced a 71 percent increase in tropical storms that resulted in extreme rain — a faster rate than anywhere else in the United States.
- **Sea Level Rise.** Sea level is increasing at a greater rate in coastal New Jersey than in other parts of the world. By 2050, there is a 50 percent chance that sea level rise will meet or exceed 1.4 feet and a 17 percent chance that it will exceed 2.1 feet. These levels increase to 3.3 and 5.1 feet, respectively, by the end of the century (under a moderate emissions scenario).

New Jersey's aging infrastructure is particularly vulnerable to the consequences of climate change. Increasing precipitation and sea level rise threaten critical transportation corridors and, in turn, communities and economic sectors dependent on those corridors. Coastal communities in northern and central New Jersey will be susceptible to "sunny day flooding" due to sea level rise, which will also increase the depth and extent of storm surge flooding during hurricanes and tropical storms. Furthermore, climate change is likely to contribute to an increase in air pollution, exacerbating respiratory and cardiovascular health problems for communities in the NJTPA region, with socially vulnerable populations expected to be disproportionately impacted. These health problems, combined with heat stress, will pose greater risks to young, elderly, socially and linguistically isolated, and economically disadvantaged individuals, as well as those with preexisting health conditions.

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[3] New Jersey Department of Environmental Protection (NJDEP). New Jersey Scientific Report on Climate Change. June 2020. https://dspace.njstatelib.org/items/07c48e1a-6de6-4458-82d3-5dd70e31de50

[4] Interagency Council on Climate Resilience (IAC). New Jersey Climate Change Resilience Strategy. October 2021. https://dep.nj.gov/wp-content/uploads/climatechange/docs/nj-climate-resilience-strategy-2021.pdf

[5] IAC. Climate Change Impacts on Human Health & Communities: Addendum to the Scientific Report on Climate Change. September 2022. https://dspace.njstatelib.org/items/8d5e35b0-bf75-40a0-9955-dff93eae3711

Systemic Approach to Transportation System Resilience

1) Overview

The NJTPA and its subregions have been active in addressing climate change for more than a decade. The NJTPA is guided by federal planning factors written into law, including the need to "Improve the resiliency and reliability of the transportation system." This is reflected in the NJTPA's planning goals to "Protect and improve natural ecosystems, the built environment and quality of life" and "Maintain a safe, secure and reliable transportation system in a state of good repair." It is also reflected in the application of project prioritization criteria that award points to projects that "promote adaptation and resiliency to extreme weather events and the impacts of climate change."[6]

The NJTPA's approach to resilience is consistent with those of other entities across the region, as well as with that of FHWA. FHWA's Vulnerability Assessment and Adaptation Framework[7] was piloted by the region's 2010 Climate Change Vulnerability and Risk Assessment (detailed above). Since the Framework was released in 2011, it has served as a guide for the NJTPA and its partner agencies, as described below. The primary steps of the Framework are as follows:

1. **Articulate objectives and define the study scope.** Establishing a clear study focus helps bound the vulnerability assessment, minimizing extraneous data collection and analysis activities.

   - The studies described in the **Systemic Approach to Transportation System Resilience** section of this RIP are organized by scope, including those spanning multi-state, state-, regional, county-, and municipality-level areas.

2. **Obtain asset data.** The study objectives and scope of a vulnerability assessment determine which asset data need to be collected. Coordination with internal and external stakeholders, such as local governments and universities, can be a way to identify all existing data and thus reduce the need to collect new data or minimize the extent of data collection efforts.

   - The NJTPA, its partners, and subregions coordinate to share asset data through platforms such as the publicly accessible NJTPA Open Data Portal.[8]

3. **Obtain climate data.** Transportation agencies can benefit from partnering with other organizations that have experience developing or using climate projections. These sources include federal agencies such as the National Oceanic and Atmospheric

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[6] NJTPA. NJTPA Long Range Transportation Plan 2050. November 2021. https://www.njtpa.org/NJTPA/media/Documents/Planning/Plans-Guidance/Planning%20for%202050/final%20pdfs/njtpa_plan2050_final2.pdf?ext=.pdf

[7] FHWA Office of Planning, Environment, & Realty (HEP). Vulnerability Assessment and Adaptation Framework, 3rd Edition. https://www.fhwa.dot.gov/environment/sustainability/resilience/adaptation_framework/chap00.cfm

[8] NJTPA. NJTPA GIS & Data Resources. https://share-open-data-njtpa.hub.arcgis.com/

Administration (NOAA), United States Geological Survey (USGS), and United States Army Corps of Engineers (USACE); national research organizations such as the Transportation Research Board (TRB) and National Science Foundation (NSF); university climate research centers; state and local agencies; and state climatologists.

- The studies described in the **Systemic Approach to Transportation System Resilience** section of this RIP draw upon climate data and research from the FHWA, the USACE, the NJ Climate Change Resource Center, and state agencies. Existing climate models such as the Sea, Lake, and Overland Surge from Hurricanes (SLOSH) model have also been used.

4. **Assess vulnerability.** In order to assess vulnerability, practitioners will use the climate and extreme weather variables they developed to identify and evaluate the exposure, sensitivity, and adaptive capacity of an asset or a system to determine its vulnerability, and, typically, assign a level of risk of the climate impacts on the asset/system.

   - The studies described in the **Systemic Approach to Transportation System Resilience** section of this RIP, those sponsored by the NJTPA and sponsored by others, assess vulnerability and risk through analysis of the following: 1) criticality to the transportation system, 2) exposure to multiple climate change-related hazards across current and future time horizons, 3) vulnerability considering sensitivity and adaptive capacity, and/or 4) risk by considering the consequences of climate change impacts.

5. **Identify, analyze, and prioritize adaptation options.** Adaptation solutions can be natural, structural, or policy-based and can range from site-specific to regional. Two frameworks for adaptation development include multi-criteria analysis (MCA) and economic analysis. MCA involves comparing adaptation options across a range of qualitative and quantitative criteria. An economic analysis can help agencies evaluate and prioritize adaptation options by clarifying the potential long-term costs and benefits of alternative adaptation strategies.

   - Several studies described in the **Systemic Approach to Transportation System Resilience** section of this RIP have used resources such as the Resilient NJ Local Planning for Climate Change Toolkit.[9] The Toolkit includes resources for integrating equity into each step of the planning process and a Local Action Matrix with almost 300 examples of adaptation actions. In addition, studies from the NJTPA's Transportation Improvement Program included in the **Project List** section of this RIP

[9] Resilient NJ: Local Planning for Climate Change Toolkit. https://experience.arcgis.com/experience/9daab51c2f5542969d50437522e012c4

have been evaluated against the NJTPA's Project Prioritization Criteria[10] and Additional Priority Factors criteria.

6. **Incorporate assessment results in decision-making.** Integrating the results of a vulnerability assessment into existing transportation programs and processes ensures that study results are used in practice.

   - The NJTPA supports and coordinates its plans and programs with the adaptation efforts of its partner agencies and subregion, including using the NJTPA's capital programming process to secure needed federal funding. This occurred after Hurricanes Sandy and Irene, with the NJTPA supporting partner agencies' funding needs to address the storms' impacts. In addition to such capital investments, the NJTPA also supports the efforts of partner agencies and subregions to review and revise operations to reflect both current and projected climate impacts.

7. **Monitor and revisit.** Adapting to extreme weather and climate impacts is an iterative process that requires monitoring and evaluation. As new climate science and data become available, agencies may need to reassess their vulnerabilities.

   - Several of the studies described in the **Systemic Approach to Transportation System Resilience** section of this RIP will continue to be updated on a periodic basis per regulatory requirements, such as county Hazard Mitigation Plans (HMPs).

2) Completed and Existing Resilience Improvement Planning Efforts

This RIP comprises existing and ongoing resilience planning work at the state, regional, county, and municipal levels. It is consistent with and complementary to the state and local mitigation plans required under section 322 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (42 U.S.C.SC 5165) and meets the requirements of 23 U.S.C. 176(e). The work detailed below highlights multi-state resilience efforts in addition to local efforts. These efforts have been included in this overview to capture significant partnerships and entities within the NJTPA's jurisdiction. It is important to note that in numerous cases, the outcome of this planning work is either actual capital projects, such as the two Rebuild by Design (RBD) projects, or plans with recommended capital projects pending funding, such as the PANYNJ's Climate Risk Assessment (CRA) work or the NJDEP Resilient NJ Initiative.

2A. NJTPA RESILIENCE PLANNING DOCUMENTS

RISK-BASED ASSESSMENTS

[10] NJTPA. NJTPA Project Prioritization Criteria: Local Highway and Local Bridge Projects. https://www.njtpa.org/NJTPA/media/Documents/Projects-Programs/Transportation-Improvement-Program-(TIP)/Scoring-Criteria/TIP-Project-Scoring-Criteria.pdf

- *Passaic River Basin Climate Resilience Planning Study (2019)*[11]

The NJTPA performed this study to evaluate the vulnerability of New Jersey's Passaic River Basin (PRB) transportation assets to climate change-related extreme weather events and identify adaptation strategies that can be used by agencies and municipalities to integrate resiliency into the transportation network. The study consisted of a vulnerability assessment of the area's transportation system, projections of future climate risks for the PRB, and the development of adaptation strategies for critical transportation corridors and assets. As a result, actions and strategies for protecting the transportation system from damage and disruption were recommended.

Asset Types Studied:

1. Bridges
2. Culverts
3. Facilities
4. Rail assets
5. Road assets
6. Transit rolling stock

Hazards Studied:

1. Flooding from extreme precipitation events
2. Sea level rise
3. Storm surge
4. Extreme heat events

Hazard Temporal Scope:

1. Existing 25-year precipitation event and existing 100-year precipitation events
2. Future (2045 and 2080) 25-year and 100-year precipitation and heat events

- *Climate Change Vulnerability and Risk Assessment of New Jersey's Transportation Infrastructure (2012)*[12]

As described in the Introduction, a partnership of New Jersey state agencies and MPOs (the "New Jersey Partnership") was awarded a grant in 2010 from FHWA to conduct a Vulnerability and Risk Assessment of transportation infrastructure from the impacts of climate change. The primary objective of this project is to pilot FHWA's Vulnerability and Risk Assessment

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[11] CDM Smith, NJTPA, Matrix New World. Passaic River Basin Climate Resilience Planning Study. June 2019. https://www.njtpa.org/NJTPA/media/Documents/Planning/Regional-Programs/Studies/Passaic%20River%20Basin%20Climate%20Resilience%20Planning/NJTPA_PassaicRiverBasin_ClimateResiliencePlan_27June19_FinalSubmittal.pdf?ext=.pdf

[12] NJTPA, South Jersey Transportation Planning Organization (SJTPO), Delaware Valley Regional Planning Commission (DVRPC), New Jersey Department of Transportation (NJDOT), NJ TRANSIT, NJDEP, Cambridge Systematics. Climate Change Vulnerability and Risk Assessment of New Jersey's Transportation Infrastructure. April 2012. https://www.njtpa.org/NJTPA/media/Documents/Planning/Regional-Programs/Studies/Climate%20Change%20Vulnerability%20and%20risk%20Assessment/CCVR_REPORT_FINAL_4_2_12_ENTIRE.pdf?ext=.pdf

Conceptual Model using New Jersey as a case study, providing feedback for the advancement of the Conceptual Model as well as developing a greater awareness and understanding of the potential effects of climate change on transportation infrastructure in New Jersey.

Asset Types Studied:

1. Roadways
2. Bridges
3. Passenger rail (including signals and switches)
4. Freight rail
5. Airports
6. Tunnels (except rail)
7. Marine container, bulk/break-bulk, roll-on/roll-off
8. Ferry terminals

Hazards Studied:

1. Sea level rise
2. Storm surge
3. Extreme temperatures and temperature ranges
4. Extreme precipitation and average precipitation levels
5. Drought
6. Inland flooding

Hazard Temporal Scope:

1. 2050 low-, medium-, and high-emissions scenarios for sea level rise, storm surge, 100-year inland flooding, extreme temperature and precipitation
2. 2100 low, medium-, and high-emissions scenarios for sea level rise, storm surge, 100-year inland flooding, extreme temperature and precipitation

OTHER ASSESSMENTS

❖ *NJTPA Plan 2050: Transportation, People, Opportunity (2021)*[13]

The NJTPA Board adopted *Plan 2050: Transportation, People, Opportunity* in September 2021, in addition to the region's Transportation Improvement Program (TIP) and Air Quality Conformity Determination. The LRTP has a planning horizon of 2050. The plan's priorities include, among others, the following:

- **Safety:** Reducing crashes and ensuring the safety of all travelers must continue to be primary focuses across all policies, programs, and investments.
- **Accessibility:** The region's planning must continue to shift its focus away from moving vehicles to accessibility — that is, using a variety of modes to give people convenient and affordable access to jobs, education, and other opportunities.

[13] NJTPA. NJTPA Long Range Transportation Plan 2050. November 2021. https://www.njtpa.org/NJTPA/media/Documents/Planning/Plans-Guidance/Planning%20for%202050/final%20pdfs/njtpa_plan2050_final2.pdf?ext=.pdf

- **Equity:** The transportation system must more fully address the needs of low-income and minority communities, which have been underserved.
- **Roads and Bridges:** "Fix it first" is the priority for reducing the backlog of needed road and bridge improvements and upgrading facilities while also preparing infrastructure for climate change impacts.
- **Transit:** Improving transit is key to solving some of the most difficult challenges, but increased funding and more stable funding mechanisms are needed. The Hudson River tunnel project and the larger Gateway project are the NJTPA's top transit investment priorities.
- **Active Transportation:** The NJTPA seeks to improve connectivity between neighborhoods and key destinations, especially in places with schools, high transit use, and lower incomes.
- **Climate Change:** The plan lays out mechanisms to support climate change policies and initiatives of the State of New Jersey, captured in the NJDEP's October 2020 Global Warming Response Act 80x50 Report.
- **Environment:** The importance of efforts in the areas of air quality, climate change, and environmental mitigation is highlighted.
- **Financial Element:** The plan offers a fiscally constrained financial plan based on realistic projects along with scenarios addressing more limited or additional funding.

❖ *Regional Capital Investment Strategy (RCIS) (2021)*[14]

The NJTPA also has established a Regional Capital Investment Strategy (RCIS) as part of *Plan 2050*. This strategy consists of nine principles and associated objectives that assist in guiding where and how investments are made across the region. One of these nine principles relates directly to transportation resilience. The principle states: "Investments should be made to mitigate risks associated with sea level rise, extreme weather, homeland security, and other potential threats. Investments should consider the criticality of infrastructure, vulnerability, and level of risk."

❖ *Climate Change and Transportation (2020)*[15]

As a supplement to *Plan 2050*, the NJTPA prepared a background paper on *Climate Change and Transportation*. The paper covers existing conditions, climate projections and associated impacts, the public sector response, and key strategies for the NJTPA and *Plan 2050*. The projected climate change impacts are consistent with those identified in the NJDEP's *New Jersey Scientific Report on Climate Change* and by the Office of the State Climatologist at Rutgers University. The report includes current data from the State Climatologist as well as temperature, precipitation, and sea level projections based on the Representative Concentration Pathway (RCP) 4.5 lower-emissions scenario and RCP 8.5 higher-emissions scenario.

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[14] NJTPA. Appendix C: The Regional Capital Investment Strategy for the NJTPA Region. Plan 2050. https://www.njtpa.org/NJTPA/media/Documents/Planning/Plans-Guidance/Planning%20for%202050/draft%20final/C-RCIS-Policy-Document.pdf

[15] NJTPA. Plan 2050 Background Paper: Climate Change and Transportation. December 2020. https://www.njtpa.org/NJTPA/media/Documents/Planning/Plans-Guidance/Planning%20for%202050/njtpa_climate.pdf

2B. MULTI-STATE PLANS AND PROJECTS

Several recent and ongoing resilience initiatives have included New Jersey and surrounding states.

RISK-BASED ASSESSMENTS

- *PANYNJ. Climate Risk Assessment (Ongoing)*[16]

The PANYNJ's Climate Risk Assessment (CRA) is an agency-wide initiative to systematically assess the physical risks of climate change at all Port Authority facilities: tunnels, bridges, bus terminals, Port Authority Trans-Hudson (PATH) rail system, ports, and airports. The CRA entails the application of rigorous, engineering-based assessment techniques to evaluate residual and emerging flood and extreme heat risks to critical assets that contribute to revenue and the regional economy. The CRA identifies site-specific climate risks to storm surge, sea level rise, precipitation, and heat; evaluates cascading impacts given interdependencies of critical assets; and conducts cost-benefit analyses of potential risk mitigation strategies. Stakeholder input is gathered throughout the process via interviews and workshops with facility staff and stakeholders. The CRA culminates in a prioritized portfolio of actionable, cost-effective resilience measures for the capital planning process. These resilience measures to address priority risks to PANYNJ assets are included in the RIP project list, where the facility-specific assessments have reached substantial technical completion. PANYNJ facility-specific CRAs are on track for full completion in Fall/Winter 2024 and Spring 2025.

Asset Types Studied:

1. All PANYNJ transportation facilities: tunnels, bridges, bus terminals, PATH rail system, ports, and airports
2. Non-PANYNJ assets that are essential to supporting PANYNJ facilities, including select local and state roadways and utilities

Hazards Studied:

1. Sea level rise
2. Coastal flooding
3. Precipitation
4. Extreme heat

Hazard Time Horizons:

1. Present day to 2100 across multiple average recurrence intervals, from 1-year to 500-year for coastal storms and to 1,000-year for stormwater, in addition to sea level rise.

[16] Port Authority of New York and New Jersey (PANYNJ). Climate Resilience. https://www.panynj.gov/port-authority/en/about/Environmental-Initiatives/climate-resilience.html

❖ *FHWA. Post Hurricane Sandy Transportation Resilience Study of NY, NJ, and CT (2017)*[17]

This research project, led by FHWA, examined the transportation system impacts of Hurricane Sandy, Hurricane Irene, Tropical Storm Lee, and Nor'easter Alfred. It also discusses climate data and analysis tools, vulnerability assessment, risk assessment, adaptation options in the tri-state metropolitan region, and integrating climate resilience in transportation decision-making. The study included exposure and vulnerability assessments of transportation systems in the South Shore of Raritan Bay in New Jersey. The assessment identified several areas that are at a high risk for coastal flooding and/or extreme heat, including portions of the Garden State Parkway and Route 35 near Matawan Creek; portions of Route 36 near Union Beach, Port Monmouth, and Hosford Ave./7th Ave; and areas of NJ TRANSIT's North Jersey Coastal Line. The Sea, Lake, and Overland Surge from Hurricanes (SLOSH) model was used to identify project coastal storm surge zones. Adaptation strategies for this region included design standards incorporating sea level rise projections, treatment or raising of concrete and electrical assets vulnerable to inundation, more frequent inspections for extreme heat impacts, enhanced capacity for coastal evacuation routes, and addition of coastal protection measures such as floodwalls and levees.

Asset Types Studied:

1. Major roadways
2. Bridges
3. Rail infrastructure
4. Freight rail infrastructure
5. Transportation hubs

Hazards Studied:

1. Sea level rise
2. Changes in intensity, frequency, and duration of storms
3. Changes in intensity, frequency, and duration of precipitation
4. Changes in average and extreme temperatures

Hazard Temporal Scope:

1. Future conditions (2050s and 2100s) for sea level rise and extreme heat
2. Future conditions (2040-2069 and 2070-2099) for 5-year, 25-year, and 100-year precipitation events

OTHER ASSESSMENTS

❖ *USACE. NY & NJ Harbor & Tributaries Focus Area Feasibility Study (HATS) (2022)*[18]

[17] Federal Highway Administration (FHWA). Post Hurricane Sandy Transportation Resilience Study in New York, New Jersey, and Connecticut. October 2017. https://www.fhwa.dot.gov/environment/sustainability/resilience/publications/hurricane_sandy/fhwahep17097.pdf

[18] U.S. Army Corps of Engineers New York District, NY & NJ Harbor & Tributaries Focus Area Feasibility Study (HATS). Updated January 2024. https://www.nan.usace.army.mil/Missions/Civil-Works/Projects-in-New-York/New-York-New-Jersey-Harbor-Tributaries-Focus-Area-Feasibility-Study/

Coastal storms have severely impacted the North Atlantic Coast of the United States, including the New York–New Jersey Harbor region. In response to these storms, the USACE is investigating measures to manage future flood risk in ways that support the long-term resilience and sustainability of the coastal ecosystem and surrounding communities and reduce the economic costs and risks associated with flood and storm events. To support this goal, the USACE completed the North Atlantic Coast Comprehensive Study, which identified nine high-risk focus areas on the North Atlantic Coast for more in-depth analysis of potential coastal storm risk management measures. One of the nine areas identified was the New York–New Jersey Harbor and Tributaries study area.

- *PANYNJ. Flood Product Library (2019)*[19]

The Flood Product Library is a tool developed to assist Port Authority design teams, Line Departments, and facilities in quickly identifying potential flood resilience solutions. It contains information for nearly 200 flood control devices, searchable by over a dozen key attributes and characteristics. This effort supports the ongoing CRA.

- *PANYNJ. Climate Resilience Design Guidelines (2018)*[20]

The Port Authority Climate Resilience Design Guidelines[21] (CRG) present a risk-informed resilience integration approach for new Port Authority projects. This effort supports the ongoing CRA. The CRG provides a science-based methodology for factoring sea level rise into the design process and addresses extreme precipitation and extreme heat. By proactively addressing climate risks during the design process, the CRG helps ensure that public dollars are wisely spent on long-lived infrastructure.

2C. STATE-LEVEL PLANNING ACTIVITIES AND INVESTMENTS

Beyond the 2010 Climate Change Vulnerability and Risk Assessment, New Jersey's state agencies have also developed cross-connecting planning activities and investments and information-sharing approaches to address climate change. In addition to the planning activities and investments listed below, the NJDOT has also developed internal vulnerability analyses and tools.

RISK-BASED ASSESSMENTS

- *New Jersey Office of Emergency Management. New Jersey State Hazard Mitigation Plan (2024)*[22]

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[19] PANYNJ. Climate Resilience. https://www.panynj.gov/port-authority/en/about/Environmental-Initiatives/climate-resilience.html

[20] Ibid.

[21] PANYNJ. Climate Resilience Design Guidelines v1.2. Updated June 2018. https://www.panynj.gov/content/dam/port-authority/about/environmental-initiatives-/clean-construction/climate-resilience.pdf

[22] New Jersey Office of Emergency Management (OEM). 2024 New Jersey State Hazard Mitigation Plan. 2024. https://nj.gov/njoem/mitigation/2024-mitigation-plan.shtml

The State of New Jersey's Hazard Mitigation Plan (HMP) captures historic disaster experiences and reflects the natural and human-caused hazards that New Jersey faces, based on current science and research. The State HMP outlines a strategy for reducing risks from hazards and serves as the basis for prioritizing future project funding. Transportation stakeholders involved in the development of the HMP included the NJTPA, the NJDOT, the New Jersey Turnpike Authority (NJTA), and the PANYNJ. Transportation was included as one of the eight categories of Community Lifelines identified by the Federal Emergency Management Agency (FEMA); 12 types of critical infrastructure and facilities were identified within this category, including aviation facilities, bus terminals, hurricane evacuation routes, navigable waterway nodes, and port facilities. These critical facilities were one input into FEMA's Hazards U.S. Multi-Hazard model (HAZUS-MH) to estimate impacts to communities. In addition, lack of transportation access was one of the categories of burden used to identify disadvantaged communities.

Asset Types Studied:

1. State-owned or -leased facilities
2. Total buildings
3. Publicly- and privately-owned critical facilities, infrastructure, and community lifelines

Hazards Studied:[23]

1. Coastal erosion
2. Drought
3. Earthquakes
4. Extreme temperature
5. Flooding (riverine, coastal, stormwater, sea level rise)
6. Geological hazards
7. Hurricanes and tropical storms
8. Severe weather
9. Severe winter weather
10. Wildfire
11. Animal disease
12. Civil unrest
13. Cyber attack
14. Economic collapse
15. Hazardous substances
16. Nuclear hazards
17. Pandemics
18. Terrorism

Temporal Scope:

1. Existing conditions for all hazards
2. Future conditions (2050 and 2100) for sea level rise, precipitation, and extreme temperatures

OTHER ASSESSMENTS

- *State of New Jersey, Interagency Council on Climate Resilience. New Jersey Extreme Heat Resilience Action Plan (2024)*[24]

[23] Hazards have been screened for those impacting the Transportation sector.
[24] IAC. New Jersey Extreme Heat Resilience Action Plan. July 2024. https://dep.nj.gov/wp-content/uploads/climatechange/extreme_heat_rap_071924-screen-version.pdf

This plan comprises 135 actions, organized thematically into 20 focus areas and further organized to align with the priorities outlined in the foundational policy framework of New Jersey's Climate Change Resilience Strategy. Associated action commitments address the activities completed, ongoing, or recommended for individual agencies, as well as efforts that span several or all state agencies that make up the Interagency Council on Climate Resilience. Actions included in this plan are designed to address community health, equity and justice, research needs, coordination of government, and the funding, financing, and investment needed to implement the action in accordance with the Resilience Strategy.

- *NJ TRANSIT. Sustainability Plan (2024)*[25]

NJ TRANSIT's *Sustainability Plan* spotlights the organization's resilience activities. Following Hurricane Sandy, NJ TRANSIT implemented multiple long-term redesign and construction projects to harden and floodproof critical infrastructure. The agency also integrated climate resilience into new projects by raising infrastructure above flood risk elevation, utilizing materials that can withstand storm surge, and incorporating innovations and best practices into the long-term recovery process. NJ TRANSIT has invested in policy-based solutions to enhance emergency response to natural hazards. These actions have allowed the system to better withstand and recover from extreme weather events. NJ TRANSIT's operation practices that promote resilience include an annually updated Comprehensive Emergency Management Plan, a new, permanent Emergency Operations Center, and a Storm Surge Early Warning System for Hoboken Terminal. Capital investments include hardening critical assets and facilities, such as a floodwall for the Meadowland Maintenance Complex. NJ TRANSIT's partnerships and initiatives include emergency response training with the Texas A&M Engineering Extension Service training program and coordination with other state agencies.

- *Interagency Council on Climate Resilience. State of New Jersey Climate Change Resilience Strategy Two-Year Anniversary Accomplishments (2023)*[26]

This product provides an update on progress made by the New Jersey Interagency Council on Climate Resilience since releasing the first statewide Climate Change Resilience Strategy in 2021.

- *Interagency Council on Climate Resilience. State of New Jersey Climate Change Resilience Strategy (2021)*[27]

The Interagency Council was established in October 2019 by Governor Phil Murphy's Executive Order 89. The Council brings together 17 agencies with responsibilities for maintaining the physical, environmental, and economic health of New Jersey's precious resources and

[25] NJ TRANSIT. NJ TRANSIT Sustainability Plan. 2024. https://content.njtransit.com/sites/default/files/sustainability/NJ_TRANSIT_Sustainability_Plan_FINAL_WEB.pdf
[26] IAC. State of New Jersey Climate Change Resilience Strategy Two-Year Anniversary Accomplishments. October 2023. https://dep.nj.gov/wp-content/uploads/climatechange/docs/ccrs-two-year-anniversity-accomplishments-final.pdf
[27] IAC. New Jersey Climate Change Resilience Strategy. October 2021. https://dep.nj.gov/wp-content/uploads/climatechange/docs/nj-climate-resilience-strategy-2021.pdf

communities. The Transportation sector is one of the economic sectors addressed, and the following transportation agencies are included on the Council: NJDOT, NJ TRANSIT, NJTA, and the PANYNJ. The inaugural Resilience Strategy outlines the broad policy framework under which the Interagency Council's work will occur. The Strategy identified six state climate resilience priorities: 1) Build Resilient and Healthy Communities, 2) Strengthen the Resilience of New Jersey's Ecosystems, 3) Promote Coordinated Governance, 4) Invest in Information and Increase Public Understanding, 5) Promote Climate-Informed Investments and Innovative Financing, and 6) Coastal Resilience Plan. Each priority includes recommendations to guide state and local government efforts to protect vulnerable communities, infrastructure, businesses, and the environment throughout all of New Jersey's 565 municipalities.

- *NJ TRANSIT. Capital Planning Resiliency Program (2021)*[28]

NJ TRANSIT's Resilience Program projects include the Delco Lead Storage and Inspection Facility, Long Slip Fill and Rail Enhancement, Raritan River Bridge Replacement, Signals and Communications Resilience, Hoboken Terminal, and the Emergency Operations Center.

- *NJ Climate Change Resource Center. New Jersey's Rising Coastal Risk (2019)*[29]

This report quantifies the impact of changes in sea level rise and changes in hurricane activity over the past four decades on flood and wind exposure and expected damage at the individual county level. It also explores how New Jersey's coastal risk will evolve in the years ahead as the climate changes. It finds that:

- Tidal flooding risk in New Jersey has more than doubled;
- Hurricane flood risk is also increasing;
- Hurricane risk extends beyond the coasts;
- Rising coastal flooding risk carries significant economic costs;
- New Jersey's exposure is projected to grow; and
- Resilience investments can reduce current and future risks.

- *NJ Climate Change Resource Center. New Jersey's Rising Seas and Changing Coastal Storms: Report of the 2019 Science and Technical Advisory Panel (2019)*[30]

The 2019 Science and Technical Advisory Panel (STAP) was tasked with identifying and evaluating the most current science on sea level rise projections and changing coastal storms, considering their implications for the practices and policies of local and regional stakeholders, and providing practical options for stakeholders seeking to incorporate science into risk-based

[28] NJ TRANSIT. Capital Planning Resiliency Program. 2021. https://www.njtransit.com/ResiliencyProgram
[29] Rhodium Group, Rutgers, Berkeley, Energy Policy Institute at the University of Chicago (EPIC). New Jersey's Rising Coastal Risk. October 2019. https://njclimateresourcecenter.rutgers.edu/wp-content/uploads/2020/09/Rhodium_NJCoastalRisk_Oct2019final.pdf
[30] Rutgers. New Jersey's Rising Seas and Changing Coastal Storms: Report of the 2019 Science and Technical Advisory Panel. November 2019. https://www.nj.gov/dep/climatechange/pdf/nj-rising-seas-changing-coastal-storms-stap-report.pdf

decision processes. The 2019 STAP process included updates to the prior report, including making historical sea level rise information for New Jersey available to provide a frame of reference for future projections and expanding consideration of tidal and storm tide-related flooding. These updates are incorporated into flood models developed by NJDEP for the Resilient NJ Initiative projects included below.

- *NJDEP. Resilient NJ Initiative (2014-Present)*[31]

Resilient NJ builds on existing efforts to create and implement regional planning solutions to address current and future flood-related hazards and promote sustainable development in riverine and coastal communities. The program aims to enhance the value of the ecological and economic resources in the region and reach underserved and socially vulnerable populations. Resilient NJ uses the best available scientific information about climate-related hazards and how they might change, including flood models that incorporate sea level rise projections from the 2019 STAP report, climate change projections from the 2020 New Jersey Scientific Report on Climate Change and the International Panel on Climate Change (IPCC), and information on climate-related hazards and impacts through the NJ Flood Mapper tool developed by Rutgers University and others.

Resilient NJ is designed to reduce flood damage in both coastal and riverine towns through community-based resiliency planning. The Resilient NJ program is implemented in two phases. Phase 1 brings together municipalities, counties, utility authorities, community-based organizations, and other regional entities with consultant teams to identify community assets, assess current and future flood risks, and develop potential actions to address flooding. These actions will form the basis of a Regional Resilience and Adaptation Action Plan. Phase 2 involves implementing the planning actions that were developed in Phase 1. Resilient NJ is currently providing funding for four multi-municipal regions to develop Regional Resilience and Adaptation Action Plans (RRAAPs) and several municipalities to develop municipal resilience action plans (MRAPs). Several of these planning efforts are in the NJTPA region and are included below.

2D. REGIONAL PLANNING ACTIVITIES AND INVESTMENTS

RISK-BASED ASSESSMENTS

- *NJDEP. Resilient NJ: A Resilience Action Plan for Northeastern NJ (2022)*[32]

Resilient Northeastern NJ (Resilient NENJ) is one of four pilot projects that focuses on developing solutions to reduce risk and build resilience in Jersey City, Newark, Hoboken, and Bayonne. These four municipalities, Hudson County, and the Ironbound Community Corporation and HOPES CAP, Inc. community organizations, comprise the Resilient NENJ Region Team. The Resilient NENJ plan is supported by a Flood Impact Assessment, which

[31] NJDEP. Resilient NJ. Updated February 2024. https://www.nj.gov/dep/bcrp/resilientnj/about.html
[32] NJDEP. Resilient NJ: Northeastern New Jersey Action Plan: A Roadmap to Resilience. October 2022, Version 2022.1. https://www.resilient-nj.com/wp-content/uploads/2022/11/RNJ_NENJ_Action-Plan-v-2022.1-screen.pdf

evaluated regional and localized impacts for rainfall flash flooding (present and future), rainfall areal flooding (present and future), tidal flooding (future), and coastal storm surge (future). The Flood Impact Assessment identified a risk of expected flood impacts to 2 out of every 5 residents in NENJ, affecting 15,000 buildings worth $61 billion and an estimated 70% of daily economic output. Additionally, a Climate Hazards Assessment evaluated impacts to the NENJ region including the urban heat island effect, air quality degradation, wildfire, invasive species and vector-borne illness, and drought.

Representatives from these entities sit on a Steering Committee that leads the project. The Action Plan's themes are Ease, Protect, Connect, Thrive, and Regenerate. The region's ability to *thrive* and *regenerate* should arise from implementing actions that *ease*, *protect*, and *connect*.

Asset Types Studied:

1. Transportation infrastructure
2. Power infrastructure
3. Buildings

Hazards Studied:

1. Flooding
2. Sea level rise
3. Extreme heat
4. Air quality
5. Wildfire risk
6. Water availability
7. Brownfields and other remediation sites

Hazard Temporal Scope:

1. Present and future conditions were studied for flash flooding and areal flooding.
2. Future conditions were also studied for tidal flooding and coastal storm surge.

❖ *NJDEP. Resilient NJ: A Resilience Action Plan for the Raritan River Bay Communities (2022)*[33]

Through the Resilient NJ program, the Raritan River and Bay Communities (RRBC) region has engaged in a stakeholder-guided process to become more resilient and improve quality of life for its more than 300,000 residents. This action plan is a culmination of these efforts. The plan summarizes the Resilient NJ program and resilience planning process undertaken in the communities; shares the outcomes and results of the program and process; and provides a roadmap for reducing flood and other climate risks and addressing critical issues in the region through identified resilience strategies and actions. The RRBC Action Plan is supported by a

[33] NJDEP. Resilient NJ: Protect, Restore, Transition: A Resilience Action Plan For The Raritan River And Bay Communities' Region. October 2022. https://resilientnewjersey.com/wp-content/uploads/2023/02/230207_RRBC_Action-Plan_Full.pdf

Flood Impact Assessment[34] that evaluates tidal flooding, storm surge, and areal flooding from stormwater for both present-day (2020) and future (2070) high-emissions scenarios. An Additional Climate Hazards Assessment also evaluated the risks of climate hazards including rising temperatures, degraded air quality, and degraded water quality.

A broad range of resilience strategies and actions can be leveraged to realize the RRBC vision for the future of, "A thriving region of interconnected watersheds, with complementary environmental, social, economic, and governance systems working together to reduce flood risk of communities and infrastructure, restore natural systems, and adapt to a changing climate."

Asset Types Studied:

1. Critical power infrastructure
2. Public roads
3. Public bridges
4. Brownfields and other vulnerable sites

Hazards Studied:

1. Coastal flooding
2. Precipitation
3. Extreme heat
4. Air quality
5. Extreme weather events

Hazard Temporal Scope:

1. Present and future conditions were studied for flash flooding and areal flooding.
2. Future conditions were also studied for tidal flooding and coastal storm surge.

❖ *NJDEP. Resilient NJ: A Resilience Action Plan for Long Beach Island (2022)*[35]

This RRAAP is one of four multi-municipal regional projects funded by Resilient NJ. The process for creating the Resilient Long Beach Island (LBI) Action Plan included critical involvement from a wide range of community stakeholders, including the Long Beach Township Field Station, the St. Francis Community Center, the Joint Taxpayers Association of Long Beach Island, and representatives from each of the six municipalities located on LBI. The foundation of the process was the implementation of a robust community engagement strategy that included meetings with the Advisory Committee, input from the Technical Committee, public workshops, and meetings with municipal leaders. The planning process included a Vulnerability Assessment performed to identify critical assets within the study area and assess the risk of these assets to climate impacts. Following development of the Vulnerability Assessment, scenario planning tools were used to evaluate the potential effectiveness of different strategies to reduce risk to critical assets. The project team evaluated resilience and adaptation scenarios to provide the LBI

[34] NJDEP. Resilient NJ: Raritan River and Bay Communities: Flood Impact Assessment. July 2022. https://resilientnewjersey.com/wp-content/uploads/2022/07/220707_RRBC_Flood-Impact-Report.pdf
[35] NJDEP. Resilient Long Beach Island Action Plan: A Roadmap to Climate Resilience. October 2022. https://resilient-nj-long-beach-island-rambollglobal.hub.arcgis.com/pages/action-plan/

community with a range of strategies with which to address risk. Each scenario included various planning steps, policy actions, and capital projects. Ultimately, the project team identified a preferred scenario based on risk reduction and community input.

Asset Types Studied:
1. Municipal facilities

Hazards Studied:
1. Coastal flooding

Hazard Temporal Scope:
1. Existing conditions (10-year and 100-year storm events)
2. Future conditions (2030-2050 and 2050-2080; 10-year and 100-year storm events)

❖ *NJDEP Climate and Flood Resilience Program. Two Rivers, One Future: Regional Resilience Adaptation Action Plan (2019)*[36]

This Fostering Regional Adaptation through Municipal Economic Scenarios (FRAMES) project is the result of a three-year risk assessment, outreach, and scenario planning process for the New Jersey Fostering Regional Adaptation through Municipal Economic Scenarios project. The project is based in the Two Rivers region of Monmouth County, New Jersey, and comprises 15 communities along the Shrewsbury and Navesink Rivers, as well as communities on the Sandy Hook Bayshore and Atlantic Ocean coastline. The project's approach and key principles are based on the framework laid out in NOAA's *What Will Adaptation Cost? An Economic Framework for Coastal Community Infrastructure*.[37] As one of the final products of the project, this Regional Action Plan presents six strategies for achieving regional resilience, as well as one potential path for implementation of the strategies, called the "conceptual scenario." The RRAAP is intended to serve as a guiding document for the communities located in the Two Rivers region to inform their planning and future development efforts.

Asset Types Studied:
1. Housing
2. Infrastructure
3. Natural resources
4. Economic assets

Hazards Studied:
1. Coastal storms
2. Sea level rise

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[36] NJDEP Climate and Flood Resilience Program. Two Rivers, One Future: New Jersey Fostering Regional Adaptation through Municipal Economic Scenarios (FRAMES). December 2019. https://www.nj.gov/dep/bcrp/njframes-docs.html

[37] Eastern Research Group, Inc. What Will Adaptation Cost? And Economic Framework for Community Planners. June 2013. https://coast.noaa.gov/data/digitalcoast/pdf/adaptation-report.pdf

Hazard Temporal Scope:

1. Projections are made out to 2050 and 2100

OTHER ASSESSMENTS

- *NJDEP. Rebuild by Design - Hudson River (2013)*[38]

The United States Department of Housing and Urban Development (HUD) launched the RBD competition in the summer of 2013 to develop ideas for improving physical, ecological, economic, and social resilience in regions affected by Hurricane Sandy. RBD-Hudson River addresses both major storm surges and high tides, as well as heavy rainfall events. The project will be built throughout Hoboken and will extend into Weehawken and Jersey City, with the following approximate boundaries: the Hudson River to the east; Baldwin Avenue (in Weehawken) to the north; the Palisades to the west; and 18th Street, Washington Boulevard, and 14th Street (in Jersey City) to the south.

- *NJDEP. Rebuild by Design – Meadowlands (2013)*[39]

This RBD project, led by NJDEP, focuses on the Meadowlands, an approximately 5,000-acre area on the Hackensack River in Bergen County. Historically wetland, the Meadowlands is relatively flat and low-lying. Urban development in this region is dense. Water-related infrastructure is often aging, under-performing, and undersized. The project area is vulnerable to both coastal flooding from storm surges and systemic inland flooding from large rainfall events. The final design seeks to achieve three primary goals: to reduce flood risk by managing drainage from rainfall events, to cultivate ecology with native planting, and to energize the community through new public realm improvements. The project uses a watershed approach to provide opportunities for reducing the flood risk and delivering ecological and community benefits. The designed project improvements include new pump stations, channel improvements, a new force main, native plantings, green infrastructure-type improvements in public rights-of-way and at existing municipal buildings, and a proposed waterfront park on the Hackensack River.

2E. COUNTY-LEVEL PLANNING ACTIVITIES AND INVESTMENTS

RISK-BASED ASSESSMENTS

- *County Hazard Mitigation Plans*

Each of the 13 counties in the NJTPA's jurisdiction has developed an HMP in accordance with FEMA guidelines. These plans address a wide range of potential hazards affected by climate

[38] NJDEP. Rebuild by Design – Hudson River. 2013. https://dep.nj.gov/floodresilience/rebuild-by-design-hudson-river/

[39] NJDEP. Rebuild by Design – Meadowlands. 2013. https://dep.nj.gov/wp-content/uploads/floodresilience/rbdm-fact-sheet-project-overview.pdf

change, including coastal erosion, drought, flooding, hurricanes and tropical storms, nor'easters, severe weather, winter storms, and wildfire.

- Bergen County. Multi-Jurisdictional Hazard Mitigation Plan (2020)[40]
  Bergen County's HMP uses FEMA's Special Flood Hazard Area (SFHA) map to identify future flooding risk to critical facilities. The HMP considers potential effects of climate change on future occurrences of hazards including coastal erosion, drought, flooding, landslides, hurricanes and tropical storms, extreme wind events, extreme temperatures and snowstorms, and wildfire events.

- Essex County. Essex County Hazard Mitigation Plan (2020)[41]
  Essex County's HMP considers potential effects of climate change on future occurrences of hazards including coastal erosion and sea level rise, coastal storms, drought, extreme temperature, flood, severe weather and winter weather, and wildfire. To consider potential flooding from coastal storms, Essex County used SLOSH inundation maps prepared by USACE and FEMA.

- Hudson County. Hudson County Hazard Mitigation Plan (2020, Planned Update 2024)[42]
  Hudson County's HMP considers potential effects of climate change on future occurrences of hazards including coastal erosion and sea level rise, coastal storms, drought, extreme temperatures, flooding (riverine, coastal, and urban), and wildfire. Hudson County performed an exposure assessment using projected sea-level rise data from NOAA's Office of Coastal Management; storm surge projections are not included.

- Hunterdon County. 2021 All Hazard Pre-Disaster Mitigation Plan (2021)[43]
  Hunterdon County's HMP considers potential effects of climate change on future occurrences of hazards including coastal erosion and sea level rise, coastal storms, drought, extreme temperatures, flooding (riverine, coastal, and urban), and wildfire.

- Middlesex County. Middlesex County Hazard Mitigation Plan (2022)[44]

[40] Bergen County Office of Emergency Management, prepared by Michael Baker International. Multi-Jurisdictional Hazard Mitigation Plan. August 2020. https://www.co.bergen.nj.us/emergency-management/all-hazard-mitigation-plan
[41] Essex County Office of Emergency Management, prepared by Tetra Tech. County of Essex All Hazard Mitigation Plan: 2020 Update. February 2020. https://www.essexsheriff.com/wp-content/uploads/2020/06/Essex_2020_HMP_Volume%201-1.pdf
[42] Hudson County Office of Emergency Management, prepared by Tetra Tech. Hudson County Hazard Mitigation Plan: 2020 Update. April 2020. https://hudsoncountynjhmp.com/draft-plans/
[43] Hunterdon County Division of Emergency Management, prepared by Tetra Tech. 2021. https://www.co.hunterdon.nj.us/477/3054/2021-All-Hazard-Pre-Disaster-Mitigation-
[44] Middlesex County Office of Emergency Management and Preparedness, prepared by Environmental Analysis and Communications Group, Edward J. Bloustein School of Planning and Public Policy, Rutgers University. January 2022. https://www.middlesexcountynj.gov/government/departments/department-of-public-safety-and-health/office-of-emergency-management-and-preparedness/hazard-mitigation-plan/-folder-226

Middlesex County's HMP considers potential effects of climate change on future occurrences of coastal erosion, drought, extreme temperatures, flooding, hurricanes and tropical storms, nor'easters, severe weather, wildfire, and winter storms.

- Monmouth County. Monmouth County, New Jersey, Multi-Jurisdictional Hazard Mitigation Plan (2021)[45]
  Monmouth County's HMP considers potential effects of climate change on future occurrences of hurricanes, tropical storms, floods, nor'easters, severe weather, winter storms, drought, and wildfire.

- Morris County. Morris County Hazard Mitigation Plan (2020)[46]
  Morris County's HMP considers potential effects of climate change on future occurrences of drought, extreme temperature, flooding, severe weather, severe winter weather, and wildfire.

- Ocean County. Ocean County Hazard Mitigation Plan (2018)[47]
  Ocean County's HMP considers potential effects of climate change on future occurrences of hazards including coastal erosion, drought, extreme heat and cold, flooding, tropical storms and hurricanes, windstorms, wildfires, and winter storms.

- Passaic County. Passaic County and All Municipalities Hazard Mitigation Plan 2020 Update (2020)[48]
  Passaic County's HMP considers potential effects of climate change on future occurrences of coastal storms, drought, extreme temperatures, flooding, severe weather, severe winter weather, and wildfire.

- Somerset County. Somerset County All-Hazards Pre-Disaster Mitigation Plan (2019)[49]
  Somerset County's HMP considers potential effects of climate change on future occurrences of severe storms, severe winter storms, flooding, wildfire, extreme temperatures, and drought.

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[45] Monmouth County Sheriff's Office. Multi-Jurisdictional Hazard Mitigation Plan. February 2021. https://www.mcsonj.org/divisions/special-ops/emergency-management/hazard-mitigation-planning/

[46] Morris County Office of Emergency Management, prepared by Tetra Tech. Morris County Multi-Jurisdictional Multi-Hazard Mitigation Plan Update. July 2020. https://www.morriscountynj.gov/Departments/Emergency-Management/Mitigation/2020-Mitigation-Plan-Update

[47] Ocean County, prepared by Michael Baker International. 2018 Multi-Jurisdictional All-Hazard Mitigation Plan. July 2020. https://www.co.ocean.nj.us/WebContentFiles/d99c7d03-cbe7-47ca-9d49-8fea931376c5.pdf

[48] Passaic County Office of Emergency Management, prepared by Tetra Tech. Passaic County and All Municipalities Hazard Mitigation Plan 2020 Update. September 2020. https://www.passaiccountynj.org/home/showpublisheddocument/2250/637672038994270000

[49] Somerset County Mitigation Planning Committee. Somerset County Multi-Jurisdictional Hazard Mitigation Plan. July 2019. https://www.co.somerset.nj.us/home/showpublisheddocument/34508/637003370186400000

- Sussex County. Multi-Jurisdictional Hazard Mitigation Action Plan Update (2021)[50]
  Sussex County's HMP considers potential effects of climate change on future occurrences of drought, flooding, hurricanes, nor'easters, severe weather, severe winter weather, and wildfire.

- Union County. Union County Hazard Mitigation Plan (2021)[51]
  Union County's HMP considers potential effects of climate change on future occurrences of drought, coastal erosion, extreme temperatures, flooding, hail, high winds, severe winter weather, and storm surge from hurricanes, nor'easters, and tropical storms.

- Warren County. 2021 Hazard Mitigation Plan (2021)[52]
  Warren County's HMP considers potential effects of climate change on future occurrences of drought, flooding, hurricanes and tropical storms, nor'easters, severe weather, severe winter weather, and wildfire.

OTHER ASSESSMENTS

❖ *County Master Plans*

County Master Plans in the NJTPA region often address potential hazards, including vulnerabilities to flooding and storm events, and discuss how the counties and their municipalities can respond. Below are two examples of Master Plans that include resilience elements and related strategies:

- *Bergen County. Master Plan (2023)*[53]
  The County Master Plan provides a snapshot of existing conditions, a vision for the future, aspirational goals for future projects and implementation, and a compendium of best practices. Moreover, it can act as a strategic tool to which agencies tie future budgeting and priorities. The Master Plan delves into various topical elements to explore existing conditions, trends and projections, best practices, and further analysis. These elements include Arts, History and Historic Resources; Land Use and Housing; Economic Vitality; Environment and Natural Resources; Open Space, Agriculture, Parks, and Recreation; Public Facilities and Services; Transportation and Mobility; and Sustainability. This Plan additionally provides direction to guide both the County and its constituent municipalities in their efforts and development, affords a regional perspective

[50] Sussex County Sheriff's Office, Division of Emergency Management, prepared by Tetra Tech. Sussex County Multi-Jurisdictional Hazard Mitigation Action Plan 2021 Update. May 2021. https://www.sussex.nj.us/documents/sheriff/2021/HMP/Final%20Plan/Sussex%20HMP%20Vol%20I.pdf
[51] Union County Division of Emergency Services, prepared by Michael Baker International. Union County, New Jersey: Multi-Jurisdictional Hazard Mitigation Plan. December 2021. https://ucnj.org/wp-content/uploads/2022/02/Union-County-Multi-Jurisdictional-Hazard-Mitigation-Plan.pdf
[52] Warren County Department of Public Safety, Office of Emergency Management, prepared by Michael Baker International. Warren County, New Jersey: Multi-Jurisdictional Hazard Mitigation Plan. January 2022. https://www.warrencountynjdps.com/home/showpublisheddocument/4500/637900899426370000
[53] Bergen County. Bergen County Master Plan. April 2023. https://www.co.bergen.nj.us/county-master-plan-public-notice

for large-scale and inter-jurisdictional matters, as well as responding to emerging trends and focus areas, and promotes best practices and innovative tools. In doing so, it will help ensure that municipal plans are consistent with the County Master Plan. By the same token, the County will revisit the Master Plan at least annually to call attention to emerging trends and new practices, with amendments should the need arise.

- *Passaic County. Master Plan (Multiple Dates)*[54]
  Passaic County's Master Plan includes several elements, including a Transportation Element, Green Stormwater Infrastructure Element, and Sustainability Element. The Transportation Element[55] adopted in 2012 proposes a formal assessment to determine the vulnerability of mass transit and roadway facilities in the Passaic River Basin to current as well as future climate change conditions. The Green Stormwater Infrastructure Element[56] adopted in 2019 outlines a comprehensive strategy for stormwater management based on widespread application of low impact development and green stormwater infrastructure. The County also adopted a Sustainability Element[57] in 2013, which discusses climate change and greenhouse gas emission reduction priorities, stormwater management and outlines a comprehensive action plan with distinct goals and strategies.

❖ *FEMA. Bergen County Flood Insurance Study (2019)*[58]

This countywide Flood Insurance Study (FIS) revises and updates the previous FIS and Flood Insurance Rate Map (FIRM) for the geographic area of Bergen County, New Jersey, including all 70 municipalities in Bergen County, as well as four municipalities in Hudson County that are part of the New Jersey Meadowlands Commission (NJMC). This FIS aids in the administration of the National Flood Insurance Act of 1968, the Flood Disaster Protection Act of 1973, and the Flood Insurance Reform Act of 2012. Associated study has developed flood risk data for various areas of the county that will be used to establish actuarial flood insurance rates. This information will also be used by Bergen County to update existing floodplain regulations as part of the Regular Phase of the National Flood Insurance Program (NFIP) and by local and regional planners to further promote sound land use and floodplain development. Minimum floodplain

[54] Passaic County Department of Planning & Economic Development. Plans and Technical Studies. https://www.passaiccountynj.org/departments/planning-economic-development/plans-and-technical-studies
[55] Passaic County Department of Planning & Economic Development with assistance from Parsons Brinckerhoff. Moving Passaic County: Transportation Element of the Passaic County Master Plan. October 2012. https://www.passaiccountynj.org/home/showpublisheddocument/2262/637672140975730000
[56] NJTPA, Passaic County, AKRF, McCormick Taylor, Mercer Planning Associates. Green Stormwater Infrastructure Element of the Passaic County Master Plan. September 2018. https://www.passaiccountynj.org/home/showpublisheddocument/2294/637696485458670000
[57] Passaic County Department of Planning & Economic Development. Passaic County Future: Sustainability Element of the Passaic County Master Plan. April 2013. https://www.passaiccountynj.org/home/showpublisheddocument/2260/637672105117830000
[58] Federal Emergency Management Administration (FEMA). Flood Insurance Study: Bergen County, New Jersey (All Jurisdictions). Revised August 28, 2019. https://map1.msc.fema.gov/data/34/S/PDF/34003CV001B.pdf?LOC=a15afe55f3be54461427ed18ef90bc81

management requirements for participation in the NFIP are set forth in Title 44 of the Code of Federal Regulations (CFR) §60.3.

2F. MUNICIPALITY-LEVEL PLANNING ACTIVITIES AND INVESTMENTS

In 2021, New Jersey updated the Municipal Land Use Law (MLUL) to require that municipalities include a climate change-related hazard vulnerability assessment when updating their master plans. The Resilient NJ Municipal Assistance Program (MAP), funded by the NOAA through the New Jersey Coastal Management Program, provides the NJDEP with a mechanism for assisting municipal entities in fulfilling this requirement. In the NJTPA subregion, two MAP projects are in progress: a Montclair Township and a Town of Harrison project. Two MAP projects have been completed and are included below in addition to other ongoing local planning efforts.

RISK-BASED ASSESSMENTS

- *NJDEP Municipal Assistance Program. Resilient NJ: Township of Ocean, NJ, Climate Change-Related Hazard Vulnerability Assessment (CCRHVA) & Resilience Action Plan (2023)*[59]

The Township of Ocean is one of the first municipalities to participate in the program and is receiving support to integrate climate change science into land use planning and decision-making. This program aims to strengthen the Township's resilience to the impacts of extreme heat, sea level rise, coastal storms, changing precipitation, and other climate-related hazards. The project team has prepared a vulnerability assessment and menu of adaptation actions. This report includes the methods and findings from this effort, an examination of the impacts of climate change on the Township of Ocean and a suite of potential action items that could improve the Township's resilience to climate change. This initial effort sets the stage for more comprehensive resilience planning and the further development and implementation of risk-mitigating actions.

Asset Types Studied:

1. Critical services assets (including communications, energy, food/water/shelter, hazardous materials, safety and security, and transportation)
2. Natural resources assets
3. Community resources assets (including residential, commercial, educational, religious, and government buildings)

Hazards Studied:

1. Sea level rise
2. Flooding (high tide, storm surge, stormwater)
3. Extreme temperatures
4. Drought

[59] New Jersey Department of Environmental Protection, prepared by Dewberry. Resilient NJ: Township of Ocean, NJ: Climate Change-Related Hazard Vulnerability Assessment (CCHRVA) & Resilience Action Plan. December 2023. https://www.nj.gov/dep/bcrp/resilientnj/docs/resilient-ocean-action-plan.pdf

5. Wildfire

Hazard Temporal Scope:

1. Historical baseline (1981-2010) for extreme temperatures
2. Existing conditions (2022) for sea level rise, flooding (10-year and 100-year)
3. Future conditions for sea level rise (2030, 2050, 2070, 2100), flooding (2030, 2050, 2070, 2100; 10-year and 100-year), extreme temperatures (2050-2070 and 2080-2090), and drought (2070-2099)

❖ *NJDEP Municipal Assistance Program. Resilient Stafford Mud City Resilience and Ecological Enhancement Plan (2023)*[60]

This report evaluates current and future risks in Stafford and provides recommended actions for mitigating those risks. In relation to these mitigation actions, projects, studies, and regulatory actions that can be implemented are identified, along with responsible parties, costs, timelines, regional connections, and innovative funding mechanisms to improve resilience to flooding and adapt to future climate concerns. The remainder of the report frames the planning process behind this project, providing critical background context, a description of the objectives and community engagement process, a summary of the vulnerability assessment, and recommended next steps.

Asset Types Studied:

1. Residential housing
2. Social infrastructure (including community centers, parks, non-critical healthcare facilities, and public schools)
3. Critical infrastructure (including critical healthcare facilities, fire and police departments, and water/sewer facilities)
4. Natural resources

Hazards Studied:

1. Coastal flooding
2. Flooding, sea level rise, and storm surge
3. Increased temperature
4. Drought
5. Wildfire
6. Hurricanes, coastal storms, and wind
7. Shoreline erosion

Hazard Temporal Scope:

1. Existing conditions (present day)

[60] Township of Stafford, NJDEP, Kleinfelder, Ramboll, Owen, Little, & Associates. Resilient Stafford Action Plan: A Roadmap to Climate Resilience. December 2023. https://www.dep.nj.gov/wp-content/uploads/ocr/resilient-stafford-action-plan.pdf

2. Future conditions (2030, 2050, 2070) for 10-year precipitation with 3-ft and 6-ft storm surge

OTHER ASSESSMENTS

- *Jersey City, Resolution of the City of Jersey City to Adopt the Hudson County, New Jersey, Hazard Mitigation Plan Update (2020)*[61]

Resolution of the City of Jersey City authorizing the adoption of the 2020 Hudson County, New Jersey, Hazard Mitigation Plan Update.

- *USACE. Passaic River Tidal Protection Area, NJ (2019)*[62]

The USACE, New York District, completed a study in partnership with the NJDEP, recommending a coastal storm risk management project in and surrounding tidal portions of Newark, New Jersey, along the Passaic River.

Many municipalities have included resilience improvement policies, including strategies, land-use and zoning changes, or investments in natural infrastructure. Below are some examples:

- *Hoboken's Green and Cool Roofs Policy (2015)*[63]
  Green roofs are encouraged wherever possible and, particularly so on roofs with surface area of 5,000 square feet or more where other alternative energy applications are not being used.

- *Hoboken Green Infrastructure Plan (2013)*[64]
  This plan aims to improve Hoboken's stormwater management systems with green infrastructure. It includes a conceptual framework, city-wide strategies, and sewershed strategies. It also includes recommendations by BPM and policy recommendations as well as information about next steps and implementation and a walk, talks and act tour.

- *Jersey City, NJ Resilient Design Handbook (2018)*[65]

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[61] City of Jersey City. Resolution of the City of Jersey City Authorizing the Adoption o the 2020 Hudson County New Jersey Hazard Mitigation Plan Update. Res. 20-737. October 2020. https://cityofjerseycity.civicweb.net/document/34626/Resolution%20to%20adopt%20Hudson%20county%20Hazard%20Mitiga.pdf?handle=D959847A18734C019077011488FEB4CB

[62] U.S. Army Corps of Engineers (USACE) New York District. FACT SHEET – Passaic River Tidal Protection Area, NJ. August 2024. https://www.nan.usace.army.mil/Media/Fact-Sheets/Fact-Sheet-Article-View/Article/487658/fact-sheet-passaic-river-tidal-protection-area-nj/

[63] City of Hoboken. § 196-28.1 Rear decks, roof decks, patios and terraces. June 2015. https://ecode360.com/15237999#30769128

[64] City of Hoboken. Hoboken Green Infrastructure Strategic Plan. October 2013. https://cms.jerseywaterworks.org/wp-content/uploads/2016/01/Final-Report_Hoboken-Green-Infrastructure-Strategic-Plan.pdf

[65] City of New Jersey. Jersey City, NJ: Resilient Design Handbook. 2018. https://cdnsm5-hosted.civiclive.com/UserFiles/Servers/Server_6189660/File/Community/Sustainability/JC_ResiliencyGuidebook_Final_for%20web_sm.pdf

This document serves as a tool to assist residents and business owners in making Jersey City greener and more resilient. It provides basic information about flooding in Jersey City as well as recommendations and best practices for Green Infrastructure and Resilient Building Design Strategies.

- *Rain Ready Newark (Ongoing)*[66]
  This is the City of Newark's Department of Water & Sewer Utilities' green stormwater infrastructure (GSI) program. Designed to increase the city's resilience to stormwater, the green infrastructure program uses natural processes to capture, filter, absorb and reuse rainwater and snowmelt.

2G. EVACUATION ROUTES

With the state's approximate 130 miles of Atlantic coastline and the state's understanding of the increased risk of coastal flooding, New Jersey's Office of Emergency Management (NJOEM) has designated coastal evacuation routes.[67] In the NJTPA region, these routes pass through Bergen, Essex, Hudson, Middlesex, Monmouth, Ocean, and Union Counties. The state's *2024 Hazard Mitigation Plan*[68] highlights these routes as critical transportation and community infrastructure (p. 4.1-8) and shows that the state is aware of the socio-economic issues associated with who can evacuate:

> *Of the total State population, economically disadvantaged populations are more vulnerable because they are likely to evaluate their risk and make decisions based on the major economic impact to their family and may not have funds to evacuate. The population over the age of 65 is also more vulnerable, and they may physically have more difficulty evacuating. The elderly population are considered most vulnerable because they require extra time or outside assistance during evacuations. Also, they are more likely to seek or need medical attention, which may not be available because of isolation during a storm event. (page 4.9-18)*[69]

Recognizing the further impacts of evacuation for those who do not own a car, NJOEM's website counsels individuals and families to, "Ask your County OEM[70] or local Police Department for details on the evacuation plans for transit-dependent individuals" and "Make plans with a neighbor who does drive."[71] NJTPA developed a study for Monmouth County in 2009.[72] In addition, this need is something future RIPs may consider.

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[66] City of Newark Department of Water & Sewer Utilities. RainReady Newark. https://www.rainreadynewark.org/
[67] State of New Jersey Office of Emergency Management (NJOEM). Evacuation Routes: NJ Coastal Evacuation Maps. https://nj.gov/njoem/plan-prepare/evacuation-routes.shtml
[68] NJOEM. 2024 Hazard Mitigation Plan. https://nj.gov/njoem/mitigation/2024-mitigation-plan.shtml
[69] Ibid.
[70] NJOEM. NJOEM County Coordinators. https://nj.gov/njoem/about-us/county-coordinators.shtml
[71] NJOEM. Your Kit / Your Plan. https://nj.gov/njoem/plan-prepare/your-kit-plan.shtml
[72] NJTPA. Monmouth County Coastal Evacuation Routes Improvement Study. https://www.njtpa.org/Planning/Subregional-Programs/Studies/Completed-Studies/2008-2009/Monmouth-County-Coastal-Evacuation-Routes-Improvem.aspx

The NJTPA funds and administers the Statewide Transportation Management Association pass-through program grant to enhance regional mobility and coordinates the activities of the state's eight TMA with county and local governments, NJ TRANSIT, NJDOT, the other NJ MPOs. TMA activities serve to reduce traffic congestion and air pollution, including promoting and supporting commuter vanpools and carpools, increasing transit ridership, encouraging walking and bicycling, and promoting electric vehicles. The TMAs also play an important role in construction mitigation and emergencies, such as in the preparation and response to extreme weather events, providing timely information about road and transit conditions and alternative modes of travel. TMAs utilize their extensive networks to disseminate upcoming weather hazards, plans and preparations for emergencies, and other public announcements from NJOEM and other state agencies.

Project List

This section highlights proposed resilience projects across the NJTPA's subregions and partner agencies. Many of the projects featured below stem from the risk-based assessments and are key to advancing regional resilience.

In a typical year, the NJTPA considers more than 300 project proposals eligible for funding in the TIP. Given limited resources, NJTPA has developed a prioritization procedure consisting of the following two steps:

1. Application of Project Prioritization Criteria – During development of the Project Development Work Program, projects are evaluated and scored based on technical measures of how well they fulfill the goals of the Long Range Transportation Plan (LRTP). Scores are based on Project Prioritization Criteria (see below) and all eligible projects are ranked according to their scores.
2. Application of Additional Priority Factors – Factors such as the feasibility of project delivery, funding availability, and project timing also are taken into account. This evaluation involves consultation and negotiation among MPO staff, municipal staff and elected officials, NJDOT, and local transit agencies.

NJTPA's current Long Range Transportation Plan (LRTP) is guided by six policy goals, one of which is to "Maintain a safe, secure and reliable transportation system in a state of good repair." It is the stated intent of the LRTP to translate these goals into specific actions, programs, and projects. The NJTPA staff administers the project prioritization process with participation by implementing agencies, the Regional Transportation Advisory Committee, and the Project Prioritization Committee of NJTPA's Board of Trustees. Project scores resulting from the process are considered during the development of the Capital Construction Program, which is the basis for development of the TIP.[73]

NJTPA includes environmental risk-based factors in the project prioritization scoring process. In addition, the NJTPA's Project Prioritization Scoring Process Technical Advisory Committee

[73] FHWA. Case Study: Project Prioritization Process | FHWA (dot.gov)

(TAC) is currently undergoing a project prioritization scoring process update. Through this update process, the agency can consider additional ideas like mapping or additional data to add to the scoring process.

As shown by the variety of projects in this section, as well as the initiatives and planning work (such as the RBD projects) described above, this region is adept at utilizing both hard infrastructure and green infrastructure to combat the impacts of climate change. Incorporating green infrastructure into projects is a key priority for the NJTPA and its subregions as can be seen in the agency's work, including studies such as the Green Stormwater Infrastructure Element of the Passaic County Master Plan (June 2018) and the Green Infrastructure Workshop held in February 2019. This workshop included sessions on green infrastructure as a resilient management tool as well as green infrastructure in transportation projects in New Jersey (Hoboken, Newark and the New Jersey Meadowlands) and in neighboring states (New York and Pennsylvania).

Moreover, the NJTPA's project prioritization process makes note of whether a project includes green infrastructure. The NJTPA's project prioritization criteria for local highway and local bridge projects includes Local Highway and Bridge Criterion (Environment) #4: "Does it improve the management of stormwater runoff?" for a maximum of 20 points. For a project to be rated "high," it would address "a problem area noted in the subregion's application or addresses issues in a Combined Sewer Overflow (CSO) area and includes best management practices (BMPs) in green infrastructure integrating techniques to manage runoff by integrating natural processes."[74]

The following NJDOT, NJ TRANSIT, Gateway Development Commission, PANYNJ, and county-level projects were prioritized for this RIP using a combination of the NJTPA's project prioritization criteria and climate hazards identified by risk-based assessments such as Resilient NENJ and other regional Resilient NJ risk-based assessments and state- and county-level HMPs which included future potential climate change impacts.

Table 1 below shows projects in the NJTPA's FY 2024-2027 TIP. Table 2 lists projects not in the TIP that would ideally be implemented within the next decade, pending funding.

[74] NJTPA. Transportation Improvement Program, FY 2024 – FY 2027. NJTPA_FINAL_FY2024-2027_TIP_1.pdf

Table One: RIP Prioritized Projects in NJTPA's FY 2024 – 2027 TIP

AGENCY	PROJECT TITLE /LOCATION	DESCRIPTION	CLIMATE HAZARDS ADDRESSED	ESTIMATED TOTAL PROJECT COST
NJDOT	Route 23, Bridge over Pequannock River / Hamburg Turnpike / Morris and Passaic Counties	Initiated by the Bridge Management System, this project will replace the bridge, built in 1934, and provide scour countermeasures to address this scour critical structure.	Flooding	$99.81 M
NJDOT	Route 82, Rahway River Bridge / Union County	Initiated by the Bridge Management System, this project will replace the structurally deficient and functionally obsolete bridge, built in 1872. The bridge also has flooding problems. The project will provide a 60' precast arch bridge with stone masonry facade. Flooding mitigation is inherent in the structural alternative, which will result in decreased flood levels and arch barrel clogging at the structure. In terms of community and environment, the historic and architectural features are fully preserved.	Flooding	$13.51 M
NJDOT	Route 166, Bridges over Branch of Toms River / Ocean County	Initiated by the Bridge Management System, this project will replace the structurally deficient bridges, built in 1928. Addressing scour critical issues, and sidewalk and ADA improvements are included. The following federal appropriations were repurposed to this project: DEMO ID# NJ 150, 184, & 075	Flooding	$32.6 M
NJDOT	Route 29, Alexauken Creek Road to	Initiated from the Pavement Management System, this project will reconstruct (including cold-in-place recycling) and resurface within the project limits. The project will be Mill X Pave X +1, and	Flooding	$19.03 M

AGENCY	PROJECT TITLE /LOCATION	DESCRIPTION	CLIMATE HAZARDS ADDRESSED	ESTIMATED TOTAL PROJECT COST
	Washington Street / Hunterdon County	will include drainage improvements to eliminate roadway, shoulder, and border ponding. The following federal appropriation was repurposed to this project: DEMO ID# NJ 161.		
NJDOT	Route 34, CR 537 to Washington Ave., Pavement / Monmouth and Middlesex Counties	Initiated from the Pavement Management System, one element of this project will provide a full depth pavement reconstruction, and address guiderails and drainage issues. The project scope will include; roadside work to restore the berm areas back to umbrella sections, earthwork to re-establish eroding slopes behind the guiderails, upgrading of guiderails, repairing damaged drainage and outfall structures, and upgrading traffic signals.	Flooding	$147.54 M
NJDOT	Route 35, Osborne Avenue to Manasquan River & Old Bridge Road to Route 34 & Route 70 / Ocean County	Initiated from the Pavement Management System, this project will reconstruct the pavement and address drainage issues within the project limits. ADA improvements will be included.	Flooding	$33.4 M
NJDOT	Route 37 On Ramp to Route 35, Missing Move / Ocean County	This project will be at the entrance to Route 35 Seaside Park from Route 37. The Route 35/Route 37 interchange is the major southern entrance to the Barnegat Bay barrier island. Vehicles entering the island and travelling south to Seaside Park, Berkeley Township and Island Beach State Park enter the island utilizing Route 37 eastbound to route 35 southbound. Currently this movement consists of making a tight double horizontal curve in the shape of an	Flooding	$9.25 M

AGENCY	PROJECT TITLE /LOCATION	DESCRIPTION	CLIMATE HAZARDS ADDRESSED	ESTIMATED TOTAL PROJECT COST
		"S". The geometric concerns associated with the S-Curve were identified during the development of the original (Pre-Sandy) project. The preferred solution was to replace the S-Curve with a smooth single curve. The S-Curve wraps around three blocks of residential properties. The straightening of the S-Curve required taking three properties in full and one partially.		
NJDOT	Route 10, Hillside Ave (CR 619) to Mt. Pleasant Tpk (CR 665) / Morris County	Initiated by the Pavement Management System, This project consists of reconstructing, milling and overlaying existing pavement, rehabilitating the deteriorated concrete, minimizing scour downstream at Indian Brook culvert and intersection modifications to improve traffic flow.	Flooding	$31.49 M
NJDOT	Kapkowski Road - North Avenue East Improvement Project / Union County	This project involves the traffic signal and roadway improvements to five existing antiquated signalized intersections to current MUTCD standards in the City of Elizabeth. The intersections include the following locations: North Avenue East / Dowd Avenue / Division Street; Intersection; Veterans Memorial Drive / Trumbull Street / Third Street Intersection; Division Street / Trumbull Street Intersection, and Underpass Road Lowering; Trumbull Street / Dowd Avenue Intersection; and North Avenue East / Kapkowski Road Intersection. This project is to improve visibility of motorists, reposition traffic and pedestrian signals to more appropriate	Flooding	$17.31 M

AGENCY	PROJECT TITLE /LOCATION	DESCRIPTION	CLIMATE HAZARDS ADDRESSED	ESTIMATED TOTAL PROJECT COST
		locations by installing new traffic signal poles and mast arms, installing video detection and CCTV on the mast arms, upgrade pedestrian signals to count down type push button activation, upgrade the signals to Light Emitting Diodes (LED), replace the existing traffic signal controllers and cabinets, install public sidewalk curb ramps with detectable warning surfaces where possible, add mast-arm mounted LED street name signs, replace the existing regulatory signs with signs conforming to the MUTCD Manual, improve drainage, curbing, sidewalks, roadway subbase, repaving, and restripe the crosswalks, stop bars and roadway center lines. The project also includes the lowering of the roadway under the Central Railroad bridge at the Division Street / Trumbull Street intersection to allow for a 14'-6" clearance. The current clearance is 12'-6". The improved clearance will eliminate a bottleneck and allow trucks to safely navigate this important area and avoid detours into residential neighborhoods. The underpass has a history of being struck by trucks.		
NJDOT	Route 80, Riverview Drive (CR 640) to Polify Road (CR 55) / Passaic and Bergen Counties	This project will reconstruct 9 miles of I-80 Westbound pavement & structures from milepost 56.4 to 65.4 in Passaic County (Woodland Park Borough and the City of Paterson) and in Bergen County (Elmwood Park Borough, Saddle Brook Township, Lodi Borough and the City of	Flooding	$953.5 M

AGENCY	PROJECT TITLE /LOCATION	DESCRIPTION	CLIMATE HAZARDS ADDRESSED	ESTIMATED TOTAL PROJECT COST
		Hackensack). In addition, there will be a widening of Rt 80 in the WB direction from MP 58.9 to 60.5. The purpose of this project is to improve safety and operation of I-80 Westbound within the project limits. The need for this project is due to the high crash rate, traffic congestion, substandard design elements, and structural deficiencies. Several bridge decks, superstructures, and complete bridges need to be replaced due to their poor condition ratings, scour critical nature, historical analysis, and life cycle cost analysis.		
NJDOT	Carteret Ferry Service Terminal / Middlesex County	The project will provide direct passenger ferry service to New York City. The total project cost will be covered by multiple funding sources. This project consists of waterside and upland improvements including the construction of bulkheads and floating docks, a parking area, landscaping, lighting, a pedestrian boardwalk, ramp access, and all necessary dredging. The upland work of this project includes construction of a parking lot with approximately 696 parking spaces; inlets, HDPE, and RCP, which will be installed throughout the parking lot to capture stormwater runoff; and porous pavement with underdrains will treat the water prior to being discharged through the outlet	Flooding	$46.63 M

AGENCY	PROJECT TITLE /LOCATION	DESCRIPTION	CLIMATE HAZARDS ADDRESSED	ESTIMATED TOTAL PROJECT COST
		structure. This phase includes site work grading, storm water management, lighting, and the installation of utility runs.		
NJDOT	Route 15 Corridor, Rockfall Mitigation, Contract B / Morris and Sussex Counties	This section of rock cuts includes the 2 highest-ranked cut slopes within the Rockfall Hazard Management System (RHMS) yet to be assigned for mitigation design; the group contains several other cut slopes ranked within the top 12%. The slopes exhibit many loose boulders and overhanging blocks, which, in conjunction with the limited catch areas, present the potential for falling material to impact the traveled roadway. In addition, within the last year, one location had a Rockfall event where a 20-ton boulder fell upon guiderail.	Precipitation and rock falls	$29.04 M
NJDOT	Route 23 and Route 94 Rockfall Mitigation, Hardyston Township / Sussex County	Rockfall mitigation measures are anticipated to include mass excavation, scaling, rock bolting, wire mesh drapes, and rock catch fences.	Precipitation and rock falls	$19.79 M
NJDOT	Route 29, Rockfall Mitigation, Kingwood Twp / Hunterdon County	Initiated by the Rockfall Hazard Management System, the project will provide rockfall mitigation within the project limits.	Precipitation and rock falls	$37.8 M
NJDOT	Route 29, Rockfall Mitigation, West Amwell & Lambertville / Hunterdon County	The slopes along this section of Rt. 29 contain many large blocks and boulders, which are intermingled with soil areas and historic rock block retaining structures; there is essentially no catch area along the NB shoulder; falling rock is	Precipitation and rock falls	$25.76 M

AGENCY	PROJECT TITLE /LOCATION	DESCRIPTION	CLIMATE HAZARDS ADDRESSED	ESTIMATED TOTAL PROJECT COST
		likely to impact the roadway, which has limited sight distance. This section contains the 4th highest ranked cut yet to be assigned for mitigation design. In addition, pavement conditions are poor and need to be assessed.		
NJDOT	Route 80, WB Rockfall Mitigation, Hardwick Township / Warren County	Initiated from the Rockfall Hazard Management System, this project will stabilize the existing rock outcrop area adjacent to I-80 Westbound at four locations within the project limits.	Precipitation and rock falls	$82.35 M
NJDOT	Route 15 Corridor, Rockfall Mitigation, Contract A / Morris and Sussex Counties	This section of rock cuts includes the 2 highest-ranked cut slopes within the Rockfall Hazard Management System (RHMS) yet to be assigned for mitigation design; the group contains several other cut slopes ranked within the top 12%. The slopes exhibit many loose boulders and overhanging blocks, which, in conjunction with the limited catch areas, present the potential for falling material to impact the traveled roadway. In addition, within the last year, one location had a Rockfall event where a 20-ton boulder fell upon guiderail.	Precipitation and rock falls	$12.85 M
NJDOT	Route 206 Rockfall Mitigation, Andover Township / Sussex County	Rockfall mitigation measures are anticipated to include mass excavation, scaling, rock bolting, wire mesh drapes, and rock catch fences.	Precipitation and rock falls	$14.57 M
NJDOT	Bridge Emergency Repair / Regionwide	This program allows the NJDOT to provide emergency bridge repairs through various Bridge Maintenance Contracts (i.e., Concrete Structural	Flooding and extreme temperatures	$340 M

AGENCY	PROJECT TITLE /LOCATION	DESCRIPTION	CLIMATE HAZARDS ADDRESSED	ESTIMATED TOTAL PROJECT COST
		Repair, Structural Steel Repair, and Timber Structure Repair contracts). The program also allows the NJDOT to obtain emergency technical consultant assistance, for inspection and repair design, when the safety of a bridge(s) is compromised due to unavoidable circumstances (a collision, flood damage, etc.) These consultants will be available to assist NJDOT personnel on an as-needed basis.		
NJDOT	Bridge Maintenance Scour Countermeasures / Regionwide	This is an ongoing program to proactively install scour countermeasures on the worst scour critical bridges. Scour countermeasures will protect bridges from storms and flooding events which can undermine their substructures.	Flooding	$34.52 M
NJDOT	Bridge Scour Countermeasures / Regionwide	This program provides funding for bridge scour countermeasure contracts, which provide critical protection to various bridge substructure elements, extending the life of state bridges which span waterways. These contracts will be awarded based on an approved list of bridges considering the availability and regional breakdown of funding.	Flooding	$800,000
NJDOT	Bridge Inspection / Regionwide	This program provides regular structural inspection of state highway, NJ Transit highway-carrying and local bridges as required by federal law. This program also enables the in-depth scour evaluation of potentially scour susceptible bridges. This program also provides regular inspection of state-owned tunnels.	Flooding and extreme temperatures	$134.32 M
NJDOT	Drainage Rehabilitation &	This program funds low-cost/high-value drainage projects on the state highway drainage system.	Flooding	$92 M

AGENCY	PROJECT TITLE /LOCATION	DESCRIPTION	CLIMATE HAZARDS ADDRESSED	ESTIMATED TOTAL PROJECT COST
	Improvements / Regionwide	The work performed through this program will be utilized to assess and track the location and condition of drainage pipes which includes corrugated metal pipes.		
NJDOT	Drainage Rehabilitation and Maintenance, State / Regionwide	This program provides funding for the rehabilitation and maintenance of state highway drainage systems, which may include: removal of material, video inspection, contract salary costs, retrofitting inlet covers due to Stormwater Management Regulations, acquisition and maintenance of specialized drainage equipment.	Flooding	$80 M
NJDOT	Storm Water Asset Management / Regionwide	This program maintains NJDOT compliance with USEPA water quality objectives and NJDEP storm water management regulations. It also ensures the state's infrastructure system is resilient under moderate to severe storm events. The Storm Water Asset Management plan evaluates and prioritizes needed repairs to storm water features, maintaining the integrity of the storm water system. The plan helps to minimize potential roadway flooding, and provides pollution prevention and abatement activities, which address stormwater management and control related to highway construction and/or due to highway runoff. The plan will identify all storm water features/assets owned or operated by NJDOT, assess conditions of the assets, develop plans for needed repairs to preserve the integrity of the assets, prioritize and conduct required repairs, and	Flooding	$15.34 M

AGENCY	PROJECT TITLE /LOCATION	DESCRIPTION	CLIMATE HAZARDS ADDRESSED	ESTIMATED TOTAL PROJECT COST
		perform inspections to ensure repairs are completed in accordance with approved plans.		
NJDOT	Betterments, Roadway Preservation / Regionwide	This is an ongoing program of minor improvements to the state highway system for miscellaneous maintenance repair contracts, repair parts, miscellaneous needs for emergent projects, handicap ramps, and drainage rehabilitation/maintenance.	Flooding and extreme temperatures	$72 M
NJDOT	Rockfall Mitigation / Regionwide	This program funds engineering services and construction of projects to reduce the potential of rockfall onto highways, preventing safety problems which could potentially cause personal injury and/or property damage. This program will also fund the maintaining of the Rockfall Hazard Mitigation System (RHMS), which evaluates all highway rock cuts and identifies potential rockfall issues. These activities will be performed utilizing both in-house and consultant engineering services.	Extreme temperatures and precipitation	$50 M
NJDOT	PROTECT / Regionwide	Establishes a program for Promoting, Resilient Operations for Transformative, Efficient, and Cost-saving Transportation (PROTECT). Activities encompass planning, resilience improvements, community resilience and evacuation routes, and at-risk coastal infrastructure.	Flooding and extreme temperatures	$52.74 M
Essex County	Delancy Street, Avenue I to Avenue P / Essex County	The Delancy Street corridor is 1.1 miles and connects freight railroad facilities, intermodal center and trucking and shipping outfits to Rt. 1&9 Portway and the airport/seaport support area. Currently the roadway is operating at an	Flooding	$17.51 M

AGENCY	PROJECT TITLE /LOCATION	DESCRIPTION	CLIMATE HAZARDS ADDRESSED	ESTIMATED TOTAL PROJECT COST
		unacceptable Level of Service during peak hours. It frequently floods, interrupting pedestrian and vehicular access to freight and business centers.		
Hudson County	Manhattan Avenue Retaining Wall / Hudson County	The Manhattan Avenue Retaining walls were built between 1912 and 1914. The walls, located at JFK Blvd East, River Rd, Manhattan Ave and Paterson Plank Rd, were constructed to protect Manhattan Avenue and stabilize the Palisades Cliffs and range to a height of 42 feet. In 2007, after a heavy rainstorm a 200 ft. section of the wall collapsed and fell onto Manhattan Avenue closing the entire roadway for a period of 10 days. The LCD study revealed that the retaining walls are in overall poor condition. There are vertical cracks, loose stones, inadequate drainage, clogged weepholes and large hollow sounding areas. The purpose of this project will be to reinforce and modernize the walls to improve safety, stabilize the rock cliffs behind the walls to prevent rockslides and slope failures and improve drainage.	Precipitation and rock falls	$51.5 M
Union County	Elizabeth Intermodal Transportation Infrastructure Planning Project / Union County	This planning study will examine, identify, and assess the feasibility of construction of a ferry terminal and incorporation of a ferry service from Elizabeth to Manhattan. It will explore viable service locations at the municipality's waterfront, required infrastructure and supportive services, as well as transportation alternatives to promote energy efficiency and effectiveness, such as through the use of an electric ferry. The total project cost is $5 million, which is funded with a	Flooding	

AGENCY	PROJECT TITLE /LOCATION	DESCRIPTION	CLIMATE HAZARDS ADDRESSED	ESTIMATED TOTAL PROJECT COST
		federal discretionary grant awarded from the FY 2022 US Department of Transportation RAISE Program. Inclusion of this Planning Project in the NJTPA TIP is a requirement of the FTA to complete the funding authorization process for the City of Elizabeth. The scope of work includes the exploration and development of a system, which reduces commuter travel time, alleviates road congestion, attracts tourists into the municipality, creates jobs within the City of Elizabeth, and provides residents with alternative affordable transportation to New York City, increasing access and the ability to compete for higher paid positions. Furthermore, this project will provide support and resiliency to current legacy transportation options, which rely on aged infrastructure and are increasingly vulnerable to climate change.		
Gateway Development Commission (GDC)	Hudson Tunnel Project / Hudson County	The Gateway Development Commission (GDC) in partnership with the States of New York and New Jersey, and the National Railroad Passenger Corporation (Amtrak), proposes the construction of the Hudson Tunnel Project (HTP). The project consists of three elements: (1) construction of a new, two-track Hudson River Tunnel parallel to the south side of the Northeast Corridor between the Bergen Palisades in New Jersey, terminating west of Penn Station New York in Manhattan; (2) construction of Hudson Yards Concrete Casing	Flooding	$47.3 M

AGENCY	PROJECT TITLE /LOCATION	DESCRIPTION	CLIMATE HAZARDS ADDRESSED	ESTIMATED TOTAL PROJECT COST
		(HYCC) Section 3 Emergency Services Building (ESB) Utility Relocation Early Work, a third and final rail right-of-way preservation project in Manhattan, New York; and (3) the rehabilitation of the North River Tunnel which opened in 1910 and sustained damage during Superstorm Sandy. The project is part of the Northeast Corridor Gateway Program, a series of strategic rail infrastructure investments designed to improve current service and create new capacity.		
NJ TRANSIT	Rail Support Facilities and Equipment / Regionwide	This program provides funds for rehabilitation and construction activities for yard improvements systemwide, improvements at support facilities necessary to perform maintenance work at rail yards, rail capacity improvements including passing sidings, interlockings and electric traction improvements, signal and communication improvements at support facilities, right-of-way fencing, maintenance-of-way equipment and the installation of pedestal tracks necessary to perform maintenance work at rail yards. Also included is funding for NJ TRANSIT's capital cost-sharing obligations related to use of Amtrak/Conrail facilities including but not limited to acquisition of properties and any items or services needed to support the acquisition. FY24 includes funding for SANDY – Long Slip Fill and Rail Enhancement resilience project in response to Superstorm	Severe storms/weather events, flooding	$321.83 M

AGENCY	PROJECT TITLE /LOCATION	DESCRIPTION	CLIMATE HAZARDS ADDRESSED	ESTIMATED TOTAL PROJECT COST
		Sandy.		
NJ TRANSIT	Miscellaneous / Regionwide	Funding is provided for the continuation of the mandated vital records program and other miscellaneous administrative expenses such as, but not limited to, match funds for special services grants and physical plant improvements incurred throughout the year. Funds support forensic accounting services in furtherance of the property insurance claim resulting from the damage caused by extreme weather events such as Superstorm Sandy. Funds also support project oversight/management for all day-to-day aspects of NJ TRANSIT projects.	Severe storms/weather events, flooding	$3.5 M

Table Two: RIP Prioritized Projects Not in NJTPA's FY 2024 – 2027 TIP

AGENCY	PROJECT TITLE /LOCATION	DESCRIPTION	CLIMATE HAZARDS ADDRESSED	ESTIMATED TOTAL PROJECT COST
PANYNJ	Climate resilience measures at Elizabeth Port Authority Marine Terminal / Essex County	The Climate Risk Assessment prioritized coastal flooding, stormwater flooding, and heat resilience measures at Elizabeth Port Authority Marine Terminal. The measures enhance the resilience of at-risk critical assets including roadways, electrical infrastructure, and buildings.	Flooding and heat	N/A

AGENCY	PROJECT TITLE /LOCATION	DESCRIPTION	CLIMATE HAZARDS ADDRESSED	ESTIMATED TOTAL PROJECT COST
PANYNJ	Climate resilience measures at George Washington Bridge (GWB) / Bergen County	The Climate Risk Assessment prioritized stormwater flooding and heat resilience measures at the GWB. The GWB is the busiest bridge in the world, on average supporting about 100 million vehicles per year and hundreds of thousands of bicycle and pedestrian trips, underscoring the importance for resilience of this regional link.	Stormwater flooding and heat	N/A
PANYNJ	Climate resilience measures at Goethals Bridge / Union County	The Climate Risk Assessment prioritized coastal resilience measures at Goethals Bridge. The maintenance and administrative buildings were inundated during Hurricane Sandy and are projected to be subject to future coastal storms. A prioritized coastal resilience measure includes flood protection of the Goethals Bridge maintenance and administrative buildings to protect equipment servicing the bridge, upgrades of a generator that supports these buildings, and elevation of the generator on a platform to support continued use of the buildings' equipment and operations in the event of a power outage during a coastal flood.	Coastal flooding	N/A
PANYNJ	Climate resilience measures at Holland Tunnel / Hudson County	The Climate Risk Assessment prioritized coastal flooding, stormwater flooding, and heat resilience measures at the Holland Tunnel. These measures supplement the extensive post-Hurricane Sandy flood protection measures at the Holland Tunnel. To address existing chronic stormwater risk, a prioritized resilience measure includes	Coastal flooding, stormwater flooding, and heat	N/A

AGENCY	PROJECT TITLE /LOCATION	DESCRIPTION	CLIMATE HAZARDS ADDRESSED	ESTIMATED TOTAL PROJECT COST
		stormwater drainage and site improvements at the Holland Tunnel New Jersey Land Ventilation Building, which involves stabilizing the site surrounding the building and installing a pre-engineered subsurface stormwater storage system.		
PANYNJ	Climate resilience measures at Lincoln Tunnel / Hudson County	The Climate Risk Assessment prioritized coastal flooding, precipitation, stormwater flooding, and heat resilience measures at the Lincoln Tunnel. The measures enhance the resilience of at-risk critical assets and systems including roadways and ventilation buildings.	Coastal flooding, precipitation, stormwater flooding, and heat	N/A
PANYNJ	Climate resilience measures at PATH / Hudson County and Systemwide	The Climate Risk Assessment prioritized coastal flooding, stormwater flooding, and heat resilience measures across the PATH system. These measures address residual climate risks in the system, after considering the extensive post-Hurricane Sandy flood protection measures at PATH stations. A near-term priority stormwater flood resilience measure includes track drainage improvements adjacent to the Journal Square eastbound platform through an aerial pressurized drainpipe along the rock wall.	Coastal flooding, stormwater flooding, and heat	N/A
PANYNJ	Climate resilience measures at Port Jersey Marine	The Climate Risk Assessment prioritized coastal and stormwater flooding resilience measures at Port Jersey Marine Terminal. The measures	Coastal and stormwater flooding	N/A

AGENCY	PROJECT TITLE /LOCATION	DESCRIPTION	CLIMATE HAZARDS ADDRESSED	ESTIMATED TOTAL PROJECT COST
	Terminal / Hudson County	enhance the resilience of at-risk critical assets including roadways and electrical infrastructure.		
PANYNJ	Climate resilience measures at Port Newark / Essex County	The Climate Risk Assessment prioritized coastal flooding, stormwater flooding, and heat resilience measures at Port Newark. The measures enhance the resilience of at-risk critical assets including roadways, electrical infrastructure, and buildings.	Coastal flooding, stormwater flooding, and heat	N/A
PANYNJ	Lincoln Tunnel Rock Slope Stabilization Project / Hudson County	The project is to manage rock falls along the slopes including with the use of nature-based solutions, to mitigate a major safety hazard to the Lincoln Tunnel roadway. An addition of mesh netting and vegetation replantings along the rock slopes would improve safety and reduce runoff.	Precipitation and rock falls	N/A
NJ TRANSIT	Peckman River Bridge Reconstruction / Essex and Passaic Counties	NJ TRANSIT's Peckman River Bridge Reconstruction is a permanent long-term recovery measure designed to restore a critical capital asset that has sustained repetitive damage during major storm events, and to avoid or mitigate significant damage to NJT's infrastructure from other potential hazards. NJT will investigate design options to identify the most feasible, practical, and cost-effective method to remove Peckman Bridge from scour critical consideration. With the findings from the Hydraulic and Scour Analysis of the Peckman River System and the Engineering and Resiliency study of the bridge, NJT will develop conceptual alternatives that will look to	Flooding, severe storm, erosion/scour	$34.1 M

AGENCY	PROJECT TITLE /LOCATION	DESCRIPTION	CLIMATE HAZARDS ADDRESSED	ESTIMATED TOTAL PROJECT COST
		bring a long-term solution to the challenges the infrastructure faces. It is anticipated that the project will require substantial river training and hardening, both upstream and downstream, of the NJ TRANSIT Right-of-Way.		
NJ TRANSIT	Hoboken Finger Pier #1 Substructure Repairs / Hudson County	The Hoboken Finger Pier #1 Substructure and Superstructure Repairs Project is needed to maintain structural integrity of the Ferry Terminal Building, which is a registered State Historic Building. The project will rebuild Finger Pier #1 to be flood resilient, upgrade substructures, and restore historic elements of the asset.	Flooding, severe storm, erosion/scour	$55 M
NJ TRANSIT	NJ TRANSIT 2025-2030 Resiliency Capital Planning / Regionwide	As a part of the 2025-2030 Capital Plan, NJ TRANSIT will be developing a number of resiliency investment strategies to address major projected resiliency challenges the agency expects to face. Included in this effort can be the following activities: system-and facility-based climate impact assessments; resiliency studies; the creation of capital investment plans for resiliency improvements; project development activities for resiliency improvements proposed through climate impact assessments; stakeholder engagement activities; and other related activities.	Extreme heat events, rising temperatures, sea level rise, storm surge, erosion/ land subsidence, marsh migration/ecosystem shifts, severe storms/weather events, flooding, stormwater runoff, wildfire, saltwater moving inland	$800,000

AGENCY	PROJECT TITLE /LOCATION	DESCRIPTION	CLIMATE HAZARDS ADDRESSED	ESTIMATED TOTAL PROJECT COST
NJ TRANSIT	Hoboken Terminal and Yard Resiliency Master Planning / Regionwide	Hoboken Terminal is one of NJ TRANSIT's major transportation hubs, and is the terminus for NJ TRANSIT's Pascack Valley, Main/ Bergen, and Gladstone Branch lines. There is also a variety of rail infrastructure at or near the terminal site that assists with daily operations. Hoboken Terminal is situated on a low-lying area immediately adjacent to the Hudson River, making it susceptible to both periodic nuisance flooding as well as more intense flooding associated with extreme events. The existing terminal layout and aged conditions make flood prevention measures extremely challenging. The Hoboken Terminal and Yard Resilient Redevelopment Project will be a four-phased approach to address many of the state of good repair and resiliency challenges that the Terminal faces. This scope of work aims to produce a Master Plan that includes concepts, design alternatives, and offer a roadmap to implementation.	Extreme heat events, rising temperatures, sea level rise, storm surge, erosion/ land subsidence, marsh migration/ecosystem shifts, severe storms/weather events, flooding, stormwater runoff, wildfire, saltwater moving inland	$10 M
NJ TRANSIT	Secaucus-Meadowlands Transitway / Regionwide	This project will create dedicated surface transit infrastructure for NJ TRANSIT that would allow the agency to provide high capacity services after a special event or major disruption that may impact the existing rail network. NJ TRANSIT will explore opportunities to ensure this project's infrastructure incorporates rapid recovery as a major project requirement to allow for easy east-	Severe storms/weather events, flooding, erosion/scour	N/A

AGENCY	PROJECT TITLE /LOCATION	DESCRIPTION	CLIMATE HAZARDS ADDRESSED	ESTIMATED TOTAL PROJECT COST
		west movements between critical communities that may be impacted by major disruptions.		
NJ TRANSIT	Rail ROW Vegetation Pilot Design and Planning / Regionwide	The project's goal is to develop "green infrastructure and vegetation conversion" concepts for sites along NJ TRANSIT's commuter rail system to improve the system's reliability, ecological impacts, maintenance requirements, and site access.	Extreme heat, severe storms/weather events, flooding, erosion/scour, stormwater runoff, saltwater moving inland, marsh migration and ecosystem shifts	$5 M
NJ TRANSIT	Northern Region Phase 1 Resiliency Project Planning / Regionwide	The project's goal is to develop standards and specifications for a resilient light rail and commuter rail network and to develop projects and programs to address infrastructure and facility upgrades necessary for future resiliency needs. The effort will create a detailed investment strategy for rail and light rail infrastructure in North Jersey to improve the overall transit network's resiliency and reliability, and will leverage the 2025-2030 Capital Planning efforts to create detailed projects and programs.	Extreme heat events, rising temperatures, sea level rise, storm surge, erosion/ land subsidence, marsh migration/ecosystem shifts, severe storms/weather events, flooding, stormwater runoff, wildfire,	$3.2 M

AGENCY	PROJECT TITLE /LOCATION	DESCRIPTION	CLIMATE HAZARDS ADDRESSED	ESTIMATED TOTAL PROJECT COST
			saltwater moving inland	
NJ TRANSIT	Bus Garage Resiliency Project Planning / Regionwide	This project will develop detailed investment strategies for bus garages across NJ TRANSIT's north bus region to improve the overall transit network's resiliency and reliability. It will establish best practices, standards, polices, and strategies for improving climate resilience of the bus network, as well as conduct resiliency impact analyses on the facilities and generate a list of high-risk locations. The project will develop high-level key resiliency strategies for each garage, with bus electrification plans factored in.	Extreme heat events, rising temperatures, sea level rise, storm surge, erosion/ land subsidence, marsh migration/ecosystem shifts, severe storms/weather events, flooding, stormwater runoff, wildfire, saltwater moving inland	$2.8 M
NJ TRANSIT	North Jersey Coast Line Resilience Project Planning and Design / Regionwide	This project will build upon findings from "Northern Region Phase 1 Resiliency Project Planning" and various climate impact assessments. The project will provide funds to design and implement projects proposed in the Assessment.	Extreme heat events, rising temperatures, sea level rise, storm surge, erosion/ land subsidence, marsh migration/ecosystem shifts, severe storms/weather events, flooding,	$2.53 M

AGENCY	PROJECT TITLE /LOCATION	DESCRIPTION	CLIMATE HAZARDS ADDRESSED	ESTIMATED TOTAL PROJECT COST
			stormwater runoff, wildfire, saltwater moving inland	
NJ TRANSIT	Light Rail System Resilience Project Planning and Design / Regionwide	This project will build upon findings from "Northern Region Phase 1 Resiliency Project Planning" and various climate impact assessments. The project will provide funds to design and implement projects proposed in the Assessment.	Extreme heat events, rising temperatures, sea level rise, storm surge, erosion/ land subsidence, marsh migration/ecosystem shifts, severe storms/weather events, flooding, stormwater runoff, wildfire, saltwater moving inland	$3.09 M
NJDEP	Resilient NJ Northeastern New Jersey Action Plan: A Roadmap to Resilience / Essex and Hudson Counties	This plan highlights projects including the installation of flood barriers, the raising of existing infrastructure, and the restoration of ecological resources to support the protection of infrastructure such as the New Jersey Turnpike, rail lines, and public roads near coastlines and shorelines. These projects are supported by the	Coastal flooding, stormwater flooding	N/A

AGENCY	PROJECT TITLE /LOCATION	DESCRIPTION	CLIMATE HAZARDS ADDRESSED	ESTIMATED TOTAL PROJECT COST
		risk-based Flood Impact Assessment and Climate Hazards Assessment.		
NJDEP	Resilient Long Beach Island Action Plan / Ocean County	This plan highlights installation of floodproofing, elevating, and improving stormwater management for critical resources like public evacuation routes, bridges, and other associated infrastructure. These projects are supported by the risk-based Flood Impact Assessment and Climate Hazards Assessment.	Coastal flooding, stormwater flooding, stormwater management	N/A
NJDEP	Resilient NJ: Protect, Restore, Transition - A Resilience Action Plan For The Raritan River And Bay Communities' Region / Middlesex County	This plan highlights installation of measures to reduce vulnerability to flooding such as flood barriers, raising of infrastructure, and the integration of stormwater management systems. These projects are supported by the risk-based Flood Impact Assessment and Additional Climate Hazards Assessment.	Coastal flooding, stormwater management, stormwater flooding	N/A

Next Steps

1) Resilience Improvement Plan: Next Steps

The NJTPA's *Plan 2050* includes the following strategies and actions consistent with the RIP:

- Support partner agencies and subregions in efforts to review and revise operations to reflect both current and projected climate impacts.[75]
- Fund studies to address the vulnerability of transportation infrastructure to climate change, such as the 2019 *Passaic River Basin Climate Resilience Planning Study*.[76]
- Upgrade the reliability of existing bus and rail transit services including through improved maintenance facilities, timely replacement of old vehicles, resiliency measures, expanded capacity, and other improvements.[77]
- Encourage the planning and use of green infrastructure measures in complete street and resiliency initiatives to slow and better manage stormwater runoff that can overwhelm sewer systems and contaminate waterways and drinking water.[78]

With this in mind, the next step for the RIP is its amendment into the LRTP, *Plan 2050*. After its incorporation into *Plan 2050*, the RIP is expected to be adopted into the NJTPA's subsequent LRTP. Federal requirements necessitate a regular four-year update period to ensure there is a "continuing, cooperative and comprehensive" planning process that provides "for the development of an integrated multimodal transportation system ... to facilitate the safe and efficient movement of people and goods in addressing current and future transportation demand."[79] The NJTPA Board is scheduled to adopt the LRTP in September 2025. Public engagement during the LRTP process will be ongoing from Fall 2024 to Spring 2025.

2) Next Steps for Regional Resilience Planning

The RIP is neither the start nor the end of resilience planning in the NJTPA region. In addition to the RIP adoption, regional resilience planning efforts described above will continue to develop. Some of the numerous efforts underway or soon to be initiated include:

- Resilient NJ planning is ongoing, as noted above for Montclair Township and the Town of Harrison. As stated on Resilient NJ's website, "The program will be undertaking climate change-related hazard vulnerability assessments (CCHRVA), per the State's Municipal Land Use Law (MLUL) and municipal resilience action plans (MRAPs).

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[75] NJTPA. NJTPA Long Range Transportation Plan 2050. November 2021. p. 87. https://www.njtpa.org/NJTPA/media/Documents/Planning/Plans-Guidance/Planning%20for%202050/final%20pdfs/njtpa_plan2050_final2.pdf?ext=.pdf
[76] Ibid., p. 88.
[77] Ibid., p. 67.
[78] Ibid., p. 93.
[79] FHWA. The Transportation Planning Process Briefing Book: Key Issues for Transportation Decisionmakers, Officials, and Staff: A Publication of the Transportation Planning Capacity Building Program. FHWA-HEP-18-005. n.d. https://www.fhwa.dot.gov/planning/publications/briefing_book/

Projects within the MAP program are conducted using a thorough and equitable engagement process to result in municipal resilience action plans to be used by local governments to advance resilience projects in their communities."[80]

- The PANYNJ's CRA, preparation for which began in 2021, is ongoing. Priority resilience projects identified through the CRA are being considered for investment within the Authority's current or future 10-year Capital Plan cycles. It is anticipated that the CRA initiative will transition from identifying current and future climate-related needs to investing strategically and proactively in resilience measures across PANYNJ facilities.
- Bergen County is currently working on a Bergen County Energy Action Plan that highlights renewable energy, energy efficiency planning, emissions reductions, electric vehicle (EV) charging infrastructure planning, and sustainability.
- Ocean County is updating its Multi-Jurisdictional Hazard Mitigation Plan, which is anticipated in 2025.

[80] NJDEP. Resilient NJ. NJDEP | Resilient NJ | Planning Projects. https://www.nj.gov/dep/bcrp/resilientnj/project.html.