How to Read *Resilient Rhody 2025*

Resilient Rhody 2025 is organized into a Plan Summary and nine supporting chapters.

The Plan Summary provides an accessible overview of key takeaways, while each chapter offers a more detailed explanation of the methodology, engagement approach, and findings. These chapters also include practical resources for practitioners. The following pages present examples of the types of content featured in each chapter.



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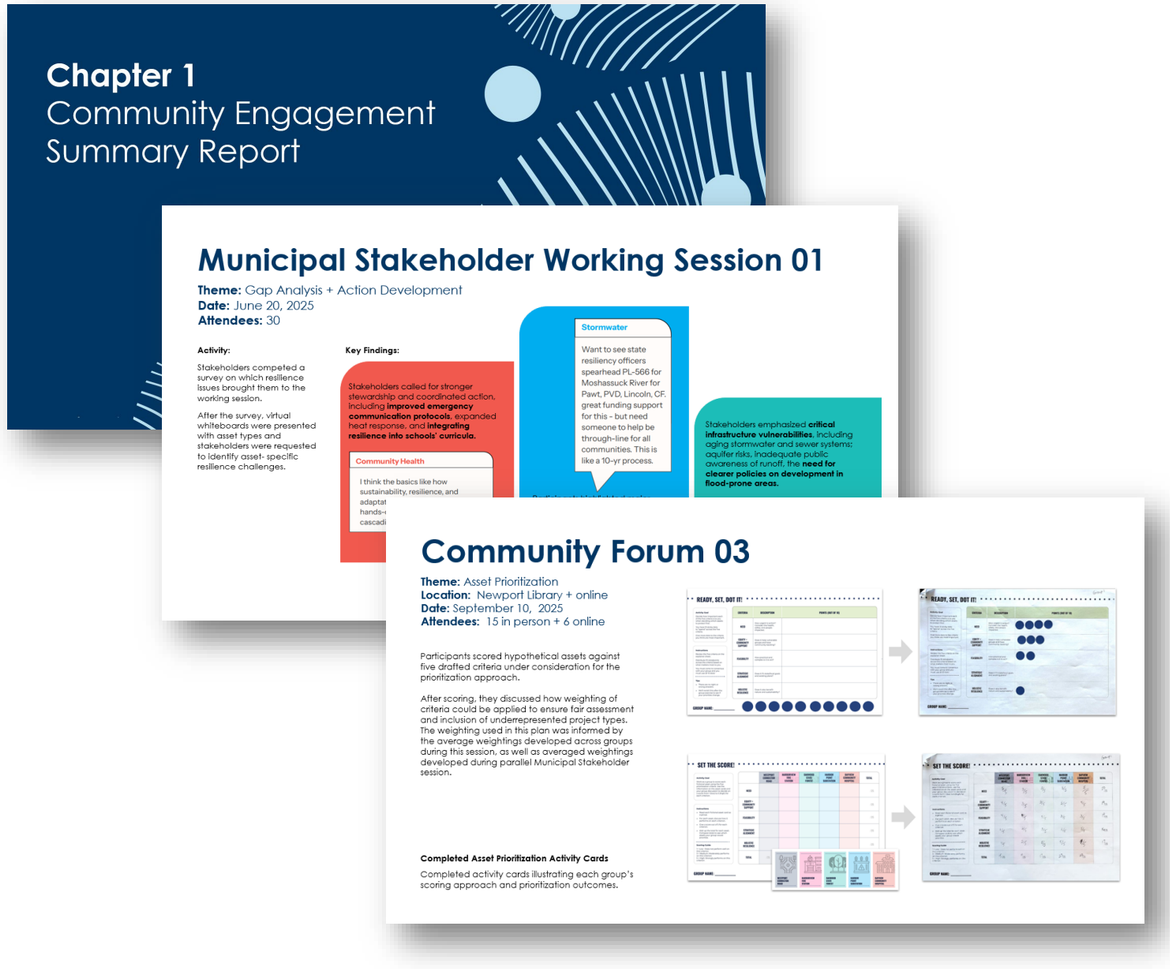
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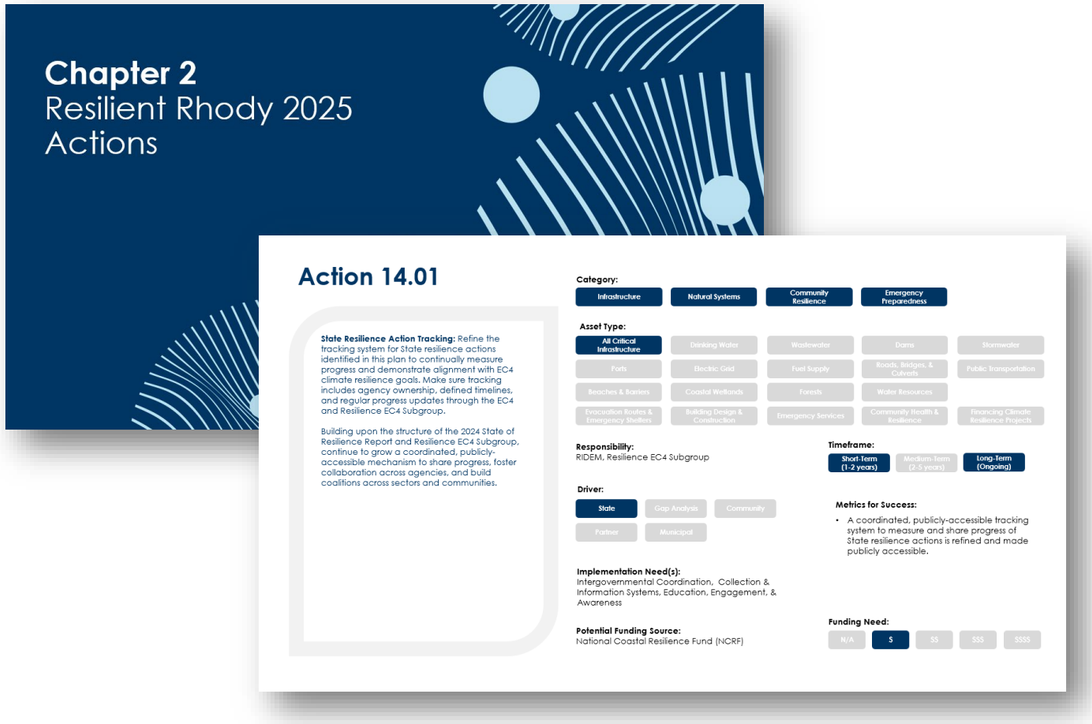
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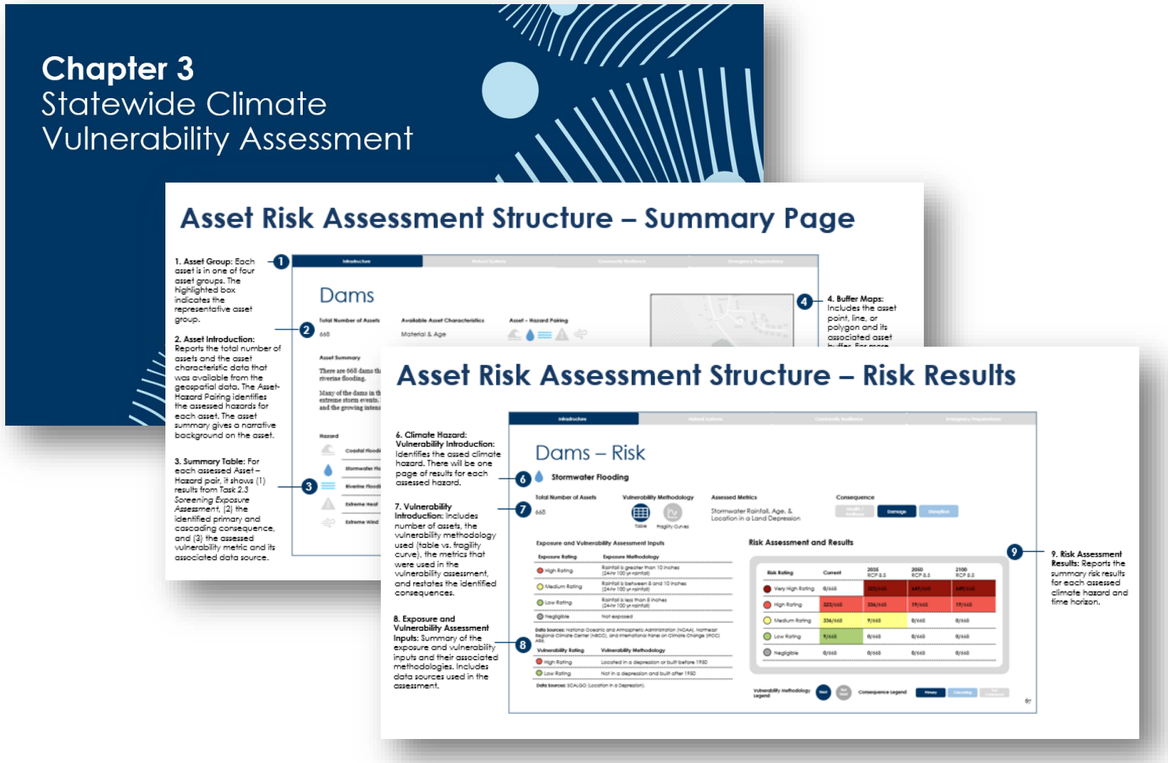
Chapter 1: Community Engagement Summary Report

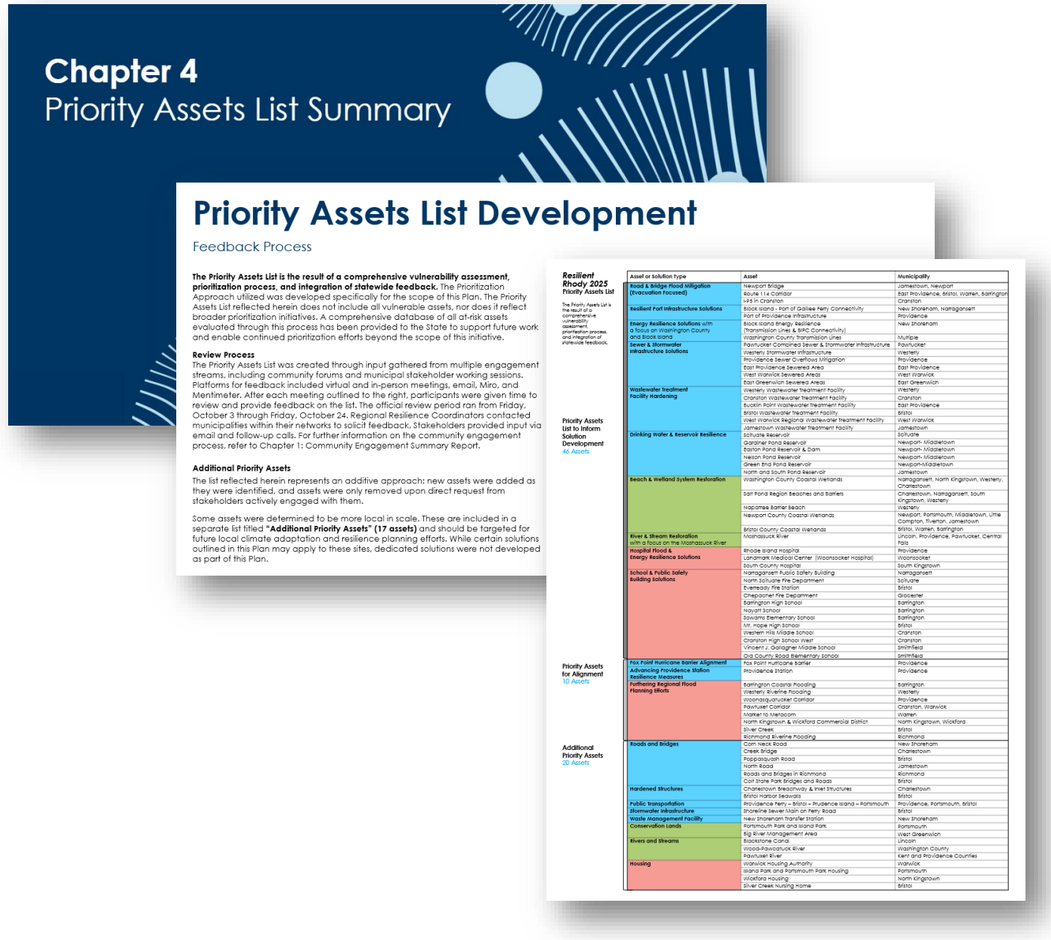
Chapter 1 provides an overview of the four community forums, six municipal stakeholder meetings, and the Health Equity Zone Frontline Community Forum conducted throughout the Plan's development. The chapter details the theme, location, date, number of attendees, and activities for each session along with key takeaways and explanation of how those insights were incorporated into the Plan.

Chapter 2: Resilient Rhody 2025 Actions

Chapter 2 includes all 79 Resilient Rhody 2025 actions and establishes cross-agency goals for each asset type. Each action page summarizes the action, identifies the responsible agency(ies) or lead party(ies), outlines the primary driver(s), details implementation needs, lists potential funding sources and estimated amounts, and provides timeline and success metrics to move towards implementation.

Chapter Summaries





Chapter 3: Statewide Climate Vulnerability Assessment

Chapter 3 outlines the methodology and results for the Statewide Climate Vulnerability Assessment. The result pages identify asset-hazard risks across all assessed asset types and five hazards: coastal flooding, stormwater flooding, riverine flooding, extreme heat, and extreme wind. Asset-hazard pairs were assessed under current and future time horizons and two emissions scenarios, data permitting. The findings illustrate how risk is projected to change over time for each assessed pair.

Chapter 4: Priority Assets List Summary & List

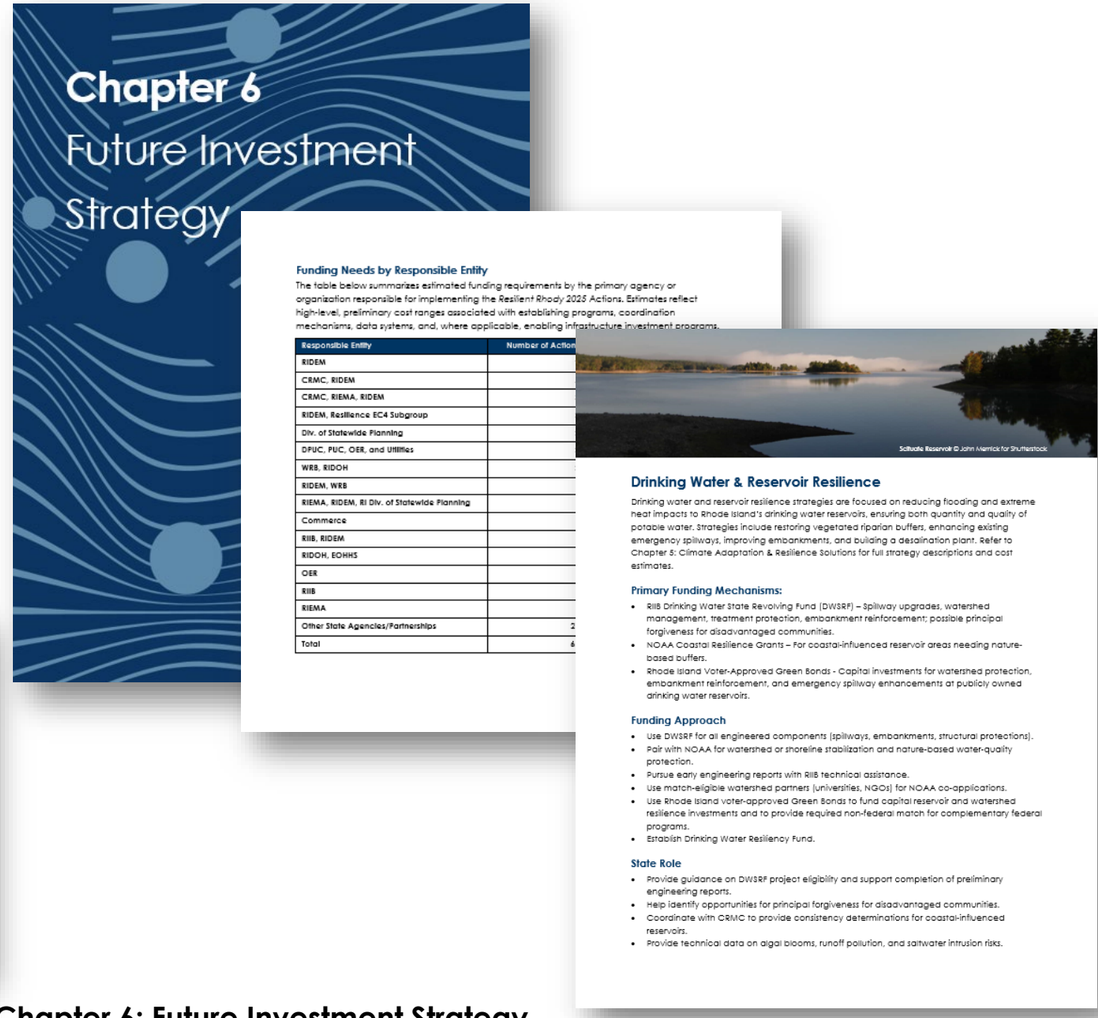
Chapter 4 includes all the priority assets that were identified through *Resilient Rhody 2025*'s prioritization process. The chapter provides more detail on the prioritization approach, which incorporated results from the statewide climate vulnerability assessment, development of weighted prioritization criteria, and integration of statewide feedback.

Chapter Summaries



Chapter 5: Climate Adaptation & Resilience Solutions

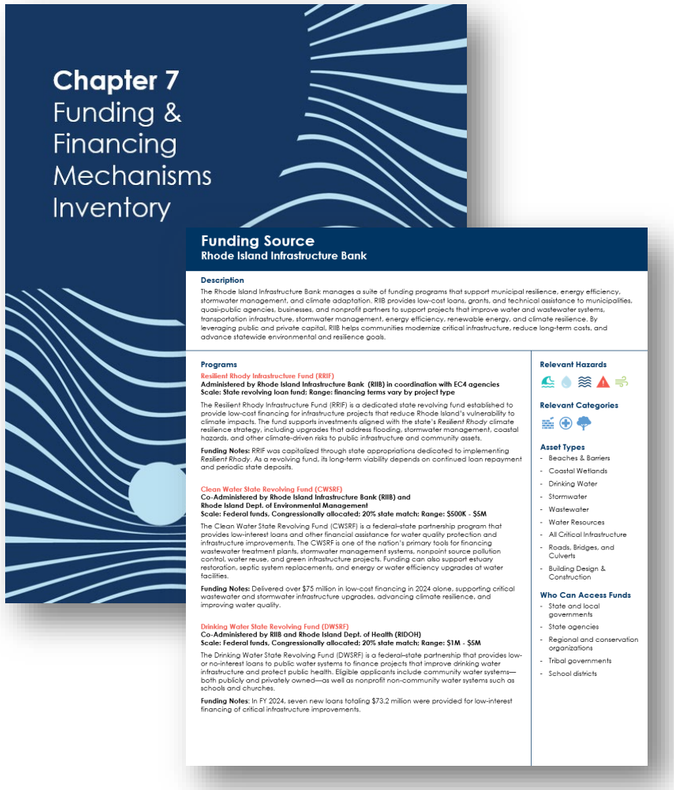
Chapter 5 presents climate adaptation and resilience solutions organized into ten asset-based solution typologies aligned with the State's priority assets. Each solution outlines the key strategies, implementation steps, cost estimates, and a funding approach to guide successful implementation.



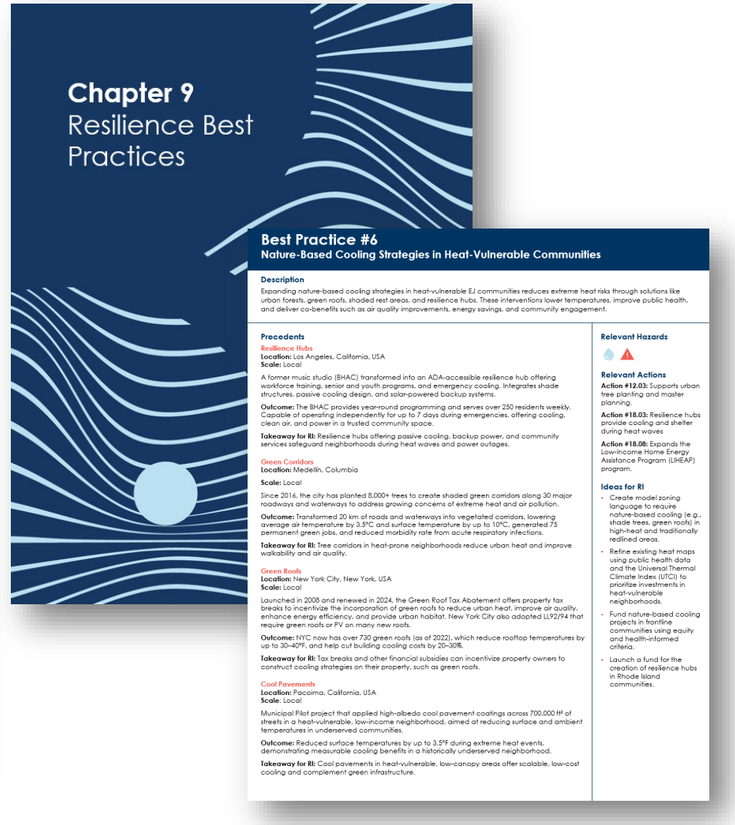
Chapter 6: Future Investment Strategy

Chapter 6 provides a framework for identifying and securing funding to implement both the *Resilient Rhody 2025* Actions outlined in Chapter 2 and the Climate Adaptation & Resilience solutions detailed in Chapter 5. For the Actions, the chapter summarizes funding and implementation needs by responsible entity and asset type. For the Solutions, each includes potential funding mechanisms, the recommended funding approach, and the role the State should play in supporting implementation.

Chapter Summaries







Chapter 7: Funding & Financing Mechanisms Inventory

Chapter 7 provides an inventory of resilience funding and financing sources and mechanisms. Each funding source includes details on program administration, scale, and eligible activities. A side panel identifies relevant hazards, asset types, and eligible applicants.

Chapter 8: Prioritization Framework

Chapter 8 outlines both the Asset and Project Prioritization Frameworks. The Asset Prioritization Framework was used to identify and prioritize the assets included in this Plan and is intended to be replicated when assessing additional assets in the future. The Project Prioritization Framework is designed to guide the prioritization of projects once they have been identified.

Chapter 9: Resilience Best Practices

Chapter 9 presents 12 best practices for advancing climate resilience. Each best practice is supported by case studies demonstrating how it has been implemented. Relevant hazards, corresponding *Resilient Rhody 2025* Actions, and key takeaways for Rhode Island are highlighted for each best practice.

Assumptions and Qualifications

Data & Information

This report relies on information provided by others to determine current and future climate conditions for hazard and risk assessment and to develop resilience solutions. Arup does not accept responsibility for the content, including the accuracy and completeness, of such information. Arup emphasizes that the forward-looking projections, forecasts, or estimates, are based upon interpretations or assessments of available information at the time of this project.

Priority Assets, Resilience Strategies & Jurisdiction

The current and future natural hazard exposure and risk of any site is dependent on many factors beyond Arup's control, including uncertainties around existing project sites and their construction details, natural hazards, and climate change.

Any climate resilience strategy includes potential residual risks. The resilience solutions described in this report are not guaranteed nor intended to eliminate all climate risk but are intended to be a tool to reduce climate-related damage and/or disruption. Arup shall not be responsible for damages or impacts associated with the performance of the climate resilience systems.

The realization of the prospective risks is dependent upon the continued validity of the assumptions on which it is based. Actual events frequently do not occur as expected, and the differences may be material. For this reason, Arup bears no responsibility for the realization of any projection, forecast, opinion or estimate. Findings are time-sensitive and relevant only to current conditions at the time of writing.

This plan does not confirm the feasibility or effectiveness of the strategies outlined as they relate to the designated Priority Assets. It provides a framework of specific steps to advance the proposed solutions from initial identification through to potential implementation. All proposed strategies require comprehensive due diligence, stakeholder engagement, detailed planning, design, and costing for each strategy and location identified.

Actions and strategies outlined in this plan may fall under municipal rather than state jurisdiction. Therefore, successful implementation of these actions may require local participation and coordination.

Costing

Cost estimates for each solution type are categorized as Class 5 based on the Association for the Advancement of Cost Engineering International (AACEi) cost estimate classification matrix based on indicative scope and benchmark projects.

The accuracy range for these class 5 cost estimates are assumed to be +100% / -50%.

Benchmark projects are sourced from desktop research and Arup's internal database. Benchmark costs are normalized to Rhode Island cost basis using location factors from RS Means. Benchmark costs are escalated to 2025 cost basis using the Construction Cost Index (CCI) from Engineering News Record (ENR).

Scope assumptions are made based on benchmark projects, proposed scope to be included, and sized relative to other strategies considering possible size of potential future projects. Parametric costing (utilizing a defined quantity and unit rate) is employed where possible. Allowances are estimated to account for scope intended to be included in the project when sufficient detail or context for parametric costing was not available.

Costs for actual projects will vary based on a variety of factors including but not limited to defined extent of scope, project-specific risks, site constraints, environmental scope, construction delivery method, stakeholder engagement, funding mechanisms, existing asset operations and potential downtime, and/or market factors.

Funding

Funding sources were identified in Summer 2025 and represent a point in time assessment. This plan does not guarantee the availability, continuation, or applicability of these sources.

All funding sources should be verified for current availability and applicability before pursuing them.

Due to changing federal priorities in both policy and funding, agencies across state government have been facing challenges in program implementation. As these changes impact agency resources including the state budget, timelines and commitments will shift, as necessary.



Nag Marsh Sunset © Narragansett Bay National Estuarine Research Reserve (NBNERR)

Glossary of Acronyms

Federal Agencies and Programs
CDC: Centers for Disease Control
DOD: Department of Defense
- DCIP: Defense Community Infrastructure Program
- OLDCC: Office of Local Defense Community Cooperation

DOE: Department of Energy
- SEP: State Energy Program

DOT: Department of Transportation
- FHWA: Federal Highway Administration
- MARAD: Maritime Administration

EPA: Environmental Protection Agency
- SNEP: Southeast New England Program

FEMA: Federal Emergency Management Agency
- NFIP: National Flood Insurance Program
- FIRM: Flood Insurance Rate Map
- PAPPG: Public Assistance Program and Policy Guide

NOAA: National Oceanic & Atmospheric Administration
- CELCP: Coastal & Estuarine Land Conservation Plan

NPS: National Park Service
USACE: United States Army Corps of Engineers
USDA: United States Department of Agriculture
USFS: United States Forest Service
- NRCS: Natural Resources Conservation Service

USFWS: United States Fish & Wildlife Service
USGS: United States Geological Survey
- 3DEP: 3D Elevation Program

Federal Funding Sources
BRACE: Building Resilience Against Climate Effects
BRIC: Building Resilience in Communities Grant Program
CAP: Continuing Authorities Program
CDBG: Community Development Block Grant
CMAQ: Congestion Mitigation & Air Quality Improvement Program
CRSCI: Climate-Ready States & Cities Initiative
CSP: Conservation Stewardship Program
CZM: Coastal Zone Management Program & Grants
ELP: Environmental Literacy Program
EPMG: Emergency Management Performance Grant
EPSCoR: Established Program to Stimulate Competitive Research
EQIP: Environmental Quality Incentives Program
EWP: Emergency Watershed Protection Program
FMA: Flood Mitigation Assistance Grant Program
HPF: Historic Preservation Fund
IIJA: Bipartisan Infrastructure Law
IRA: Inflation Reduction Act
LIHEAP: US Department of Health and Human Services Low Income Energy Assistance Program
NBEP: Narragansett Bay Estuary Program
NCRF: National Coastal Resilience Fund
NCWCG: National Coastal Wetlands Conservation Grants
NDSP: National Dam Safety Program
NEP: National Estuary Program
NRCS: Natural Resources Conservation Service Incentives
PRO Housing Grant Program: Pathways to Removing Obstacles to Housing Grant Program
PROTECT: Promoting Resilient Operations for Transformative, Efficient, & Cost-saving Transportation Program
REAP: Rural Energy for America Program
REPI: Readiness & Environmental Protection Integration Program
RISG: Rhode Island Sea Grant Program
SOAR: SNEP Opportunity to Advance Resilience
SWIG: SNEP Watershed Implementation Grants
WFIA: Water Infrastructure Finance & Innovation Act
WCPP: Wildlife Crossings Pilot Program
WPDG: Wetland Program Development Grants

State Agencies and Programs
CRMC: Rhode Island Coastal Resources Management Council
- **CEHRTF:** Coastal & Estuarine Habitat Restoration Trust Fund

DBR: Rhode Island Department of Business Regulation
DHS: Rhode Island Department of Human Services
EC4: Rhode Island Executive Climate Change Coordinating Program
EOHHS: Rhode Island Executive Office of Health & Human Services
HEZ: Health Equity Zones
OER: Rhode Island Office of Energy Resources
- **SESP:** State Energy Security Plan

RIDE: Rhode Island Department of Education
- **CTE:** Career and Technical Education

IDEM: Rhode Island Department of Environmental Management
- **CRO:** Chief Resilience Officer
- **RISDISM:** Stormwater Management, Design, & Installation Rules

RIDLT: Rhode Island Department of Labor & Training
RIEMA: Rhode Island Emergency Management Agency
RIGIS: Rhode Island Geographic Information Systems
RIIB: Rhode Island Infrastructure Bank
- **SPA:** Stormwater Project Accelerator

RIDOH: Rhode Island Department of Health
- **RIWARN:** Rhode Island Water/Wastewater Agency Response Network

RIDOT: Rhode Island Department of Health
- **CIP:** RIDOT Capital Improvement Program

State Agencies and Programs
RIPDES: Rhode Island Pollution Discharge Elimination System
STIP: Statewide Transportation Improvement Program
IRA: Inflation Reduction Act
WRB: Water Resources Board

State Funding Sources
OER: Rhode Island Office of Energy Resources
- **REF:** Renewable Energy Fund
- **RGGI:** Regional Greenhouse Gas Initiative

RIDEM: Rhode Island Department of Environmental Management
- **CRF:** Rhode Island Climate Resilience Fund
- **OSCAR:** Ocean State Adaptation and Resilience
- **WWTFRF:** Wastewater Treatment Facility Resilience Fund

RIIB: Rhode Island Infrastructure Bank
- **C-PACE:** Commercial Property Assessed Clean Energy
- **CPAF:** Community Project Assistance Fund
- **CSSLP:** Community Septic System Loan Program
- **CWSRF:** Clean Water State Revolving Fund
- **DWSRF:** Drinking Water State Revolving Fund
- **EBF:** Efficient Building Fund
- **MIGP:** Municipal Infrastructure Grant Program
- **MRP:** Municipal Resilience Program
- **MRBRF:** Municipal Road & Bridge Revolving Loan Fund
- **RRIF:** Resilient Rhody Infrastructure Fund

Schools
CCRI: Community College of Rhode Island
RIC: Rhode Island College
RISD: Rhode Island School of Design
URI: University of Rhode Island

Data and Modeling Sources
ASCE: American Society of Civil Engineers
GDDP: NASA Earth Exchange Global Daily Downscaled Projections
HAZUS: Hazards United States
HEC-RAS: Hydrologic Engineering Center–River Analysis System
IPCC AR6: Intergovernmental Panel on Climate Change Sixth Assessment Report
MarshRAM: Statewide Coastal Rapid Assessment Method
NRCC: Northeast Regional Climate Center
RI-CHAMP: Rhode Island Coastal Hazards Modeling and Prediction
SVI: Social Vulnerability Index
SWMM: EPA Stormwater Management Model
UTCI: Universal Thermal Climate Index

Data and Modeling Sources (cont.)
URI EDC: University of Rhode Island Environmental Data Center
SewerGEMS: Sewer Geospatial Engineering Modeling System
SLAMM: Sea Level Affecting Marshes Model Maps

Other
AACEI: Association for the Advancement of Cost Engineering International
APA: American Planning Association
ARCCA: California Alliance of Regional Collaboratives for Climate Adaptation
BIPC: Block Island Power Center
CCO: University of Oregon Climate Change in Oregon Data Portal
CFROD: Boston Coastal Flood Resilience Overlay District
CIG: University of Washington Climate Impacts Group Data Hub
CRO: Norfolk Coastal Resilience Overlay Zone Update
CRRA: New York Community Risk and Resiliency Act
CSCI: The Climate Smart Communities Initiative
DEEP: Connecticut Department of Energy & Environmental Protection Climate Resilience Fund
DEP: New Jersey Department of Environmental Protection Blue Acres
EAP: Emergency Action Plan
ETAA: Illinois Energy Transition Assistance Act
FMPRA: California Floodplain Management, Protection, & Risk Awareness Grant Program
FTE: Full-Time Equivalent
GLISA: University of Michigan Great Lakes Integrated Sciences & Assessments
HEZ: Health Equity Zone
IBC: International Building Code
IBHS: Insurance Institute for Business & Home Safety
ISR: Infrastructure, Safety, and Reliability Filings
MVP: Massachusetts Municipal Vulnerability Preparedness Program
NCCF: North Carolina Coastal Federation
NCRF: National Coastal Resilience Fund
NEIWPCC: New England Interstate Water Pollution Control Commission*
NFWF: National Fish and Wildlife Foundation
NBC: Narragansett Bay Commission
NRDC: Natural Resources Defense Council
NYSARP: New York State Adaptation & Resilience Plan
PPL: Project Priority List
RIE: Rhode Island Energy
RMAT: Resilient Massachusetts Action Team Climate Resilience Design Standards Tool
SCV: Statewide Climate Vulnerability Assessment
SEA Streets: Street Edge Alternatives

Glossary of Technical Terms

Key Terms

Climate Resilience The capacity of individuals, institutions, businesses, and natural systems within Rhode Island to survive, adapt, and grow no matter what chronic stresses and weather events they experience. While the effects of climate change are felt across the state, these impacts are not equally distributed. Effective climate resilience requires a focus on environmental justice and equity to support local leadership for sustained interaction between community, business, and government.

Adaptive Capacity The ability of a community, agency, or system to adjust its practices and use its resources, including redundancies, to respond effectively to change.

Climate Mitigation Reducing emissions of heat-trapping greenhouse gases into the atmosphere.

Engineering Terms

BFE: Base Flood Elevation Water surface elevation resulting from the flood having a 1-percent chance of being equaled or exceeded in any given year.

CSO: Combined Sewer Overflows A sewer system that collects rainwater runoff, domestic sewage, and industrial wastewater into one pipe.

EUL: End of Useful Life The point at which an asset can no longer safely, effectively, or economically perform its intended function.

GSI: Green Stormwater Infrastructure Infrastructure that uses natural processes such as filtration, infiltration, and evapotranspiration to treat stormwater where it falls.

HRU: Hydrologic Response Unit Areas of common physical characteristics that are expected to respond to precipitation and weather events in a similar way.

I/I: Infiltration/Inflow Sources Sources of water other than domestic wastewater that enters sanitary sewer systems.

LIDAR: Light Detection and Ranging A remote sensing method that uses light in the form of a pulsed laser to measure ranges to the Earth and generate information about the Earth's shape and surface.

MHHW: Mean Higher High Water The average of the higher of the two daily tides observed over a 19-year period.

NbS: Nature-based Solutions Infrastructure projects that intentionally use natural and nature-based habitats and processes to reduce risks and deliver multiple benefits.

PER: Preliminary Engineering Report A technical planning document that assesses the viability, cost, and environmental impact of a proposed project before final design.

ROW: Right-of-Way A legal right granted to pass through or use another person's land for a specific purpose, such as transportation, utilities, or access to support essential infrastructure.

SCP: Stormwater Control Plan A regulated document outlining site-specific strategies and best management practices to control, treat, and minimize pollutants in stormwater runoff.

SLR: Sea Level Rise An increase in the total volume of ocean water over time, driven in part by melting glaciers and polar ice sheets.

SSO: Sanitary Sewer Overflow A release of untreated or partially treated sewage from a municipal sanitary sewer.

STU: Stormwater Treatment Unit Infrastructure that improves stormwater runoff quality, reduces runoff volume, and/or reduces runoff peak flow.

TMDL: Total Maximum Daily Load The maximum amount of a pollutant a waterbody can receive while still meeting water quality standards, along with the pollutant reduction targets assigned to its sources.

WWTF: Wastewater Treatment Facility Facilities that remove contaminants from sewage and wastewater.

Planning & Policy Terms

ADA: Americans with Disabilities Act A federal civil rights law that prohibits discrimination against people with disabilities.

CBO: Community-Based Organization A nonprofit that represents its community and provides educational or related services.

CBP3: Community-Based Public-Private Partnership A partnership between a local government and a private entity with the goal of providing cost-effective, high-quality services.

CCMP: Comprehensive Conservation and Management Plans Document that establishes priorities for activities, research, and funding for the Narragansett Bay Estuary.

EJ: Environmental Justice The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.

GJZ: Green Justice Zone Areas that face a legacy of public health burdens, environmental degradation, and socioeconomic stressors, but are prioritized for resources and support at a variety of levels to implement community-based solutions to achieve change.

MPO: Metropolitan Planning Organization An agency created by federal law to provide local elected officials input into the planning and implementation of federal transportation funds to metropolitan areas with populations of greater than 50,000.

NOFO: Notice of Funding Opportunity A publicly available document by which a Federal Agency makes known its intentions to award discretionary grants or cooperative agreements.

RCP: Representative Concentration Pathways Plausible future scenarios of carbon dioxide emissions and possible reductions in atmospheric concentration.

RFP: Request for Proposals A solicitation method which communicates the government's requirements and requests proposals.

RLF: Resilience Loan Fund A specialized financing mechanism designed to provide loans and capital to fund projects that build resilience to natural hazards.

SAMP: Special Area Management Plan A plan used to collect and examine data, identify potential development trends and anticipates conflicts between different uses. In coastal areas.

SSP: Shared Socioeconomic Pathways A set of narratives describing possible future development pathways in relation to its use of fossil fuels and the social and economic factors which drive fossil fuel use.

SSP2-4.5: Intermediate Emissions Scenario where carbon dioxide emissions continue around current levels until 2050, then decrease but do not reach net zero by 2100.

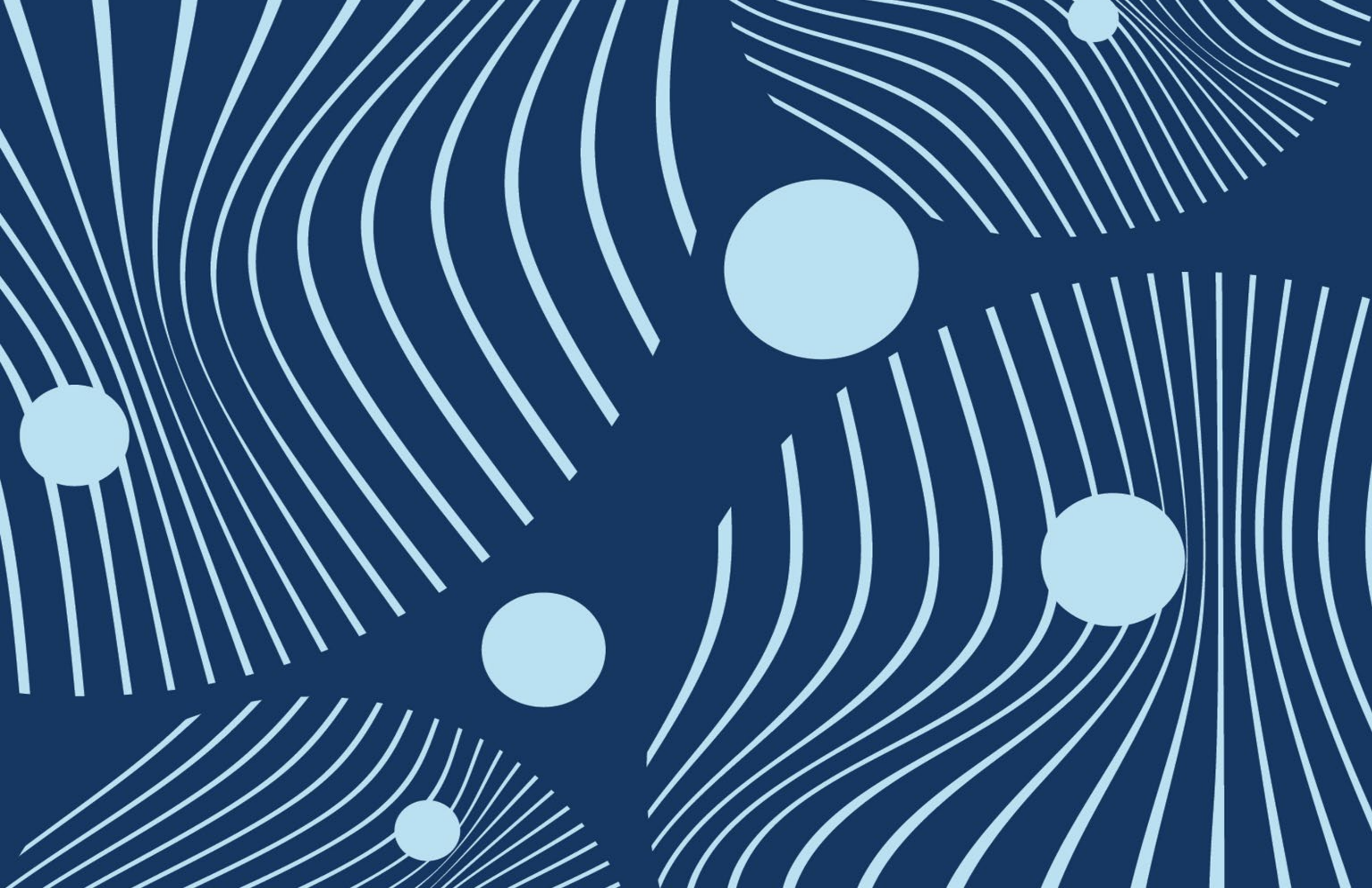
SSP5-8.5: Very High Emissions Scenario characterized by continued growth in carbon dioxide emissions throughout the 21st century, driven by heavy reliance on fossil fuels, with emissions increasing substantially by 2100.

TAP: Technical Assistance Package A support mechanism funded by potentially responsible parties that enables community groups to retain the services of an independent technical advisor.

TDR: Transfer of Development Rights The transfer of development rights from land in a sending area to land in designated receiving areas.

TIF: Tax Increment Financing A value capture tool that uses taxes on future gains in real estate values to pay for new infrastructure.

WUI: Wildland-Urban Interface: The zone of transition between unoccupied land and human development.



Resilient Rhody 2025
Plan Summary

Foreword

We are pleased to introduce *Resilient Rhody 2025*, a critical step forward in strengthening Rhode Island's ability to adapt to the impacts of climate change.

As the Ocean State, with 400+ miles of shoreline, the topic of coastal resilience is of the utmost importance. Sea level rise and increased frequency & intensity of storms and precipitation have worsened the depth and extent of both our coastal and riverine flooding. Such storm events have driven need for extensive emergency management and repair measures, with significant financial impact. Between September 2023 and January 2024 alone, flood disasters resulted in more than $22 million in FEMA Individual and Household Assistance for Rhode Island residents.

Rising air and water temperatures as well as changing biodiversity drive further social and economic impacts to our state, including hospitalization increases during heat waves and financial impacts to the marine trades.

In 2018, Rhode Island launched *Resilient Rhody*, our first comprehensive strategy to address the impacts of climate change and outline actions to strengthen our state's resilience. This strategy outlined the climate impacts facing our state and identified 61 key resilience actions across areas such as Critical Infrastructure & Utilities, Natural Systems, Emergency Preparedness, Community Health & Resilience, and Financing Climate Resilience Projects.

Since then, state agencies, municipalities and partners have collaborated to implement innovative programs, funding mechanisms, and technical assistance. From green infrastructure projects to health equity initiatives and emergency preparedness improvements, our communities are better protected today than they were when *Resilient Rhody* began.

However, the work is far from finished. Climate impacts are accelerating—sea level rise, stronger storms, inland flooding, and rising temperatures continue to threaten our infrastructure, ecosystems, and public health. These challenges demand bold, coordinated action.

In response to these challenges, we are pleased to introduce *Resilient Rhody 2025,* Rhode Island's statewide coastal resilience plan*,* which develops an actionable, implementable approach for Rhode Island's climate resilience.

Herein you will find:

- A comprehensive vulnerability assessment of Rhode Island's public built and natural assets
- Updated statewide resilience actions
- Priority solutions with accompanying cost estimates for critical resilience projects
- A funding and investment strategy to turn plans into action

Our goal remains clear: to ensure Rhode Island has the capacity to adapt and thrive no matter what chronic stresses and weather events we face. We also acknowledge that while the effects of climate change are felt across the state, these impacts are not equally distributed. Effective climate resilience requires a focus on environmental justice and equity—supporting local leadership and fostering sustained collaboration between communities, businesses, and governments.

With *Resilient Rhody 2025*, Rhode Island will be positioned to accelerate resilience efforts, leverage collaboration, and secure the resources needed to make adaptation possible on the ground. I am confident that this plan will put us on the path to build the capacity and develop the funding sources necessary to protect our most vulnerable assets and communities.

Resilient Rhody is intended to remain a dynamic plan that adapts to Rhode Island's evolving needs. Accordingly, it will undergo a full review and update in two years.

We thank our partners for their continued commitment and collaboration. Together, we can advance resilience efforts to safeguard Rhode Island's communities, economy, and natural systems for generations to come.





Kimberly Korioth

Chief Resilience Officer,
State of Rhode Island



Prudence Island © RIDEM

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Department of Health (RIDOH)
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North Road at Great Creek in Jamestown, RI © RIDOT

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Chapter 8: Prioritization Framework

Chapter 9: Resilience Best Practices

Resilient Rhody 2025
Purpose



Rhode Island Landscape © Narragansett Bay National Estuarine Research Reserve (NBNERR)

Resilient Rhody 2025
History and Purpose

As Rhode Island communities face growing risks from sea level rise, stronger storms, and other climate impacts, the State is taking decisive action with *Resilient Rhody 2025,* Rhode Island's first Statewide Coastal Resilience Plan.

Resilient Rhody's Definition of Climate Resilience

"The capacity of individuals, institutions, businesses, and natural systems within Rhode Island to survive, adapt, and grow no matter what chronic stresses and weather events they experience. While the effects of climate change are felt across the state, these impacts are not equally distributed. Effective climate resilience requires a focus on environmental justice and equity to support local leadership for sustained interaction between community, business, and government."

Six Statewide Manifestations of Climate Change

Identified in Resilient Rhody 2018

- Sea level rise
- Warming air temperatures
- Warming water temperatures
- Storm frequency and intensity
- Changing biodiversity

***Resilient Rhody 2025* builds on more than a decade of coordinated efforts to advance climate mitigation and resilience goals.**

In 2014, the General Assembly passed the "Resilient Rhode Island Act", which set the framework for addressing climate change and created the Executive Climate Change Coordinating Council (EC4) to guide statewide efforts. In 2015, EC4 defined six key climate change manifestations and began coordinating resilience planning across agencies.

Building on this foundation, on September 15, 2017, Governor Gina M. Raimondo signed Executive Order 17-09: "Action Plan to Stand Up to Climate Change", establishing a Chief Resilience Officer to lead climate resilience efforts across the state in collaboration with business, academic, and non-profit partners. This culminated in *Resilient Rhody* in 2018, Rhode Island's first climate adaptation strategy.

Resilient Rhody outlined the impacts Rhode Island faces and identified 61 priority actions across critical areas such as infrastructure, natural systems, emergency preparedness, community health, and financing resilience projects.

Following the first *Resilient Rhody* plan, Governor Daniel McKee signed the "2021 Act on Climate" on April 14, 2021. This updated the 2014 "Resilient Rhode Island Act" to create enforceable emission reduction mandates.

In 2023, Governor Daniel McKee signed the Executive Order 23-07: "Rhode Island Resilience 2023" on May 22, 2023. This re-established the Chief Resilience Officer position and resulted in the *Resilient Rhody 2024 State of Resilience Report.* The 2024 report reviewed progress on the 2018 actions and highlighted new initiatives launched across Rhode Island.

With climate impacts accelerating, in 2024, the General Assembly passed the "Act on Coasts", which mandated the development of *Resilient Rhody 2025.* This 2025 plan takes the next step by updating resilience actions, assessing statewide vulnerabilities, prioritizing solutions, and developing a funding strategy to turn plans into action.



Beavertail State Park in Jamestown, RI © RIDEM

Resilient Rhody 2025
Scope

Resilient Rhody 2025 is anchored by four core initiatives that collectively advance statewide climate resilience: *State Resilience Action Development*, a *Statewide Climate Vulnerability Assessment*, development of *Climate Resilience Solutions*, and a *Future Investment Strategy* that provides pathways for implementing both actions and solutions. Community engagement serves as the throughline across all components, ensuring local voices shape priorities and outcomes.

Resilient Rhody 2025 reflects work completed between April and December 2025, with iterative collaboration across tasks to refine findings and integrate stakeholder input.

State Resilience Action Development

Resilient Rhody 2025 identifies 79 actions representing the most urgent and high-impact interventions to protect Rhode Island's residents, economy, and natural resources. These actions build on the original 61 actions *from Resilient Rhody 2018*, incorporating new objectives informed by stakeholder input and feedback, a statewide gap analysis, and an adaptative capacity survey. Each action specifies the responsible agency, implementation requirements, estimated funding needs and sources, and includes timelines and success metrics to track statewide implementation.

Statewide Climate Vulnerability Assessment

This assessment provides Rhode Island's first comprehensive evaluation of climate risk across 21 asset types and five major hazards—coastal flooding, stormwater flooding, riverine flooding, extreme heat, and extreme wind—under four-time horizons (current, 2035, 2050, and 2100) and two emissions scenarios (intermediate and very high). The analysis identified more than 10,000 high-risk assets out of over 130,000 assessed statewide, creating a foundation for developing targeted resilience strate

Climate Adaptation & Resilience Solutions

Building on vulnerability findings and a community-driven prioritization process, the plan introduces 10 climate resilience solutions tailored to critical assets. These solutions address infrastructure such as roads and bridges, ports, energy systems, stormwater and wastewater facilities, drinking water reservoirs and dams, beaches and wetlands, inland water areas, schools, public safety buildings, and hospitals. While their development was informed by specific assets, these solutions are intended to serve as a blueprint for similar assets across Rhode Island.

Future Investment Strategy

The Future Investment Strategy outlines actionable steps to advance the 79 actions and 10 solutions, summarizing funding needs, legislative requirements, and implementation pathways. It provides a Funding Strategy Framework to help state and local partners identify and prioritize projects, navigate available funding opportunities, and coordinate effective implementation beyond the scope of this plan.

Community Engagement

Community engagement was integral throughout the *Resilient Rhody* process. Through five Community Forums, six municipal stakeholder working sessions, and a targeted Frontline Community Forum with Health Equity Zone stakeholders, residents and partners provided input that shaped priorities and solutions reflected herein.

Scope of Work

State Resilience Action Development
Identifies and advances 79 high-impact actions to protect Rhode Island's residents, economy, and natural resources.

Statewide Climate Vulnerability Assessment
Conducted the state's first comprehensive evaluation of climate risks across 21 asset types and five major hazards under multiple time horizons and greenhouse gas scenarios.

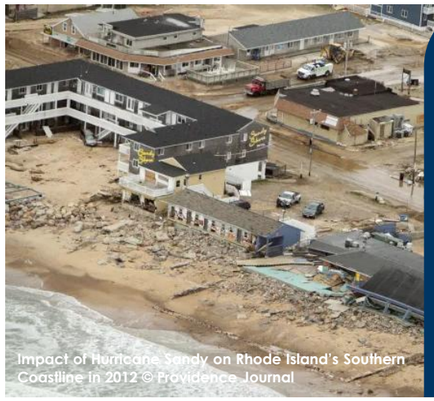
Climate Adaptation & Resilience Solutions
Outlines and costs 10 priority solutions for critical assets, informed by vulnerability findings and community-driven prioritization.

Future Investment Analysis and Strategy
Outlines funding pathways, legislative needs, and strategies to implement actions and solutions effectively.

Community engagement serves as the throughline across all components, ensuring local voices shape priorities and outcomes.

Resilient Rhody 2025
Executive Summary

Key Take-Aways



Impact of Hurricane Sandy on Rhode Island's Southern Coastline in 2012 © Providence Journal

Growing Climate Risks Will Require Proactive Solutions

Rhode Island faces increasing climate risks, with catastrophic flooding and extreme heat events projected to intensify throughout this century. These hazards threaten public health and infrastructure, underscoring the need for proactive strategies that move beyond reactive measures. Building statewide resilience will require long-term, sustainable solutions supported by programs and on-the-ground interventions that address highly vulnerable assets and strengthen system-wide resilience.

Today, 13% of all assessed assets are considered high or very high risk to coastal flooding. By late century, this could grow to 18% under the most extreme scenario. That is nearly one in five assets.

How Resilient Rhody 2025 Responds

Resilient Rhody 2025 introduces a bold set of actions designed to reduce risks from natural hazards across the state while providing detailed strategies and cost estimates to help communities advance toward implementation. Key actions emphasize proactive climate solutions, including:

Action 14.05 State Resilience Standards
Develop strengthened resilience standards across agencies and programs that consider various assets, such as residential, commercial, roads, wastewater, stormwater, drinking water infrastructure, electrical infrastructure, and open space.

Action 11.03 Develop Retreat & Voluntary Buyout Programming
Identify opportunities for retreat, infrastructure removal, and restoration on state-owned and municipally-owned properties, which can serve as demonstration sites for shoreline adaptation. Where possible, retreat rather than fortification should be considered as a coastal adaptation strategy.



Nag Marsh Sunset © Narragansett Bay National Estuarine Research Reserve (NBNERR)

Need for Systems-Based Approaches that Prioritize Community and Natural Resource Health

Rhode Island communities emphasized the importance of strategies that focus on holistic community health and the protection of natural systems. While this assessment and Plan concentrated on identifying specific assets at risk from climate impacts, resilience efforts will require integrated solutions that address multiple asset types and operate across regional boundaries. Ensuring accessible and multilingual resilience resources for residents, mitigating stormwater flooding, and safeguarding beaches, wetlands, and forests were consistently identified as priorities throughout the development of this Plan.

Stormwater flooding emerged as the top concern expressed by community members during the development of this Plan, largely due to its cascading effects on daily life and emergency response.

Resilient Rhody 2025 outlines Actions that prioritize regional collaboration on resilience projects, particularly those involving natural systems that span jurisdictional boundaries. In addition, Actions aimed at strengthening local community resilience include:

Action 18.03 Resilience Hubs
Develop a Resilience Hubs Program that provides technical support to create new Hubs, implement backup power systems, deploy mobile health units, and carry out necessary retrofits for shelters, community centers, and other critical infrastructure.

Action 13.01 Water Resources Coordination & Monitoring
Strengthen coordination between freshwater and saltwater systems by advancing holistic watershed management across eco-geophysical boundaries and integrating this approach into existing regulatory and funding frameworks.



Ft. Adams © RIDEM, RI State Parks

Evolving Risks Call for Flexible Funding and Technical Assistance

Expanded and flexible funding mechanisms, paired with technical assistance to support regional collaboration, were consistently identified as essential for advancing resilience. Legislative frameworks and policy reforms—focused on improved standards, ordinances, and strategies to manage ongoing development—will play a critical role in enabling these efforts and ensuring that initiatives move from planning to implementation. Municipalities emphasized that implementation will ultimately depend on financial resources and policy alignment, requiring new funding streams to support proactive, long-term projects.

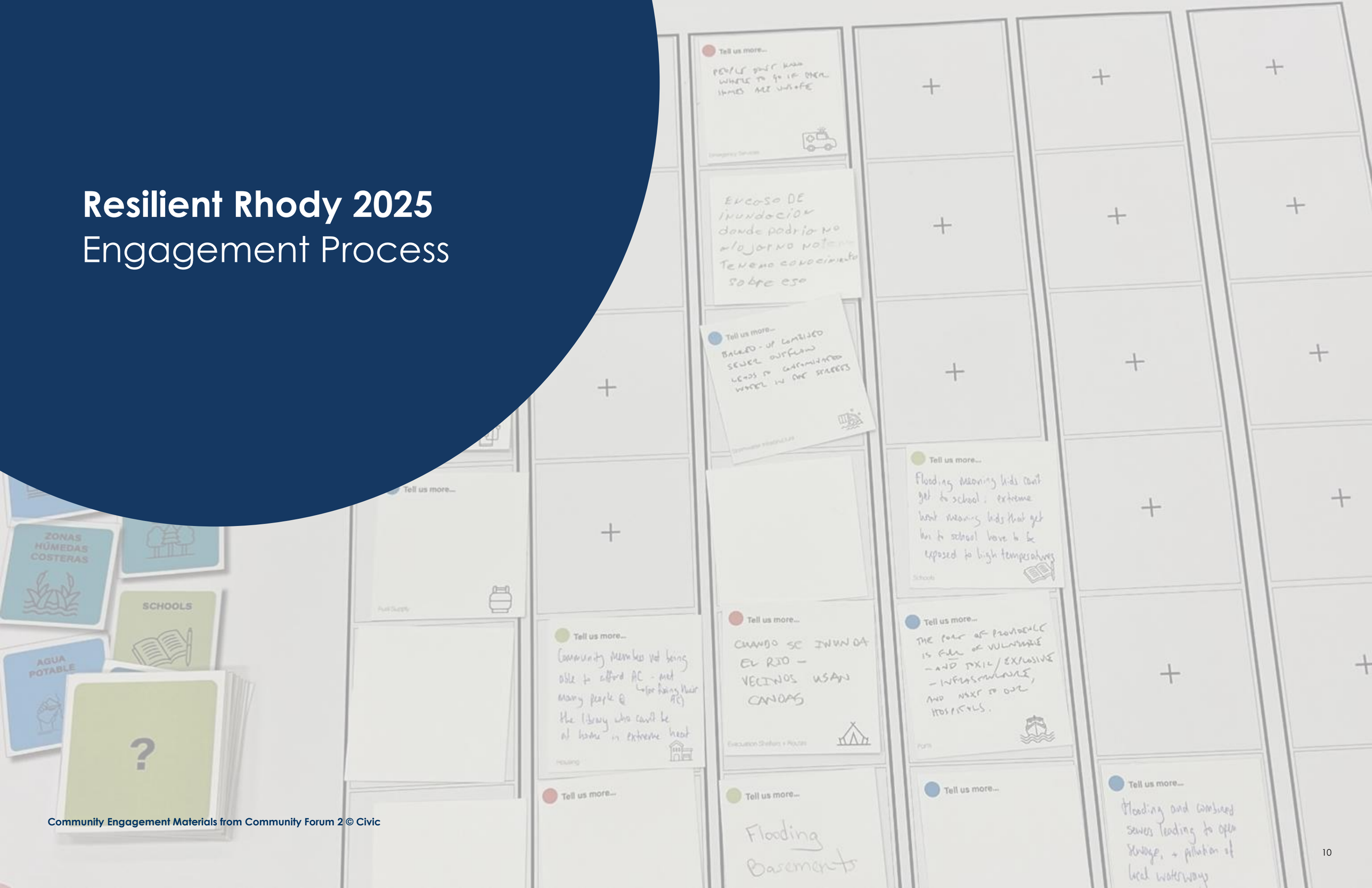
The estimated funding required to realize the *Resilient Rhody 2025* Actions ranges from $119 million to $298 million. This excludes implementation and construction costs.

By leveraging both existing and new funding platforms, *Resilient Rhody 2025* outlines funding strategies for each Action and Solution identified herein. The Plan also includes multiple actions to expand available funding. Key actions related to technical assistance and funding include:

Action 18.01 Resilience Technical Assistance
Establish support to help local governments—especially small, rural, and under-resourced communities—access climate resilience funding, with a focus on health, equity, and infrastructure needs.

Action 19.03 Resilience Loans
Fund and launch the recently established *Resilient Rhody Infrastructure Fund*, which will serve as the State's resilience revolving loan fund.

Resilient Rhody 2025
Engagement Process



Community Engagement Materials from Community Forum 2 © Civic

Engagement Process

The community engagement process for *Resilient Rhody 2025* was designed to ensure that local voices and lived experiences directly shaped the Plan.

Through a series of community forums, municipal stakeholder meetings, and a dedicated Health Equity Zone (HEZ) session, *Resilient Rhody 2025* worked to understand the diverse needs, challenges, and aspirations of residents and partners across the state. These conversations provided essential context and grounded the Plan's strategies in the realities of those most affected.

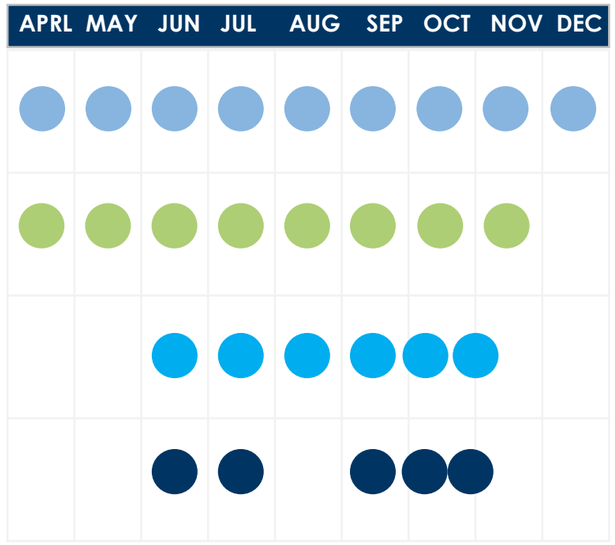
In total, ***Resilient Rhody 2025* hosted 11 engagement sessions with more than 280 participants** representing municipalities and residents, complemented by 17 meetings with the Resilience EC4 Subgroup and Rhode Island Resilience Partner Group representatives. This approach ensured that the plan reflects both technical expertise and community priorities.

Resilience EC4 Subgroup: Monthly meetings with 14 State Agencies

Rhode Island Resilience Partner Group: Monthly meetings with over 40 entities including non-profit organizations, institutions, and subject matter experts

Municipal Stakeholders: Over 130 people in attendance at six working sessions

Community Forums: Over 150 attendees at five community forums



***Resilient Rhody 2025* Engagement Goals**

- **Learn** about community priorities and concerns.
- **Gather** local knowledge and insights.
- **Grow** communities' awareness of the Plan.
- **Build** trust and interest.

Refer to Chapter 1: *Community Engagement Summary Report* for more information about Community Forum and Municipal Stakeholder Working Session activities and key findings.

Beginning in 2024, RIDEM convened the Resilience Executive Climate Change Coordinating Council (EC4) Subgroup and the Rhode Island Resilience Partner Group to provide ongoing forums for coordination, information-sharing, and collaboration on statewide resilience initiatives, including the development of *Resilient Rhody 2025*. Together, these groups represent more than fifty-five agencies and organizations and have met monthly throughout the plan's preparation to advise and guide the process.

Resilience EC4 Subgroup

The Resilience EC4 Subgroup facilitates ongoing coordination across state agencies engaged in climate resilience efforts. Comprised of representatives from each EC4 agency, the group meets monthly to discuss active resilience projects and needs, identify opportunities for interagency collaboration, and review statewide resilience standards, metrics, and priorities.

The subgroup played a central role in developing *Resilient Rhody 2025*, ensuring alignment across agencies and supporting consistent progress toward statewide resilience goals.

Rhode Island Resilience Partner Group

The Rhode Island Resilience Partner Group convenes resilience practitioners from nonprofits, universities, community-based organizations, and private partners. Meeting monthly, the group facilitates cross-sector collaboration and information sharing, helps identify opportunities for coordinated initiatives, provides technical and community-informed input on state resilience standards and metrics.

The Rhode Island Resilience Partner Group contributed critical expertise during the development of *Resilient Rhody 2025* and continues to help align statewide efforts with the diverse knowledge and experience of Rhode Island's resilience community.

Community Forums

Resilient Rhody 2025 hosted five community forums with more than 150 participants across in-person and virtual platforms.

Resilient Rhody 2025 leveraged libraries and schools for all in-person sessions, complemented by a virtual option. Libraries serve as natural community resilience hubs, making them an ideal setting for engagement. The locations selected for this round of public engagement were chosen to maximize accessibility and participation. Sites with strong public transportation access, opportunities for hybrid (in-person and virtual) participation, and the ability to host large groups were prioritized.

Each session featured structured engagement activities designed to spark dialogue, surface priorities, and foster collaborative planning. Participants contributed through interactive Mentimeter surveys and hands-on exercises using table-based or Miro digital tools, sharing perspectives, identifying needs, and shaping the plan's development in real time. Portuguese and Spanish translation services were provided at each Forum.

Forums were strategically scheduled throughout the planning process, allowing feedback to inform every phase. After each session, input was consolidated into summary reports and integrated directly into interim deliverables, ensuring community voices were reflected in the evolving plan.

Future outreach will place greater emphasis on communities that were less represented in this engagement cycle—particularly inland municipalities and communities in the southwestern region of the state. At the same time, we recognize that some stakeholders were unable to participate due to competing priorities and commitments; their perspectives remain equally important. These communities and stakeholder groups will be prioritized in upcoming engagement rounds to ensure more comprehensive, equitable representation of Rhode Island's diverse resilience needs.

Community Forum 1: Resilience Priorities & Actions

Providence, Providence Public Library
June 18, 2025

Participants began in small groups, sharing the resilience issues that motivated their attendance. After these conversations, boards displaying gap analysis findings were placed around the room, and participants were invited to add their concerns and priorities. Key topics included community health, stormwater infrastructure, public transportation, and forest resources.

Community Forum 2: Asset-Hazard Mapping

East Providence, Weaver Library
July 17, 2025

Community members shared experiences with climate hazards such as flooding, extreme heat, and high winds, as well as community assets where they had experienced these impacts. Local experiences were then matched with previously drafted asset and hazard typologies, with the goal of identifying any assets or hazards that should be added to the Statewide Vulnerability Assessment. Stormwater and coastal flooding were the most frequently discussed hazards, while housing and schools were the most identified assets.

Community Forum 3: Asset Prioritization Framework

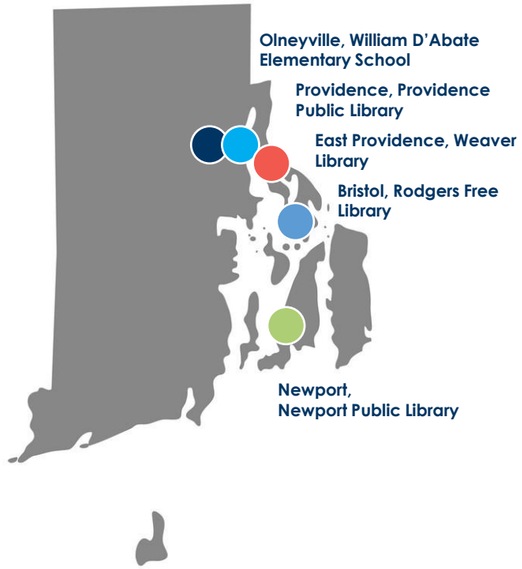
Newport, Newport Public Library
September 10, 2025

Participants scored hypothetical assets against five drafted criteria under consideration for the prioritization approach. After scoring, they discussed how weighting of criteria could be applied to ensure fair assessment and inclusion of underrepresented project types. The weighting used in this plan was informed by the average weightings developed across groups during this session, as well as averaged weightings developed during parallel Municipal Stakeholder session.

Community Forum 4: Climate Resilience Priority Assets & Investment Strategy

Bristol, Rogers Free Library
October 22, 2025

A shortlist of identified priority assets and projects was shared with participants, followed by an anonymous survey to collect feedback. Participants then completed the "Build Your Own Project" activity, selecting hypothetical assets and choosing from a range of solution options for each asset. Popular strategies included rain gardens and bioswales, relocation, permeable pavements, and zoning regulation. Feedback from this session played a critical role in shaping the Climate Resilience and Adaptation Solutions.



Locations of Community Engagement Forums

Frontline Community Forum

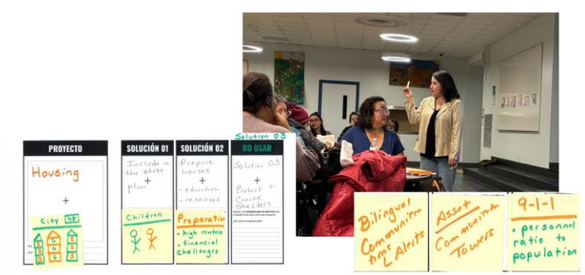
Olneyville, William D'Abate Elementary School
October 29th, 2025

This session focused on Rhode Island's Health Equity Zones (HEZs) and frontline community organizations. In an open discussion, participants identified housing, communication infrastructure, emergency response infrastructure, and local education on emergency preparedness as priority areas. They also completed the "Build Your Own Project" activity to explore potential solutions.



Community Forum 2:
Asset-Hazard Mapping



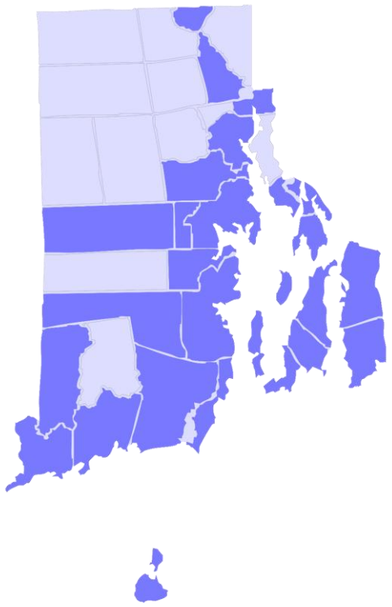


Community Forum 4 & Frontline Community Forum:
Build Your Own Project

Municipal Stakeholder Working Sessions

Resilient Rhody 2025 hosted six municipal stakeholder working sessions with more than 130 participants.

Represented Municipalities at Stakeholder Working Sessions



Refer to Chapter 1: *Community Engagement Summary Report* for more information about Community Forum and Municipal Stakeholder Working Session activities and key findings.

Municipal Stakeholder Working Session #1
Theme: Gap Analysis + Action Development
June 20, 2025

Stakeholders competed a survey on which resilience issues brought them to the working session. After the survey, virtual whiteboards were presented with asset types and stakeholders were requested to identify asset- specific resilience challenges. Key topics included critical infrastructure vulnerabilities, including aging stormwater and sewer systems; aquifer risks, inadequate public awareness of runoff, and the need for clearer policies on development in flood-prone areas. Stakeholders also highlighted major capacity and funding gaps and called for improved coordination. These priorities were incorporated into the *Resilient Rhody 2025* Actions.

Municipal Stakeholder Working Session #2
Theme: Asset + Hazard Mapping
July 18, 2025

Stakeholders shared their experience with climate hazards as they pertained to different asset types. Stakeholders identified stormwater and coastal flooding as the most significant and widespread hazards, with roads and bridges, stormwater systems, wastewater facilities, and housing consistently cited as highly impacted and high-priority assets. These asset and hazard pairs were further studied in Chapter 3: Statewide Climate Vulnerability Assessment.



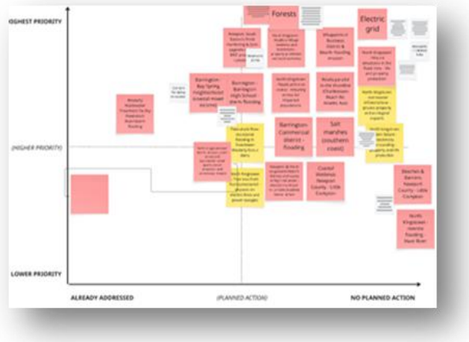
Municipal Stakeholder Working Session #2:
Asset-Specific Whiteboards

Municipal Stakeholder Working Session #3
Theme: Vulnerability Assessment
August 29, 2025

The results from the Statewide Climate Vulnerability Assessment were shared with stakeholders. Stakeholders broadly agreed with the vulnerability findings, emphasizing flooding-related damage and disruption as the most urgent risks across asset types. Stakeholders then prioritized assets based on need, equity, and service criticality, while stressing that short-term fixes must build toward long-term climate resilience.

Municipal Stakeholder Working Session #4
Theme: Asset Prioritization
September 12, 2025

Stakeholders ranked the importance of various criteria that were to be used for prioritizing assets, with Need and Feasibility emerging as the top priorities. Stakeholders then prioritized hypothetical assets against these criteria. Hospitals, substations, and major roads ranked highest. The weighting applied in this plan was based on the average values developed across groups during this session, as well as those derived from parallel Community Forum session.



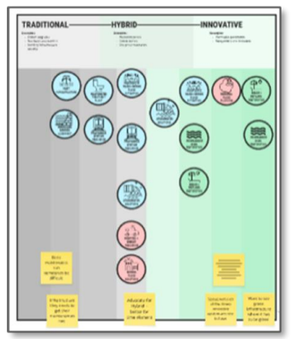
Municipal Stakeholder Working Session #3:
Asset Prioritization

Municipal Stakeholder Working Session #5
Theme: Priority Assets
October 3, 2025

A draft shortlist of identified priority asserts were shared with Municipal stakeholders, who provided feedback on the selections. Stakeholders then discussed the priority assets in small groups. Across both groups, critical infrastructure assets ranked as the highest priority, with wastewater facilities, major evacuation routes, hospitals, and energy transmissions lines most prioritized. These priority assets informed the Climate Adaptation & Resilience Solutions developed in this plan.

Municipal Stakeholder Working Session #6
Theme: Climate Resilience Solutions
October 24, 2025

An updated draft of the asset shortlist and Climate Resilience Solutions were shared with municipal stakeholders. Stakeholders were asked to review the proposed solutions and respond to questions about the level of innovation, the role of the State can take in implementation, and potential funding approaches. This session informed the strategies developed for Chapter 5: Climate Adaptation & Resilience Solutions.



Municipal Stakeholder Working Session #5
Solution Development

Resilient Rhody 2025
Statewide Climate Vulnerability Assessment



Rhode Island Sunset © Narrcagansett Bay National Estuarine Research Reserve (NBNERR)

Understanding Rhode Island's Climate Vulnerabilities

By analyzing current and projected climate risks, the Statewide Climate Vulnerability Assessment delivers data-driven insights to safeguard Rhode Island's most critical assets against future impacts.

With over 400 miles of coastline, approximately 400,000 acres of forest, and densely populated urban areas, Rhode Island faces significant climate challenges.

The assessment defines climate risk as the combination of climate hazards, asset exposure, and asset vulnerability, representing both the likelihood of climate-related impacts and the potential consequences for each asset.

Five climate hazards were evaluated: coastal flooding, stormwater flooding, riverine flooding, extreme heat, and extreme wind. These hazards were assessed across four time horizons (current, 2035, 2050, and 2100) to understand how risks will evolve over time, using two greenhouse gas emission scenarios—intermediate (SSP2-4.5) and very high (SSP5-8.5).

The analysis covered 21 asset types grouped into four categories:

- Critical infrastructure and Facilities
- Natural Systems
- Community Resilience structures
- Emergency Preparedness Structures

A total of over 130,000 assets were analyzed, including nearly 90,000 half-mile segments of roads and evacuation routes. Approximately 10,000 assets were classified as high or very high at risk (excluding roads and evacuation routes).

Refer to Chapter 3: *Statewide Climate Vulnerability Assessment* for a comprehensive overview of all climate hazard risk scores across asset types.

Rhode Island faces significant climate risks across critical systems, with flooding and extreme heat emerging as the most severe threats.*

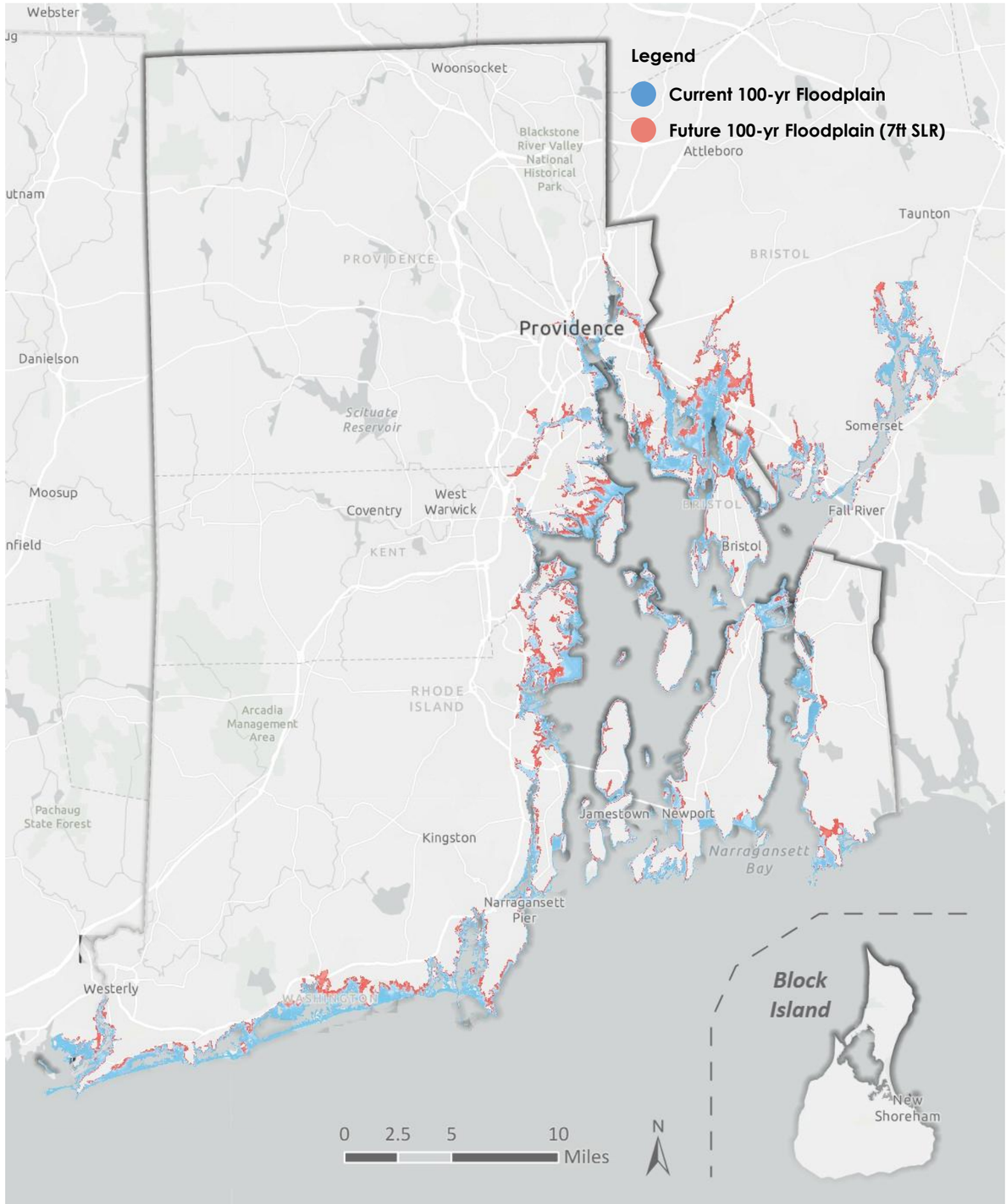
Critical Infrastructure and Facilities:
Flood hazards pose the greatest risk to these assets. Under the most extreme scenario, stormwater flooding impacts 100% of assets, coastal flooding threatens 12% of assets, while riverine flooding affects one in 10 assets, with those proportions rating high or very high at risk.

Natural Systems:
Extreme heat, stormwater flooding, and coastal flooding are the primary hazards of concern. Extreme heat and stormwater flooding threatens 100% of assessed assets, and coastal flooding impacts 57%, under the most extreme scenario.

Community Resilience Structures:
Stormwater flooding and heat dominate risks for more than 1,200 high-risk assets. Extreme heat and stormwater flooding affects 100% of assessed assets. In addition, extreme wind impacts all public housing, with those proportions rating high or very high at risk.

Emergency Preparedness Structures:
Stormwater flooding and heat pose the greatest challenges, projected to impact over 230 high-risk assets. Extreme heat and stormwater flooding threatens 100% (not including evac routes), coastal flooding 17%, and riverine flooding 15%.

*Summary results are taken for the most extreme scenario, which is SSP5-8.5 in 2100 for coastal flooding, stormwater flooding, extreme heat, and extreme wind, and present day for riverine flooding.



Current and Future Coastal Flooding (Assessed Using University of Rhode Island STORMTOOLS Data)

Methodology

Resilient Rhody 2025 assessed current and future climate hazard risks across Rhode Island's infrastructure, natural, community, and emergency preparedness systems.

1 Hazard

Definition: Occurrence of climate-related events.

Process: Collected climate hazard data.

2 Exposure

Definition: The likelihood, extent, and intensity of a hazard occurrence in relation to the asset.

Process: Combined statewide asset location data with hazard data to determine exposure.

3 Vulnerability

Definition: How susceptible to damage an exposed asset is to a hazard.

Process: Used asset characteristics to determine its vulnerability to the hazard(s) to which it is exposed.

4 Risk

Definition: The impacts of a hazard to an asset based on the asset's exposure and vulnerability to the hazard.

Process: Combined the asset's hazard exposure and vulnerability characteristics to produce a qualitative evaluation of asset risk.

Hazards Assessed

Five climate hazards were assessed based on the six manifestations of climate change outlined in *Resilient Rhody 2018*.

Five Hazards

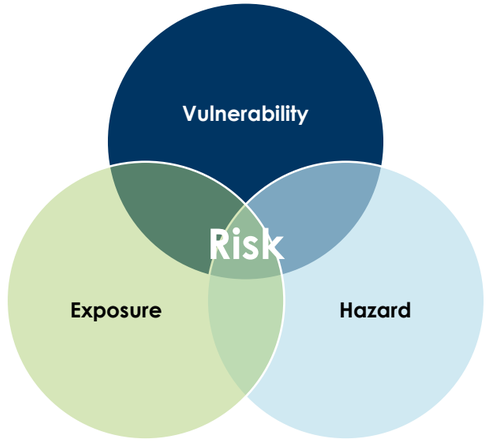
- Coastal Flooding
- Stormwater Flooding
- Riverine Flooding
- Extreme Heat
- Extreme Wind

Four Time Horizons

- **Present:** Current Conditions
- **Future:** 2035, 2050, 2100

Two Climate Scenarios

- **SSP2-4.5:** Intermediate emissions scenario
- **SSP5-8.5:** Very High emissions scenario



Refer to Chapter 3: *Statewide Climate Vulnerability Assessment* to learn about the Risk Rating Methodology & Results for each asset type.

Assets Assessed

Climate hazards were mapped against 21 asset-types to determine exposure. To assess vulnerability, additional criteria were applied, including asset characteristics (such as age of asset), physical state (such as condition), and socioeconomic indicators (such as the Social Vulnerability Index).

Critical Infrastructure and Facilities
Drinking Water Systems, Wastewater Treatment Facilities, Dams, Seawalls and Tidal Gates, Stormwater Infrastructure, Ports, Electric Grid, Fuel Supply, Roads, Bridges, and Culverts, Historic Resources, and Public Transportation

Natural Systems
Coastal Wetlands, Beaches and Barriers, Forests, and Water Resources

Community Resilience Structures
Public Housing, Municipal Buildings, Schools, and Food Markets

Emergency Preparedness Structures
Evacuation Routes & Emergency Shelters and Emergency Services

Consequences Assessed

Risk metrics were developed to evaluate susceptibility and measure potential consequences across three dimensions: damage, disruption, and life safety.

Damage
Physical damage experienced by an asset resulting in financial loss and/or inability to function as required. (example: $)

Disruption
Disruption of critical functionality resulting from hazard impact on infrastructure systems exceeding their capacity (example: downtime of roadways).

Life Safety
Negative human health outcomes that are not attached to physical damage of other assets but pose a direct risk to life safety of asset occupants. (example: hospitalization)

Example: Risk Rating Development

Hazard

Nor'easter storms commonly occur in Rhode Island from September through April and have been increasing in intensity.

Exposure

Two assets share the same probability of experiencing a Nor'easter, resulting in a High exposure rating. Exposure reflects the likelihood and extent to which an asset may experience a hazard.

Vulnerability

One asset is newer, elevated, and constructed with resilient materials. It also has backup power. The other is older, low-lying, in poor condition, and built with less flood-resistant materials. These characteristics determine how susceptible each asset is to experience hazard consequences.

Risk

Although both assets are exposed to the same hazard, the one with lower vulnerability is expected to experience fewer consequences; resulting in reduced overall risk. In contrast, the asset with higher vulnerability faces a significantly greater risk due to its increased susceptibility to impacts.

Coastal Flooding
Summary

This assessment found that approximately 18% of the assets assessed for coastal flooding will have high or very high risk by 2100.

This includes more than half of the ports, wastewater treatment facilities, natural systems, and colleges identified as being at high or very high risk of coastal flooding. Damage and downtime to critical assets can disrupt essential transportation routes, degrade natural systems, and delay emergency response times. Debris and contaminants carried by flood waters can further threaten life safety.

Coastal Flooding is a Disruptive Community Concern

Feedback from Municipal Stakeholder Working Session 3 emphasized that flood-related damage and disruption was the **most urgent risk** across all asset types.

Key Takeaways:

- The percentage of assets at high or very high risk to coastal flooding is projected to increase by 5% between present day and 2100.
- In instances where the proportion of at-risk assets remains constant over time and emissions scenarios, some assets may still experience greater flood depths.



Flooding in Westerly during Tropical Storm Henri © Scott Eisen, Getty Images

Coastal Flooding Risk
Critical Infrastructure

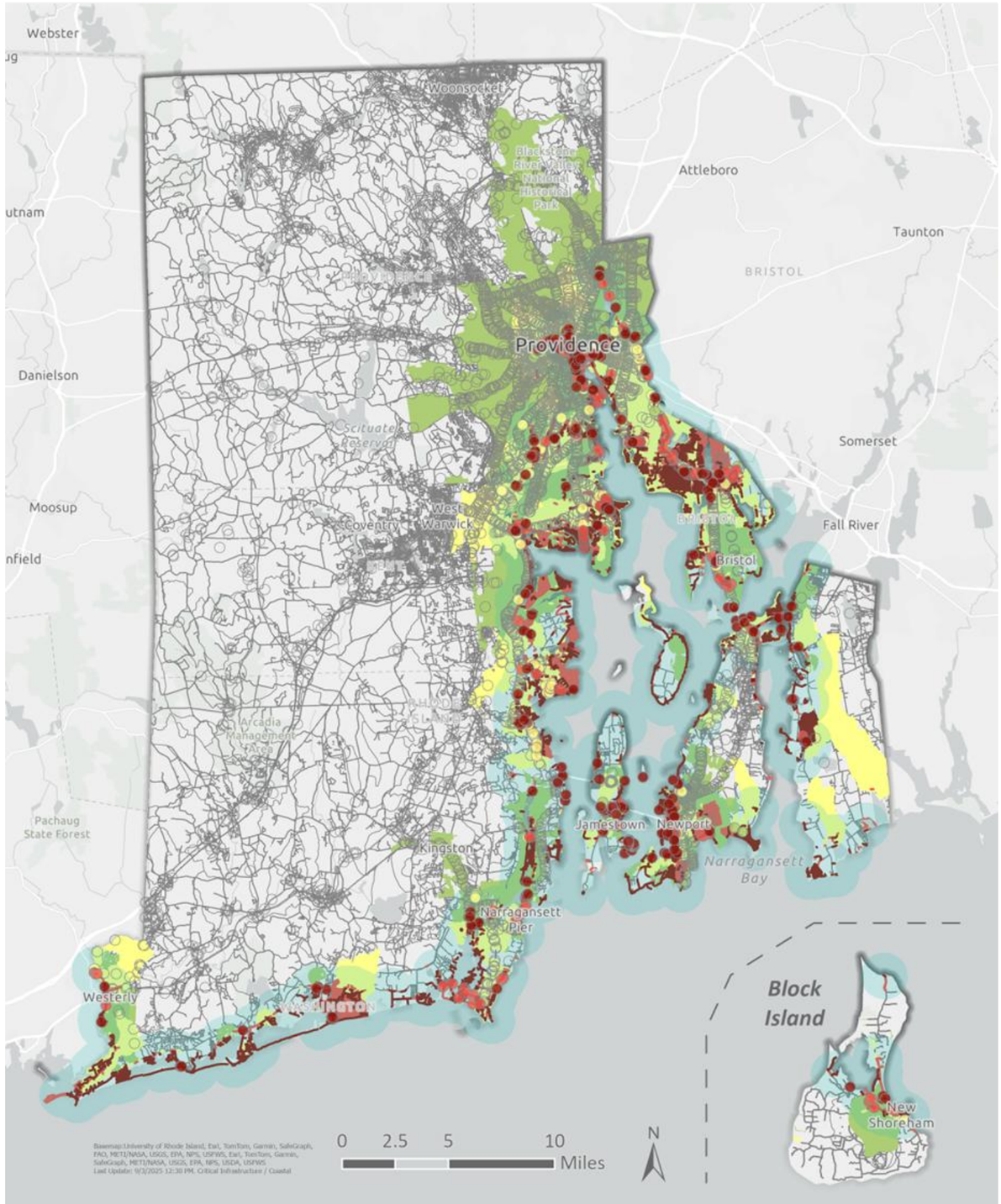
Coastal flood hazards pose a risk to Critical Infrastructure and Facilities with over 2,500 assets receiving a high or very high-risk rating (not including roads).

Approximately 18,500 critical infrastructure and facilities, and an additional 84,000 half-mile segments of roads were assessed. Approximately 12% of these assets are at high or very high risk to coastal flooding, which could lead to statewide impacts.

Damage and downtime to critical assets can disrupt the functionality of essential transportation routes and options, limiting access across the state. Life safety impacts may be heightened due to increased runoff carrying contaminants.

Asset	**Risk Results** (High or Very High Rating, 2100, High SLR*)
Drinking Water Systems	**4** / 111 **drinking water systems**
Electric Grid	**11**/ 165 **electric grid assets**
Fuel Supply	**29** / 317 **underground storage tanks**
Ports	**813** / 1568 **ports**
Public Transportation	**883** / 8722 **public transportation assets**
Roads, Bridges, and Culverts	**9844** / 85848 **road and bridges (1/2-mile segments)**
Seawalls and Tidal Gates	**70** / 1098 **hardened shorelines**
Stormwater Infrastructure	**374** / 2887 **stormwater infrastructure**
Wastewater Treatment Facilities	**13** / 19 **wastewater treatment facilities**

*University of Rhode Island's (URI) Coastal STORMTOOLS data was used to map coastal flooding through the State.



Coastal Flooding Risk
Natural Systems

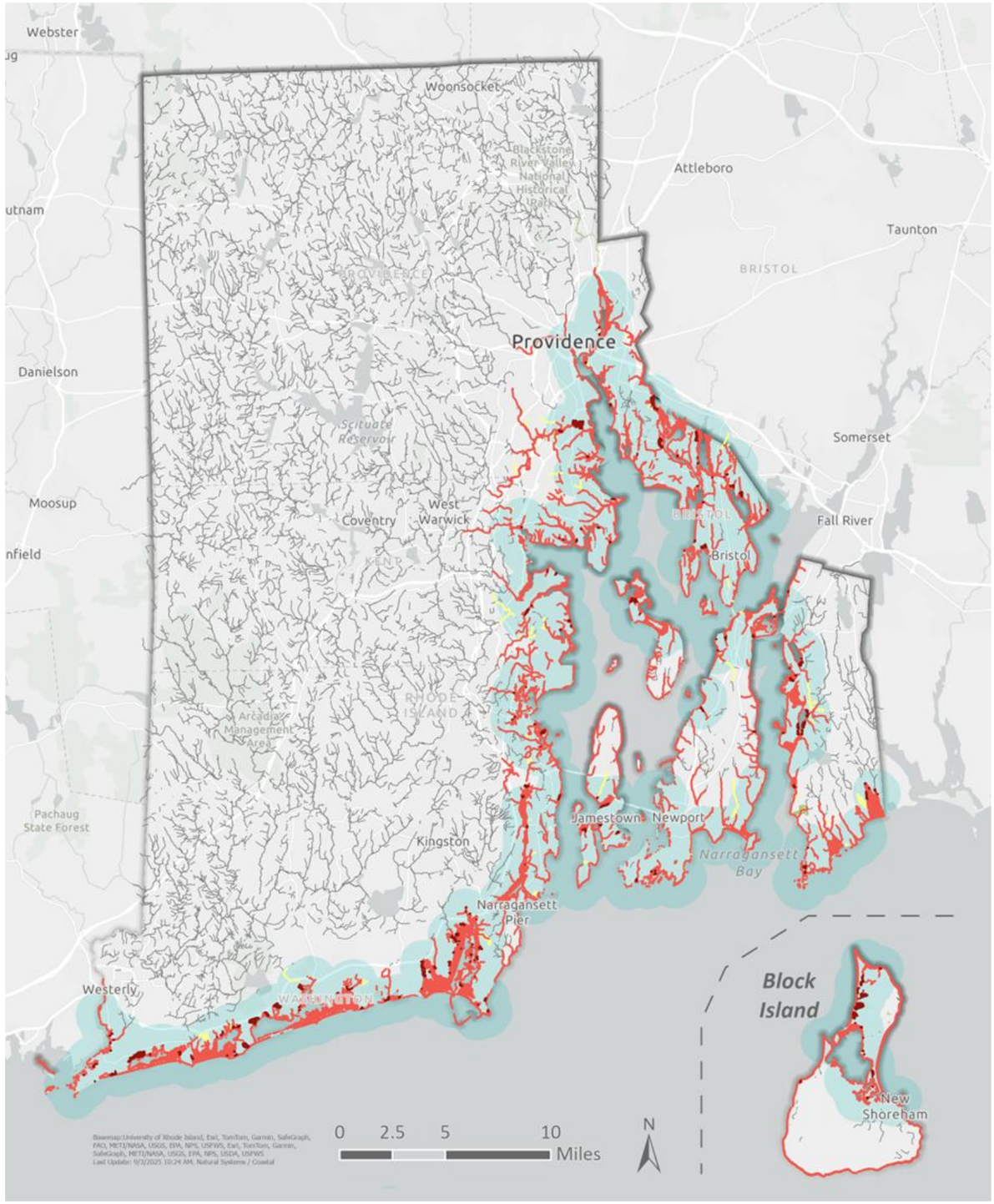
Along with extreme heat, coastal flooding poses one of the greatest risks to natural systems, with more than 10,000 assets classified as high or very high risk.

The assessment evaluated nearly 19,000 natural system assets across Rhode Island. Results indicate that 57% of these assets are at high or very high risk from coastal flooding, which could create cascading impacts on ecosystems.

Coastal flooding damages natural buffers such as wetlands and dunes, leaving adjacent development more exposed to future storms. Saltwater intrusion and rising flood levels further disrupt habitats, degrade soil quality, and reduce biodiversity.

Asset	**Risk Results** (High or Very High Rating, 2100, High SLR*)
Beaches and Barriers	**37**/134 **beaches and barriers**
Coastal Wetlands	**9821**/9966 **coastal wetlands**
Water Resources	**904**/8788 **rivers and streams**

*University of Rhode Island's (URI) Coastal STORMTOOLS data was used to map coastal flooding through the State.



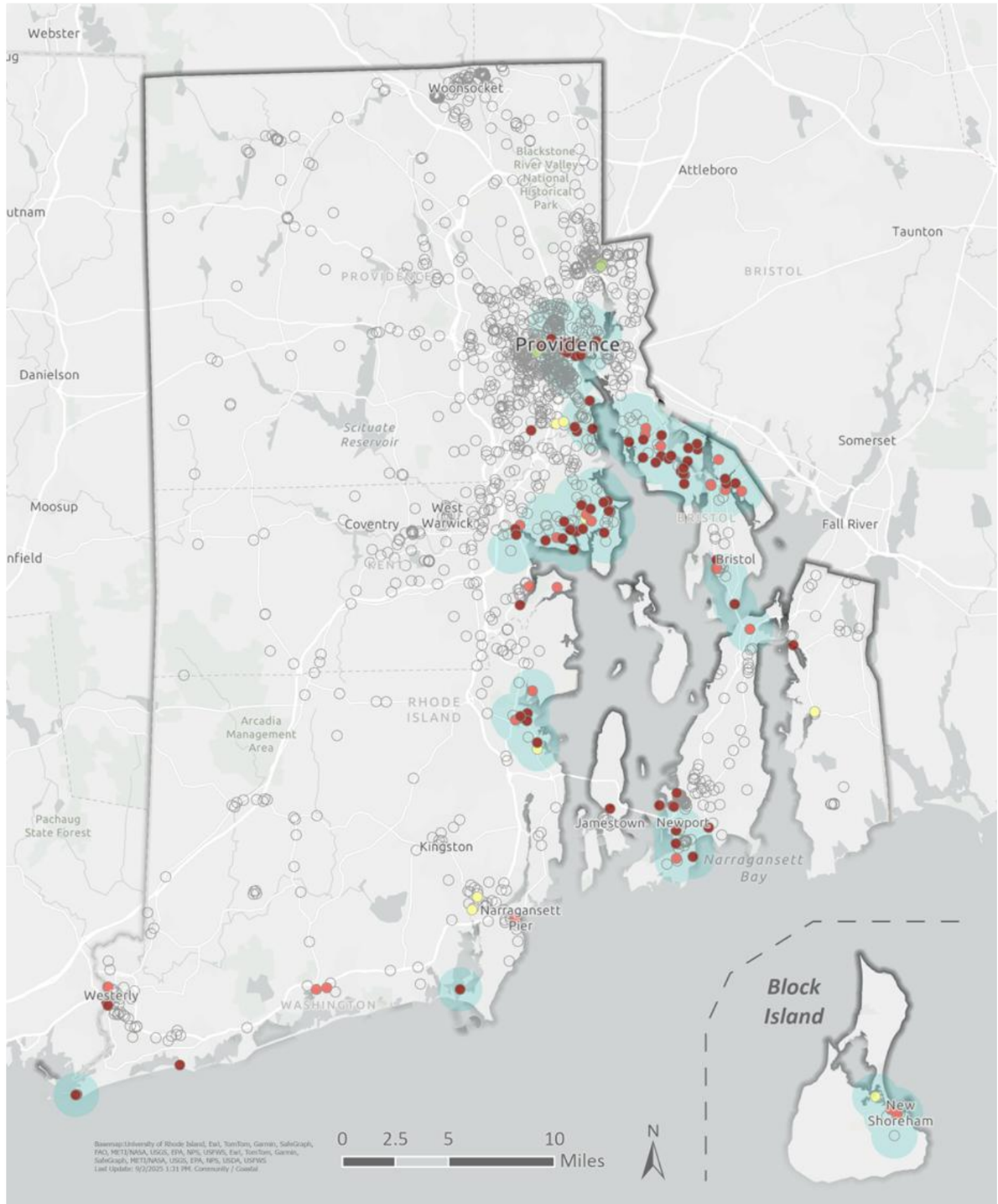
Coastal Flooding Risk
Community Resilience Structures

Nearly 2,000 community resilience structures were assessed, and approximately 130 assets face high or very high risk from coastal flooding.

This represents about 7% of all community resilience structures, including half of the State's universities. These structures include schools, libraries, food distribution centers, and other facilities that serve as critical hubs for community well-being. Flooding can cause costly property damage and disrupt essential services such as education, emergency shelter, and food access. Loss of functionality in these facilities during extreme events can leave communities without safe gathering spaces or access to vital resources, amplifying the impacts of climate hazards.

Asset	**Risk Results** (High or Very High Rating, 2100, High SLR*)
Public Housing	**26**/ 799 **housing assets**
Municipal Buildings (Libraries and Town Halls)	**9** / 110 **buildings**
Schools (Pre K-12 Schools and Colleges and Universities)	**54** / 568 **schools**
Food Markets	**41**/ 470 **food markets**

*University of Rhode Island's (URI) Coastal STORMTOOLS data was used to map coastal flooding through the State.



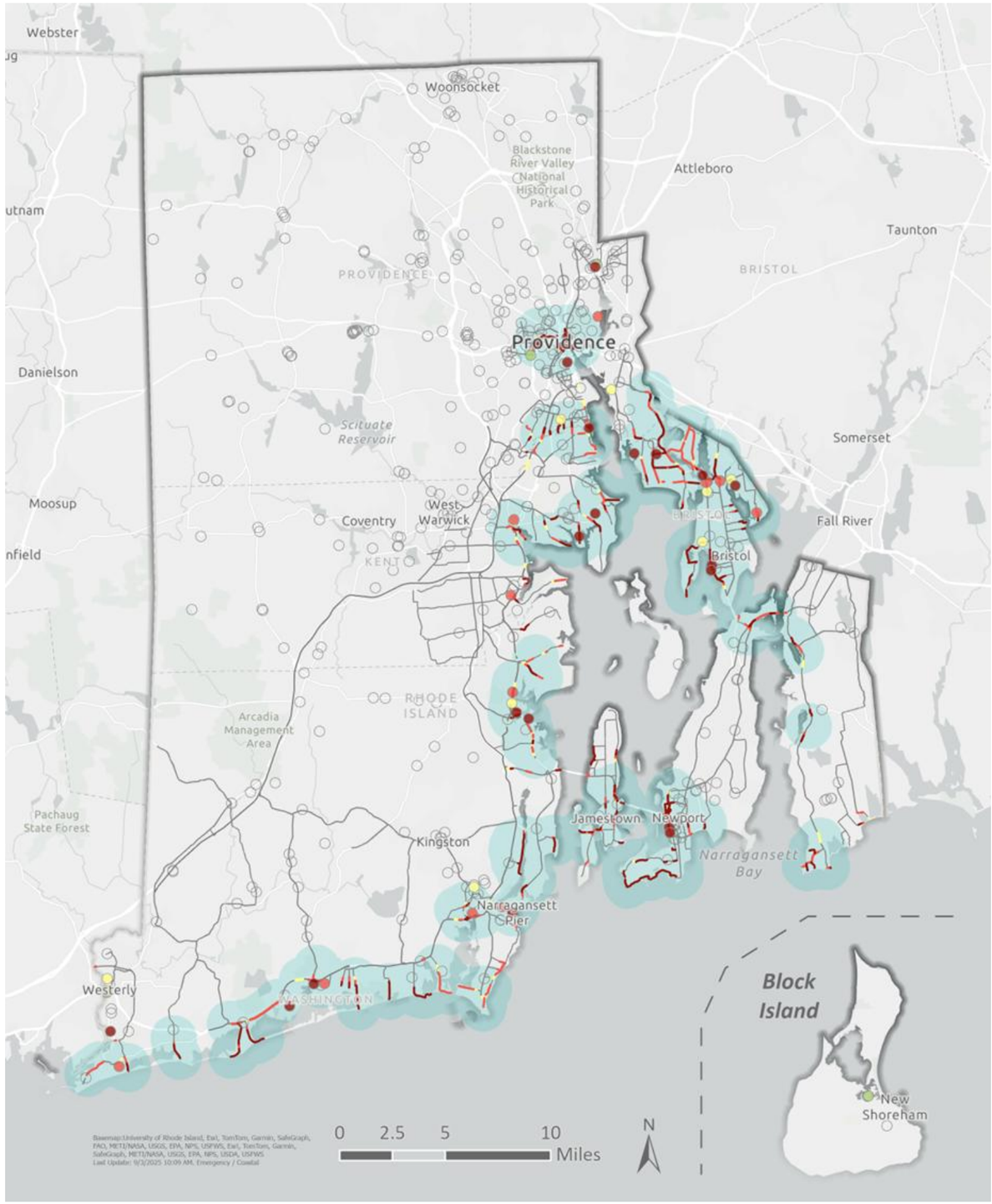
Coastal Flooding Risk
Emergency Preparedness Structures

Results show that 17% of the 450 assessed assets and 4,000 half-mile segments of evacuation routes face high or very high risk from coastal flooding.

Assets at high or very high risk to coastal risk include almost one-fifth of the State's hospitals and key evacuation routes, which are essential for life safety during extreme climate events. Flooding can disrupt emergency operations, delay response times, and compromise access to medical care and shelter. These disruptions are especially dangerous during severe storms or heat waves when emergency services are most needed.

Asset	**Risk Results** (High or Very High Rating, 2100, High SLR*)
Hospitals	**3**/17 **hospitals**
Fire Stations	**15**/173 **fire stations**
Police Facilities	**6**/68 **police facilities**
Evacuation Routes	**18% evacuation routes**
Emergency Shelters	**14**/192 **emergency shelters**

*University of Rhode Island's (URI) Coastal STORMTOOLS data was used to map coastal flooding through the State.



Stormwater Flooding
Summary

Nearly all of the assets assessed for stormwater flooding are projected to face high or very high risk by 2100, underscoring the severity of projected impacts.

These results highlight the severity of projected stormwater impacts by late century, with the potential to damage every major infrastructure type, disrupt critical transportation routes, spread contaminants, and reduce overall quality of life.

Stormwater flooding also threatens homes and essential community facilities, such as schools, leading to significant disruptions to daily life and creating costly, long-term recovery needs.

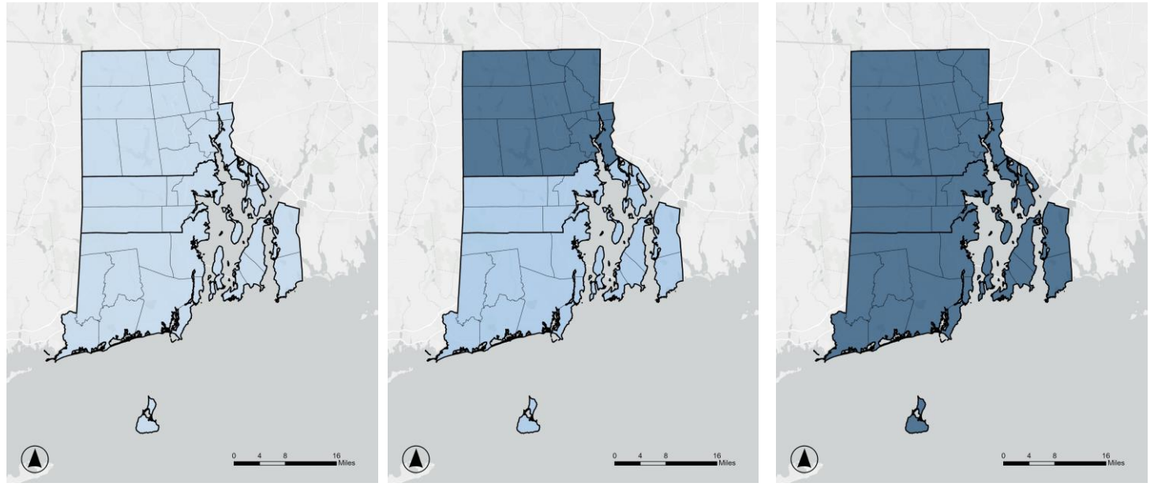


Stormwater Flooding at Reservoir Avenue in Cranston © WPRI

Stormwater Flooding is a Community Priority

During the second Community Forum, community members highlighted **stormwater infrastructure, emergency services, and roads, bridges, and culverts** as the assets most impacted by stormwater flooding and of highest concern.

Projected Rainfall During a 24-hr 100-yr storm based on SSP5-8.5



Present **2035** **2050 and 2100**

Projected Rainfall **< 8 inches** **8 to 10 inches** **> 10 inches**

Key Takeaways:

- Rainfall is anticipated to increase by approximately 2 inches during a 24-hr 100-year storm event by 2030 across all counties, with an additional inch by 2100.
- By 2100 all counties could experience over 10 inches of rainfall during a 24-hr 100-yr storm.
- Providence County currently has the highest rainfall totals among Rhode Island counties and is projected to continue experiencing the greatest rainfall through 2100.

Riverine Flooding
Summary

This assessment found that approximately 10% of the assets assessed for riverine flooding currently face high or very high risk.

Cascading consequences from riverine flooding events may include increased pollutants in water supplies and streets, transportation disruption, and costly repairs.

Riverine Flooding is an Environmental and Public Health Challenge

Community feedback identified **public health** impacts as a priority concern. Stormwater flooding can trigger sewage overflows, while riverine flooding can spread that contamination more widely.

Key Takeaways:

Assets such as the Electrical Grid, Commuter Rail Line and Stations, Bridges, Wastewater Treatment Facilities, Hospitals, and Evacuation Routes demonstrate a notable portion of total high-risk assets.



Blackstone River Flooding in Rhode Island March 31, 2010 © National Weather Service and NOAA

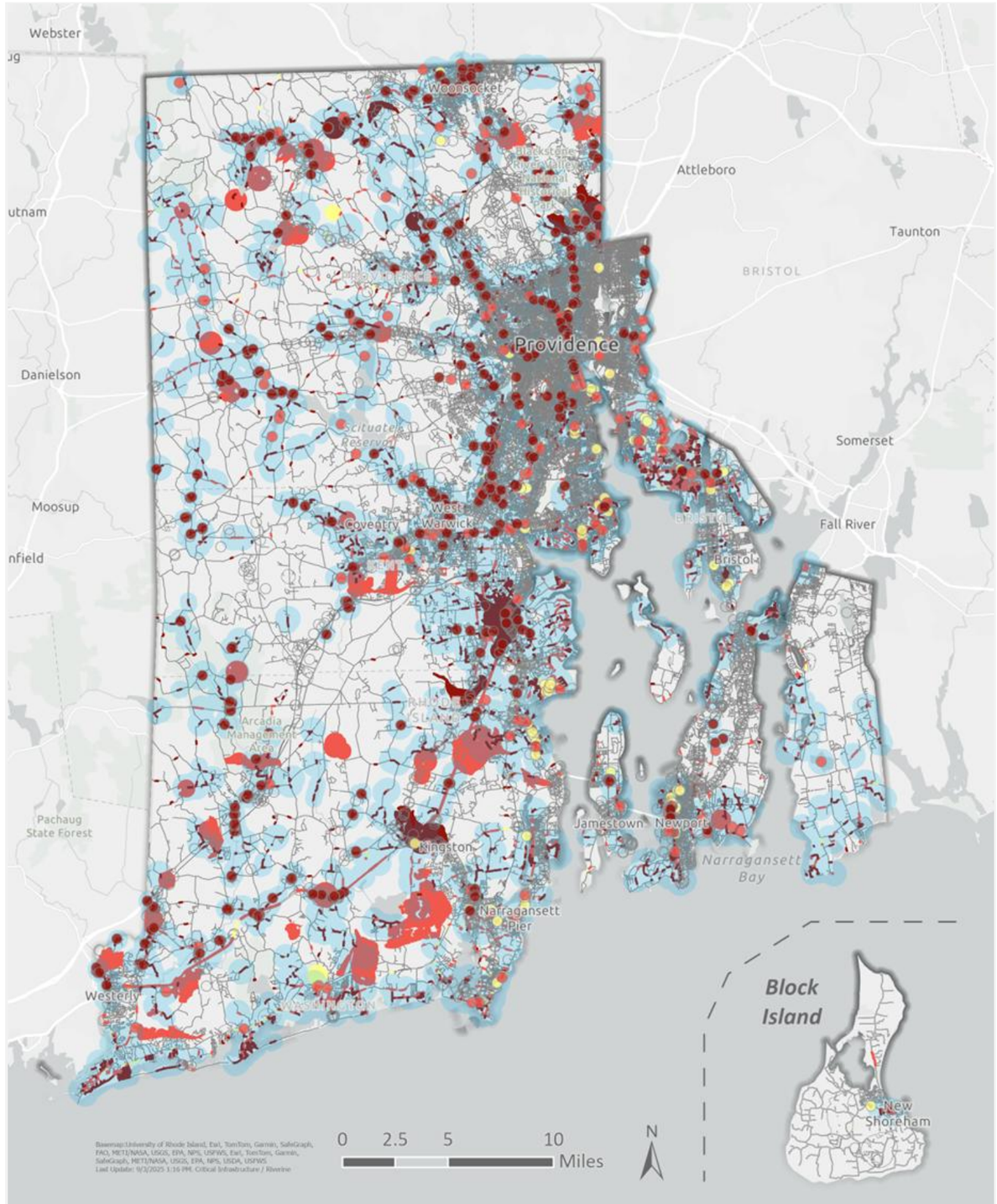
Riverine Flooding Risk
Critical Infrastructure

Results indicate that 10% of the 95,000 assessed Critical Infrastructure assets are at high or very high risk to riverine flooding.

More than half of dams, drinking water systems, and commuter rail lines face high or very high riverine flood risk. These events can contaminate drinking water, interrupt essential transportation services, and result in extensive and costly infrastructure damage.

Asset	**Risk Results** (High or Very High Rating, Present*)
Dams	**391** / 669 **dams**
Drinking Water Systems	**75** / 111 **drinking water systems**
Electric Grid	**9** / 218 **electric grid assets**
Fuel Supply	**39** / 317 **underground storage tanks**
Public Transportation	**791** / 8722 **public transportation assets**
Roads, Bridges, and Culverts	**8643** / 85848 **roads and bridges**
Wastewater Treatment Facilities	**5** / 19 **wastewater treatment facilities**

*FEMA FIRM data was used to map riverine flooding throughout the State.



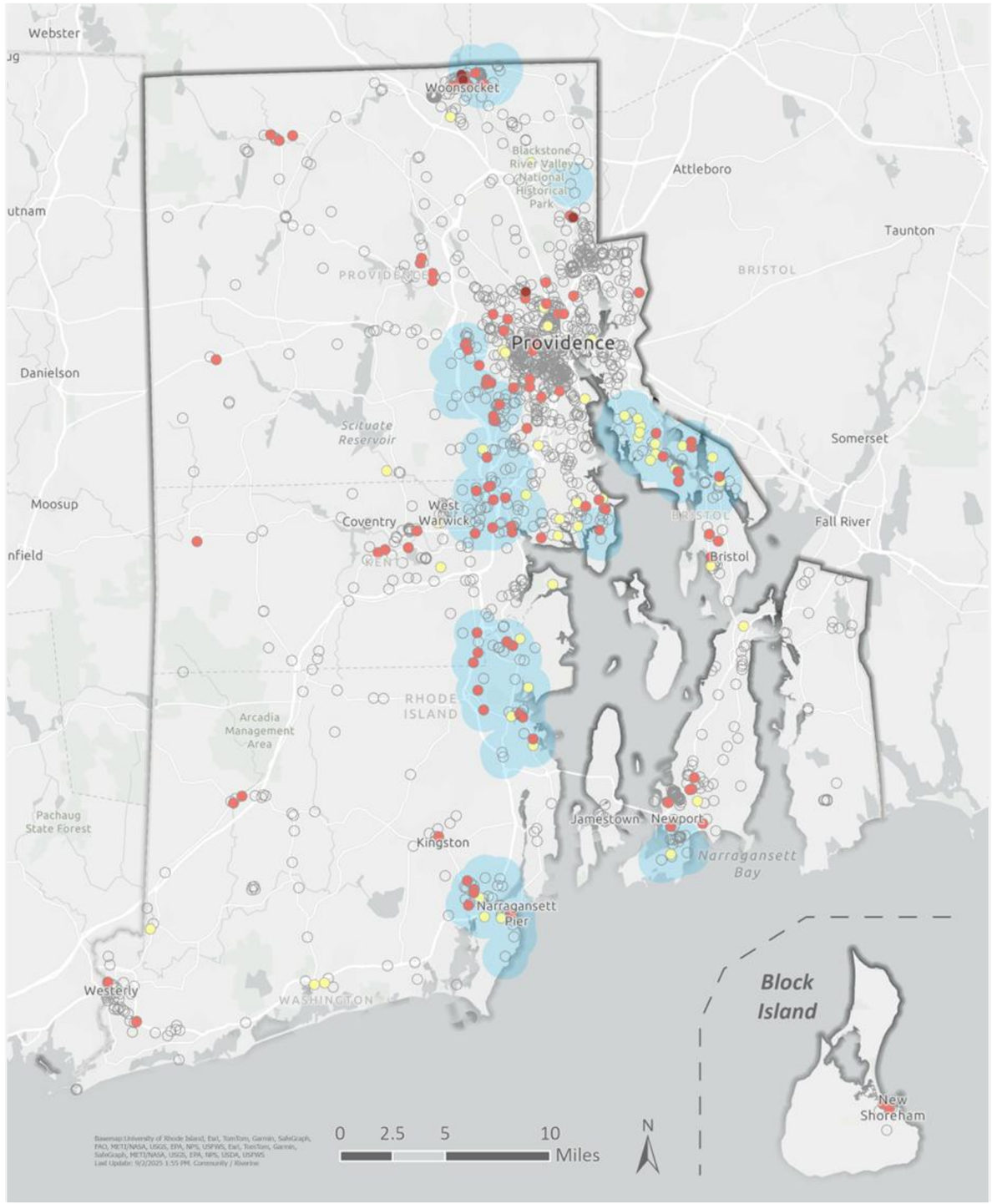
Riverine Flooding Risk
Community Resilience Structures

Approximately 17% of the nearly 2,000 assessed Community Resilience assets face high or very high risk to riverine flooding, totaling 128 at-risk assets.

More than one out of every ten PreK-12 school or college and university are at high or very high risk to riverine flooding. Riverine flooding can threaten the safety of students and faculty.

Asset	**Risk Results** (High or Very High Rating, Present*)
Public Housing	**21** / 799 **housing assets**
Municipal Buildings (Libraries and Town Halls)	**5** / 110 **buildings**
Schools (Pre K-12 Schools and Colleges and Universities)	**61** / 568 **schools**
Food Markets	**41** / 470 **service providers**

* FEMA FIRM data was used to map riverine flooding throughout the State.



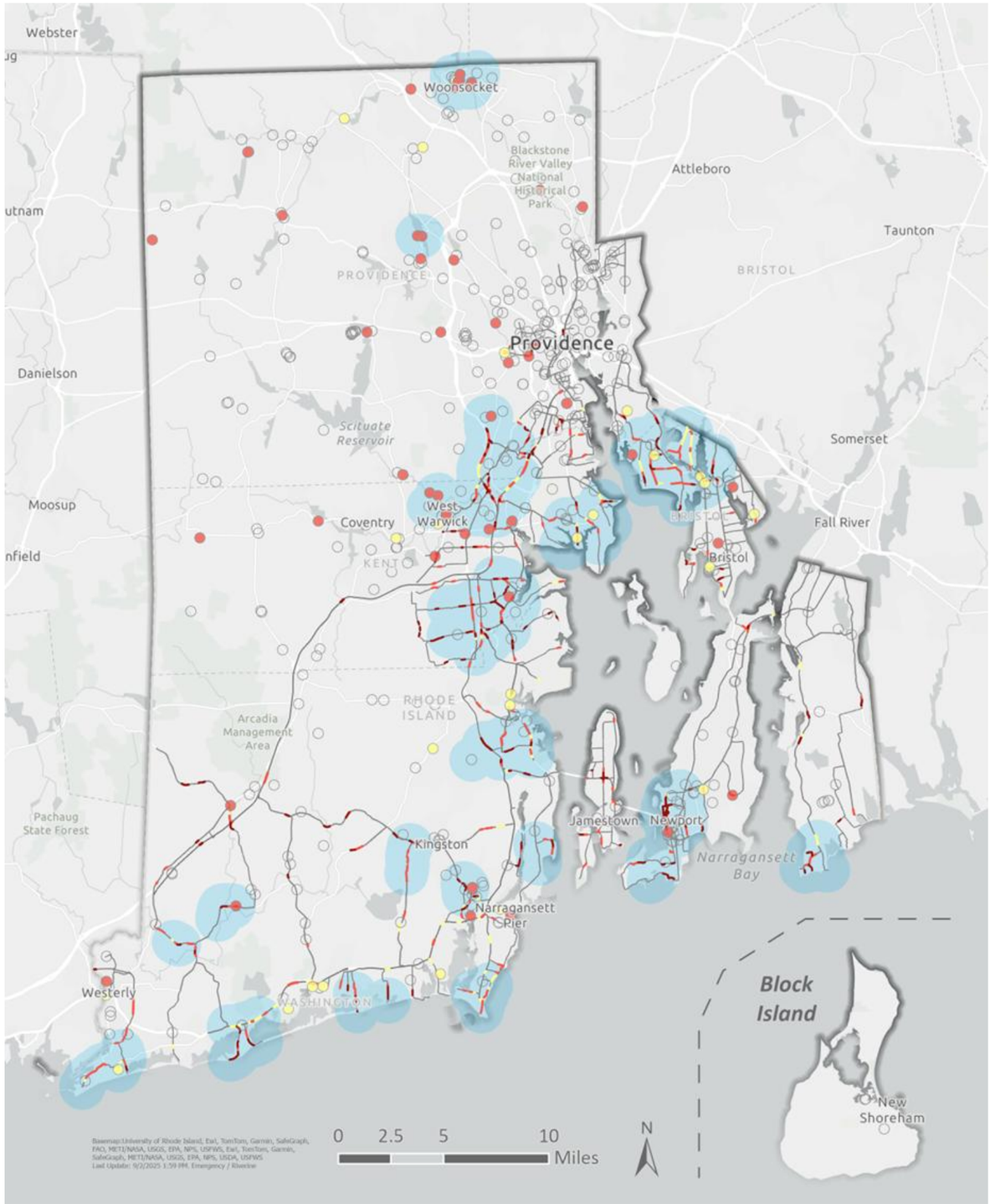
Riverine Flooding Risk
Emergency Preparedness Structures

Results show that approximately 15% of the 450 assessed emergency preparedness assets and 4,000 half-mile segments of evacuation routes face high or very high risk to riverine flooding.

Hospitals, police stations, and emergency shelters each had more than 10% of their assessed assets receive a high or very high risk score. These facilities provide essential care and safety to the community, and any operational disruption or loss due to flooding could result in widespread impacts.

Asset	**Risk Results** (High or Very High Rating, Present*)
Hospitals	**3**/17 **hospitals**
Fire Stations	**15**/173 **fire stations**
Police Facilities	**9**/68 **police facilities**
Evacuation Routes	**15% of half- mile evacuation route segments**
Emergency Shelters	**23**/192 **emergency shelters**

* FEMA FIRM data was used to map riverine flooding throughout the State.



Extreme Heat
Summary

All of the assets assessed for extreme heat are anticipated to face high or very high risk by late century, with all counties expected to experience over 30 days per year above 90°F by 2100.

These findings illustrate the pervasive nature of extreme heat risk and its potential for wide-ranging consequences.

Extreme heat directly threatens public health and increases the risk of power outages by placing significant strain on the electric grid. This combination is particularly concerning because critical services are most needed during heat events.

High temperatures can also accelerate bacterial growth in drinking-water systems and threaten our natural systems, compounding public health risks and stressing already-vulnerable ecosystems.

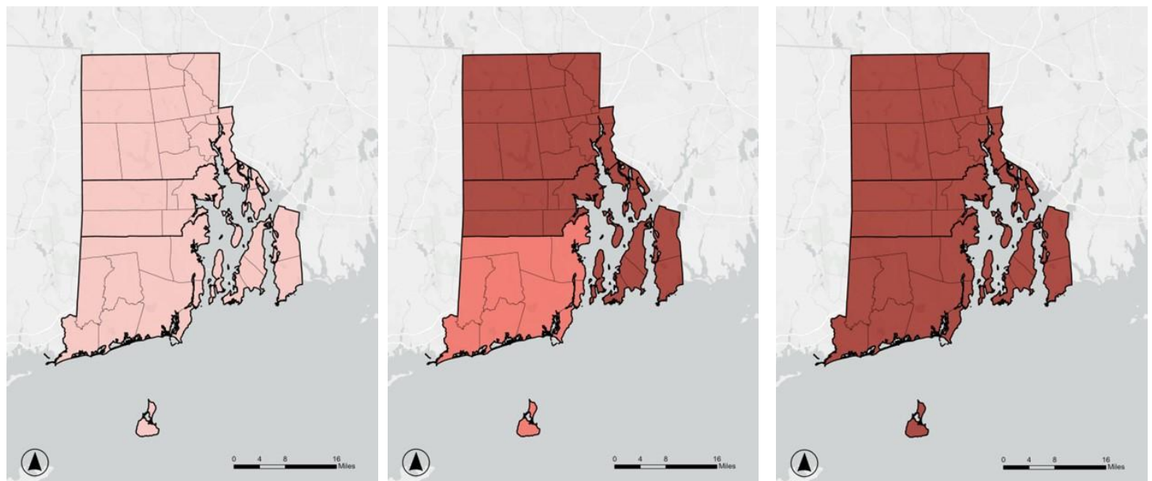


Hot summer day in Rhode Island
© Providence Journal

Extreme Heat is a Public Health Threat

During the second Community Forum, community members highlighted **housing, public transportation, and schools** as the assets most impacted by extreme heat and of highest concern.

Number of Annual Days Above 90 °F based on SSP5-8.5



Key Takeaways:

- Extreme heat is projected to become an increasingly significant hazard across all assets, with the number of days exceeding 90°F rising significantly through 2100.
- By 2100 under the SSP5-8.5 scenario, all counties are projected to experience over 30 days per year above 90°F.
- Providence County is projected to consistently experience the highest number of extreme heat days, followed by Kent and Bristol Counties.

Extreme Wind
Summary

This assessment found that approximately 50% of the assets assessed for extreme wind face high or very high risk by 2100.

All electrical transmission lines and public housing assets were identified to be at high or very high risk from extreme wind. Extreme wind can bring down overhead power lines and trees and cause significant damage to buildings. Cascading consequences from extreme wind events may include power outages, transportation disruption, costly repairs, and serious safety concerns.

Extreme wind can cause cascading impacts across Rhode Island's roads and electrical grid.

Community feedback highlighted tree health, power loss, and emergency access as concerns related to extreme wind, underscoring how wind-driven disruptions can quickly spread across multiple systems.

Key Takeaways:

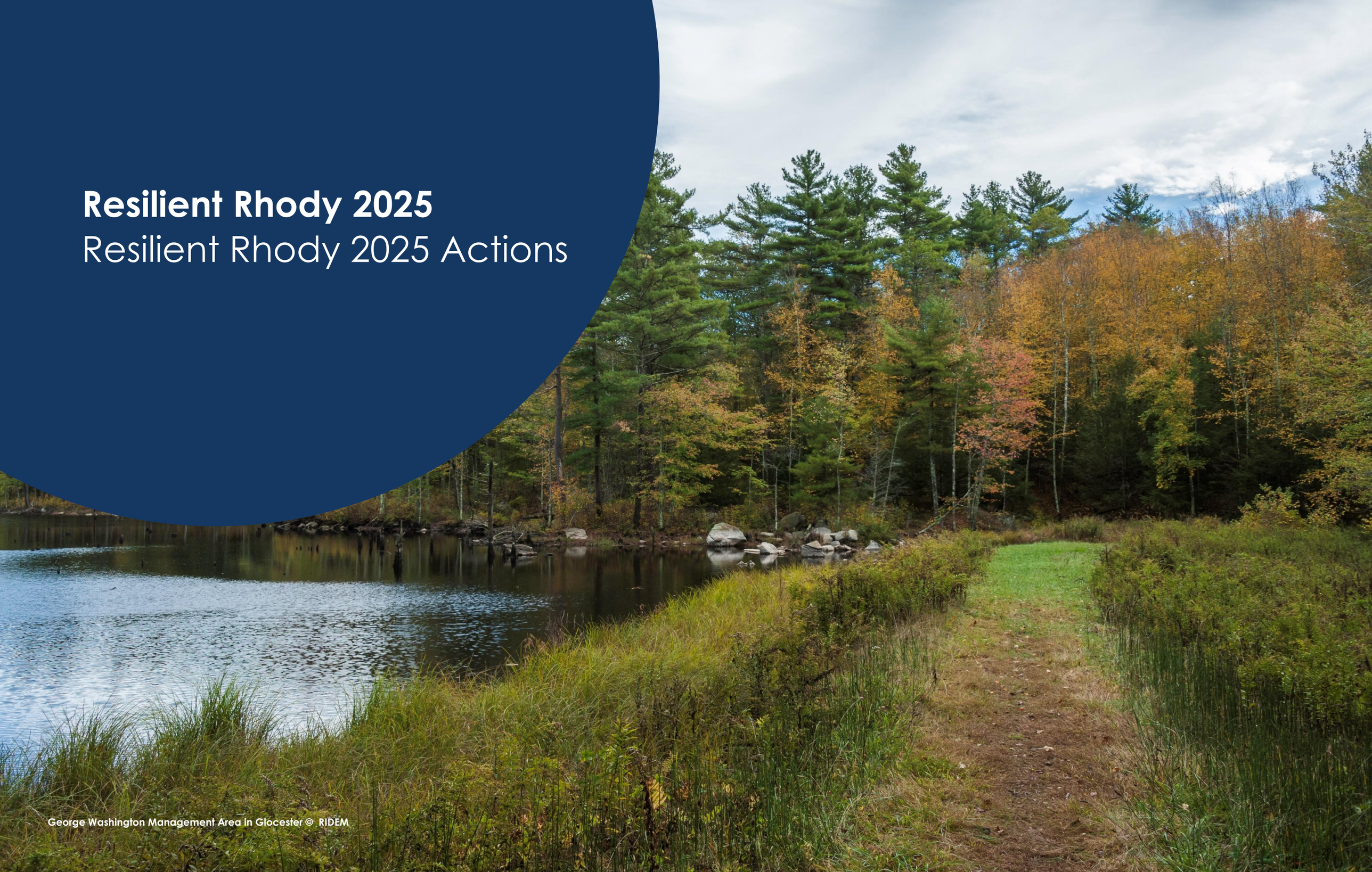
- Present-day extreme wind speeds are relatively consistent across counties, ranging from approximately 130 to 140 mph.
- By 2100, wind speeds are projected to rise sharply, with Newport and Washington counties projected to reach 150 mph.
- Newport and Washington Counties show the highest projected wind speeds across scenarios.



Downed tree and powerline from Hurricane Henri on Rhode Island's coastline © Stew Milne, AP

Resilient Rhody 2025

Resilient Rhody 2025 Actions



George Washington Management Area in Glocester © RIDEM

Introduction & Summary

The *Resilient Rhody 2025* Actions set bold, cross-agency goals to strengthen resilience across Rhode Island's systems and communities.

Building on the foundation of the original 61 actions from *Resilient Rhody 2018*, these actions aim to reduce climate-related risks, such as flooding, heat, and severe storms, while protecting critical infrastructure and essential services. They prioritize safeguarding natural resources, advancing equity, and enhancing community resilience, all while creating a framework for long-term investment and integrating climate considerations into state and local decision-making.

The 2025 Actions were developed through a multi-step process from January to November 2025.

The process commenced with a series of consultations involving state agencies and statewide partner organizations to review the existing *Resilient Rhody 2018* actions and to propose revisions and additions. Subsequently, current state resilience initiatives were consolidated into a structured database. This was followed by a comprehensive gap analysis to identify underrepresented assets and an assessment of adaptive capacity across agencies and municipalities.

Based on these findings, draft actions were developed incorporating new objectives. Upon iterative review by stakeholders, this effort culminated in the formulation of 79 finalized actions intended for statewide implementation.

This Plan outlines 79 Actions

38 actions focus on infrastructure asset types, addressing climate risks to critical systems.

18 actions strengthen community resilience, including new measures to address health impacts of climate hazards and expand financing for resilience solutions.

14 actions target natural systems, emphasizing preservation and restoration of vulnerable habitats.

9 actions enhance emergency preparedness, streamlining response procedures and improving coordination.

Asset Type	Number of Actions
Critical Infrastructure	**38**
Statewide Resilience: All Critical Systems	14
Drinking Water	4
Wastewater	3
Dams	1
Stormwater Infrastructure	3
Ports	2
Electric Grid	4
Fuel Supply	2
Roads, Bridges, and Culverts	3
Public Transportation	2
Natural Systems	**14**
Beaches and Barriers	5
Coastal Wetlands	3
Forests	4
Water Resources	2
Community Resilience	**18**
Community Health & Resilience	10
Resilience Funding	5
Cross Sector Resilience	3
Emergency Preparedness	**9**
Building Design and Construction	3
Evacuation Routes & Emergency Shelters	2
Emergency Services	4

Refer to Chapter 2: *Resilient Rhody 2025* Actions for all 79 Actions.

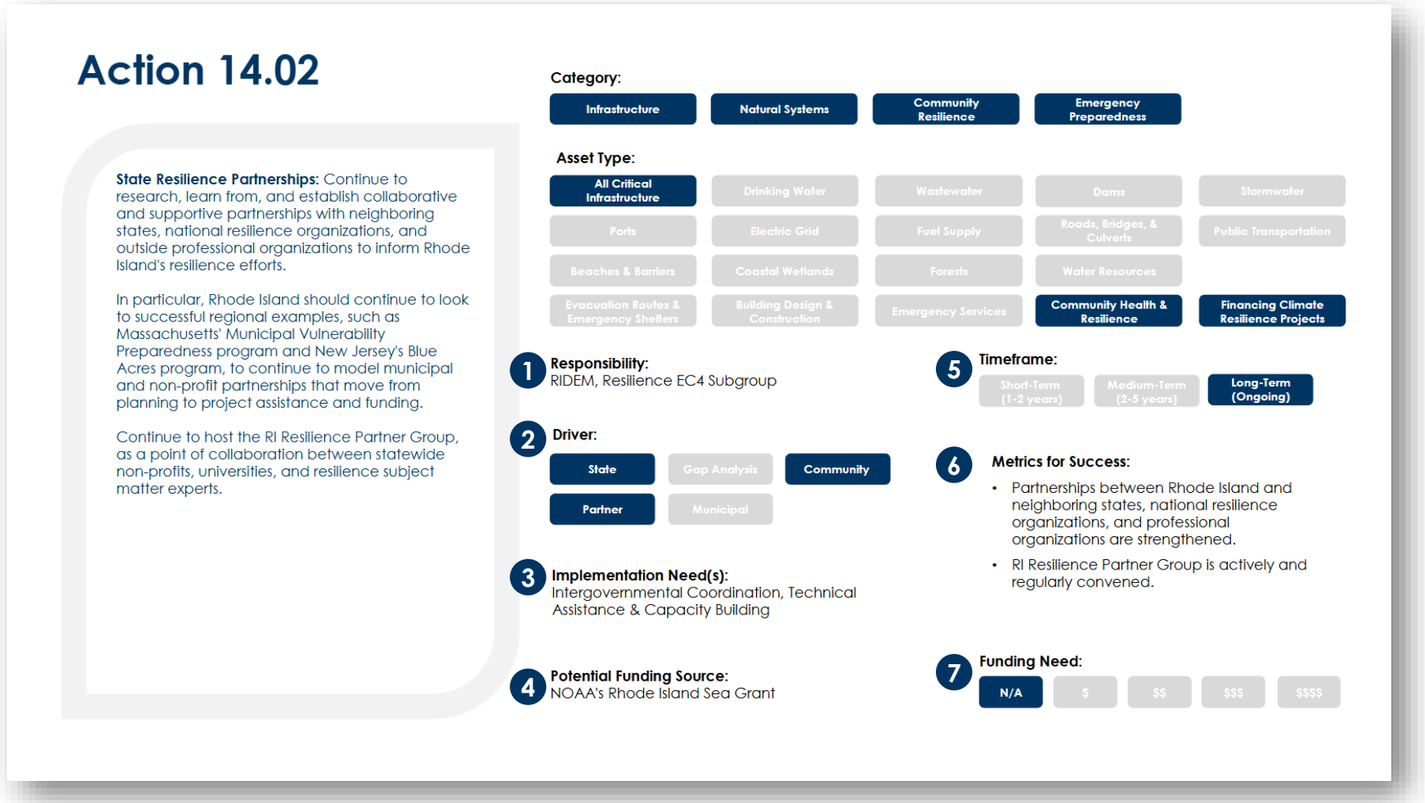
Contents

The *Resilient Rhody 2025* Actions articulate statewide programmatic priorities, outline funding needs, and designate responsible entities, while establishing metrics to evaluate success.

The *Resilient Rhody 2025* Actions use a numbering system as shown below. Each Action ID corresponds to the focus area based on the five thematic groups and asset categories established in the *Resilient Rhody 2018* framework. Each action is presented on its own page within the Plan, detailing the action ID, action, category, and asset type, along with the information outlined on the right.

Asset Types & IDs

1 - Drinking Water Systems
2 – Wastewater Treatment Facilities
3 - Dams
4 – Stormwater Infrastructure
5 - Ports
6 - Electric Grid
7 - Fuel Supply
8 - Roads, Bridges, and Culverts
9 - Public Transportation
10 - Beaches and Barriers
11 - Coastal Wetlands
12 - Forests
13 - Water Resources
14 - Statewide Resilience: All Critical Systems
15 - Building Design & Construction
16 - Evacuation Routes and Emergency Shelters
17 - Emergency Services
18 - Community Health & Resilience
19 - Financing Climate Resilience Projects
20 - Cross-Sector Coordination



1 **Responsibility**
Indicates the lead or partner entities responsible for the action.

2 **Action Driver**
Identifies the stakeholder group(s) that initiated, influenced, or recommended the action.

3 **Implementation Need(s)**
Indicates policy or legislative needs necessary to implement the action. These are categorized into four groups: Funding, Policy & Compliance, Tools & Training, & Coordination needs.

4 **Potential Funding Source**
Indicates potential funding sources ranging from federal, state, local, and innovative mechanisms.

5 **Timeframe**
Indicates short-term, medium-term, or long-term/ongoing actions.

6 **Metrics for Success**
Indicators of success to measure progress towards the action against.

7 **Funding Need**
Indicates the relative funding amounts necessary to carry forward the action. N/A indicates actions focused on advocacy, efficiency, or priority setting.

*All funding sources should be verified for current availability and applicability before pursuing them.

Resilient Rhody 2025
Climate Adaptation & Resilience Solutions



Prudence Island © RIDEM

Asset Prioritization Approach

Ten climate adaptation and resilience solutions were developed and costed based on assets identified as priorities within this Plan.

The Priority Assets List represented the outcome of a comprehensive vulnerability assessment, a structured prioritization process, and the integration of stakeholder feedback. The objective of this effort was to identify priority, high-risk assets across Rhode Island's infrastructure, natural systems, and community resilience networks.

The prioritization approach was designed specifically for the scope of this Plan. The applied criteria and methodology provided a consistent and structured process for identifying critical assets, while also incorporating community input. The Priority Assets List reflected herein therefore includes assets identified through engagement alongside those surfaced through the criteria-based process.

This list does not encompass all vulnerable assets within the state, nor did it reflect broader prioritization initiatives. A comprehensive database of all assets evaluated during this process has been provided to the State to support future planning and enable continued prioritization efforts beyond the scope of this initiative.

A three-step scoring framework was applied to narrow a broad list of high-risk assets into a shortlist of priority assets. This structured approach ensured consistency given the diversity and complexity of asset types. Assets identified through engagement were integrated into the shortlist to reflect community priorities.

Step 1: Statewide Climate Vulnerability Assessment

Assets determined to be at high or very high risk in the Statewide Climate Vulnerability Assessment were considered for inclusion in the prioritization process. This initial screening encompassed approximately 10,000 assets.

Step 2: Intra-Asset Comparison

Assets were evaluated within their respective categories using criteria tailored to each asset type, such as role in emergency response, service capacity, and redundancy. This process reduced the list to approximately 200 assets.

Step 3: Cross-Type Comparison

From an initial screening of approximately 200 assets, assets were compared across categories using a weighted scoring system. Weightings for criteria were developed based on aggregated feedback from stakeholder working sessions and community forums. This approach ensured alignment with the Plan's objectives and strategic priorities.

Category	Percentage of Total Points	Criteria
Need	**35%**	Life Safety (Health + Wellness Consequences)
		Urgency
		Criticality (Cross-Sector Interdependency)
		Redundancy
		Number of People Impacted
Equity and Community Support	**20%**	Supports Vulnerable Populations
		Community Supported
		Advances Environmental Justice
		Protects Economic Resources
Strategic Alignment	**25%**	Alignment with Local and Regional Planning Goals
		Identified in Multiple Resilience Planning Initiatives (HMPs, etc.)
Holistic Resilience	**20%**	Advances or Protects Biodiversity
		Provides Ecosystems Services or Co-benefits
		Supports Sustainability Goals or Initiatives
		Carries Cultural or Historical Value

Qualification

Prioritization within complex, interdependent systems is inherently challenging. There is no single definitive method for ranking assets, as infrastructure, communities, and ecological systems function as an interconnected network. No asset operates in isolation, and any prioritization approach necessarily simplifies the dynamic relationships that influence statewide resilience. This complexity is most evident in the State's natural systems, which underpin the State's built, community, and cultural infrastructure. Accordingly, this Plan affirms that protecting, managing, and restoring natural systems is not ancillary to resilience efforts but central to them, even if note explicitly highlighted among priority assets.

Review Process & Engagement Process

The Priority Assets List was developed through input gathered from multiple engagement streams, including community forums and municipal stakeholder sessions. Feedback was collected through virtual and in-person meetings utilizing interactive platforms such as Miro and Mentimeter.

After the list was narrowed to approximately 40 assets, sites identified during community forums, municipal stakeholder sessions, technical assistance meetings, and annual resilience updates were reviewed and added. Assets were then added or removed assets as appropriate, ensuring that the final list reflected both technical criteria and community priorities.

Regional Resilience Coordinators & Technical Assistance Packages

In June of 2025, Rhode Island Department of Environmental Management hired three Regional Resilience Coordinators to support the Chief Resilience Officer and local resilience efforts statewide as part of the agency's growing resilience team. These coordinators, covering three distinct regions (Coastal, Inland, and Urban), provide technical assistance to municipalities and communities for advancing their resilience priorities. To define local resilience needs and establish workplans, coordinators held introductory meetings with municipalities in their regions to establish Resilience Technical Assistance Packages (RTAPs) with cities and towns. To support the *Resilient Rhody 2025* priority asset identification process, coordinators compiled all 2026 priority resilience actions named by municipalities in their RTAPs for inclusion within this process.

Refer to Chapter 4: *Priority Assets List* for more information.

Priority Asset List

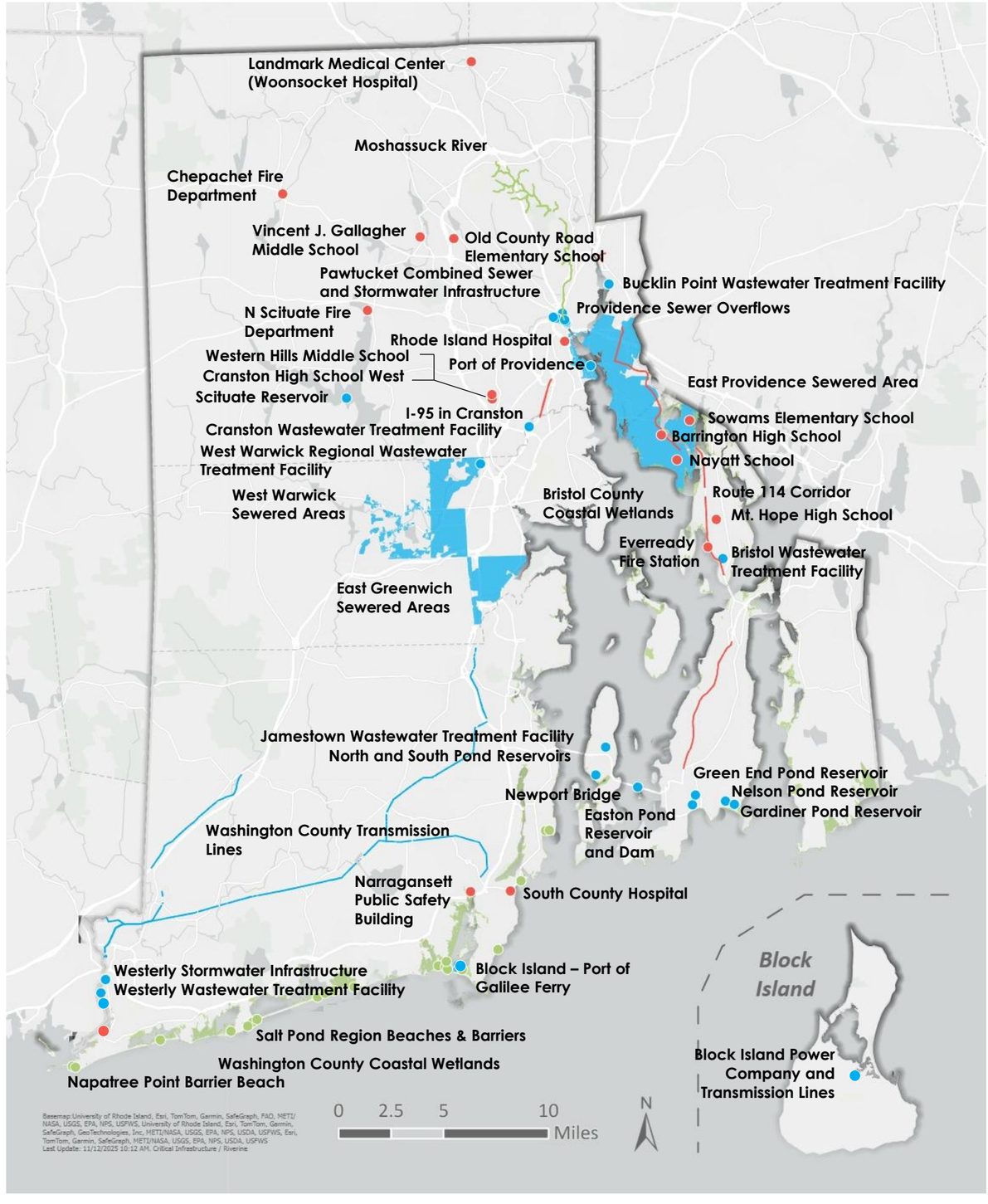
The adjacent map shows how the identified priority assets are distributed across the state.

These assets were identified as high-risk to one or more assessed hazards, aligned with prioritization criteria, and confirmed through the engagement process. These assets informed the ten developed and costed strategies described in Chapter 5: Climate Adaptation & Resilience Solutions.

Asset Category	Number of Priority Assets
Critical Infrastructure and Facilities	**25**
Natural Systems	**6**
Community Resilience and Emergency Preparedness Structures	**15**

Additional assets were identified through this planning process as critical to Rhode Island communities, particularly the **Fox Point Hurricane Barrier** and **Providence Station**. This Plan recognizes that ongoing initiatives are already addressing these locations. To prevent duplication of efforts, this Plan did not develop solutions for these assets. However, they remain priority areas, and this Plan supports projects at these locations through strategic alignment and recommends continued, dedicated efforts moving forward.

Refer to Chapter 4: *Priority Assets List* for the comprehensive list of assets identified within the scope of this Plan.



Assets

- **Critical Infrastructure & Facilities**
- **Natural Systems**
- **Community Resilience & Emergency Preparedness Structures**

Introduction

Building resilience against climate hazards demands strategic physical infrastructure improvements.

Therefore, to supplement the *Resilient Rhody 2025* Actions, the Plan presents ten targeted solutions designed to strengthen Rhode Island's resilience.

The solutions are tailored to priority assets identified through a statewide vulnerability assessment and stakeholder input. While grounded in these known priority assets, the guidance is designed to remain flexible and adaptable to additional assets as needs evolve.

These strategies serve as both a reference for viable alternatives to address relevant climate risks and a practical guide for municipal planners, state agencies, utilities, and partners to help move projects from risk identification to implementation.

Organization

Solutions are organized into three categories based on asset type:

- Critical Infrastructure,
- Natural Systems,
- Community Resilience and Emergency Preparedness

Contents

Each solution described includes:

- Strategy guidance
- Cost estimates
- Funding approaches

Refer to Chapter 5: *Climate Adaptation & Resilience Solutions* for more information.



Climate Adaption and Resilience Solutions
Sample Pages

Strategy Mechanisms

This Plan identifies four key mechanisms that explain how resilience strategies strengthen assets and communities.

These mechanisms—Protect, Accommodate, Restore, and Rethink—serve as a framework for understanding the different ways solutions function and interact to build resilience. Strategies may apply one or more of these mechanisms, working independently or in combination to address climate risks.

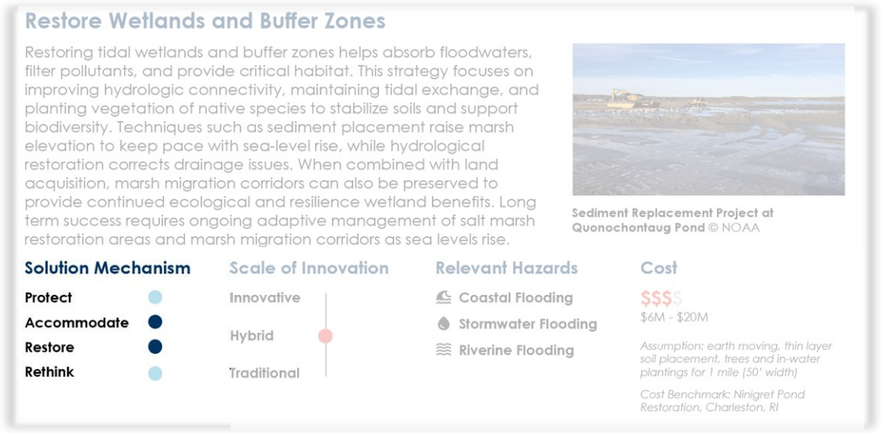
Protect strategies focus on defending vulnerable areas through physical or engineered measures, using approaches like landscape berms and shoreline protection that stabilize coasts.

Accommodate strategies emphasize adapting buildings, systems, and infrastructure to withstand changing conditions, such as building and infrastructure retrofits that elevate structures and reduce exposure to hazards.

Restore strategies prioritize rehabilitating natural systems to buffer against hazards, including nature-based solutions like green infrastructure that improves biodiversity and hydrologic function.

Rethink strategies involve reevaluating how Rhode Island plans its communities to steer growth away from high-risk areas, using tools such as zoning and regulatory updates to reduce long-term vulnerability.

Solution mechanisms are identified within each strategy description in Chapter 5: Climate Adaptation & Resilience Solutions to illustrate how the approach enhances resilience for the asset. For example, the Beach and Wetland System Restoration strategy, "Restore Wetlands and Buffer Zones," provides guidance on improving the health of wetlands and buffer zones through techniques that strengthen biodiversity and restore the hydrologic function of these critical areas. These solutions focus on restoring ecosystem health, which in turn enables these areas to better accommodate future conditions. Therefore, this strategy is marked with both relevant solution mechanisms.



Refer to Chapter 5: *Climate Adaptation & Resilience Solutions* for additional strategy descriptions.

Protect

Defend vulnerable areas using physical or engineered measures

Ex: Shoreline Protection

Engineered and natural barriers can stabilize coasts



Napatree Point © Yankee Magazine

Accommodate

Adapt buildings and infrastructure to withstand changing conditions

Ex: Building & Infrastructure Retrofits

Elevating and reinforcing structures can prevent hazards from impacting operations and occupants



Olneyville Resilience Hub © City of Providence

Restore

Rehabilitate natural systems to buffer against hazards

Ex: Green Infrastructure

Nature-based solutions like rain gardens can capture and filter stormwater while supporting biodiversity



Stormwater Infrastructure at Roger Williams Park
© Providence Stormwater Innovation Center

Rethink

Reevaluate planning strategies and support people, infrastructure, and critical assets relocate away from high-risk areas

Ex: Zoning and Regulation

Implementing land-use policies and development standards can help prevent growth in high-risk areas



Trustom Pond National Wildlife Refuge
© U.S. Fish and Wildlife Service

Strategies


Interstate 95 in Cranston © Kyle Kane for WPRI-TV

Road & Bridge Flood Mitigation Solutions

- Implement Nature-Based Solutions and Stormwater Infrastructure in Right-of-Ways
- Raise Emergency Access Roads
- Create Flood Barriers
- Consider Roadway Rerouting and Retreat


Port of Providence © Gridwealth

Resilient Port Infrastructure Solutions

- Integrate Dock and Pier System Improvements for Accessibility
- Elevate Bulkheads and Flood Barriers
- Design Hybrid Nature Based Solutions
- Install Energy and Backup Power Systems


Downed tree on electrical line in Rhode Island © The Providence Journal

Energy Resilience Solutions

- Expand Right-Of-Way (ROW) Area and Vegetation Management
- Create Alternative Transmission Routes
- Increase the Number of Interconnection Points
- Underground Transmission Lines in High-Risk Areas


Flooding at Salty Brine in Narragansett, RI © WJAR

Sewer & Stormwater Solutions

- Disconnect Infiltration/Inflow (I/I) Sources
- Increase Storm Drain Capacity
- Replace Undersized Culverts
- Harden Infrastructure in Floodplain
- Develop Nature-based Flood Storage
- Develop Green Stormwater Infrastructure
- Remove & Disconnect Impervious Coverage
- Stormwater Mitigation Funding Mechanisms


West Warwick Regional Wastewater Treatment Facility, © West Warwick Wastewater

Wastewater Treatment Facilities

- Protect or Relocate Facilities and Equipment
- Install Submersible Pumps and Ensure Access to Backup Pumps
- Provide Storage and Emergency Disinfection
- Redirect Sewage Flows, Where Possible


Scituate Reservoir © John Mernick for Shutterstock

Drinking Water & Reservoir Resilience

- Implement Watershed Management and Heat Reduction Measures
- Enhance Existing Emergency Spillway
- Improve Embankment
- Build a Desalination Plant


Trustom Pond National Wildlife Refuge © U.S. Fish and Wildlife Service

Beach & Wetland System Restoration

- Enhance Dynamic Dunes and Barriers
- Restore Wetlands and Buffer Zones
- Implement Voluntary Buyout Program


Moshassuck River Preserve © The Nature Conservancy

River and Stream Restoration

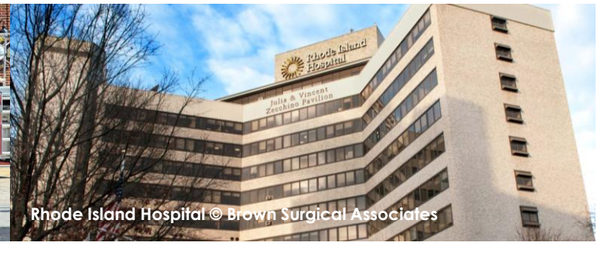
- Improve Water Quality with Green Infrastructure
- Reconnect Floodplains and Increase Riparian Buffer Capacity
- Restore Wetland Function
- Improve Watershed Hydraulics



North Scituate Fire Department, © North Scituate Fire Department

School & Public Safety Building Solutions

- Relocate Programming Out of Flood Zones
- Elevate Critical Infrastructure
- Retrofit and Reinforce
- Create a Resilience Hub and Microgrid



Rhode Island Hospital © Brown Surgical Associates

Hospital Flood & Energy Resilience Solutions

- Conduct Multi Hazard Mitigation Planning
- Comprehensive Floodproofing & Façade Enhancements
- Emergency Access Protective Measures
- Create Microgrids

This page presents the ten climate adaptation and resilience solutions and supporting strategies, designed and costed to strengthen the resilience of priority assets and communities across Rhode Island. Each solution provides strategic guidance, cost estimates, and funding approaches to assist municipal planners, state agencies, utilities, and partnerships in advancing projects.

Refer to Chapter 5: *Climate Adaptation & Resilience Solutions* for the full guidance.

Resilient Rhody 2025
Future Investment Strategy



East Beach © RIDEM, RI State Parks

Summary

This Plan provides a statewide strategy to advance the *Resilient Rhody 2025* Actions and Solutions by summarizing funding needs, implementation requirements, and specific funding pathways for each of the 79 Actions and the ten solutions.

Resilient Rhody 2025 Actions

Understanding funding and implementation requirements is critical to advancing the *Resilient Rhody 2025* actions. Each action includes an estimated funding need, developed through targeted research using cost ranges derived from prior state capital plans, comparable adaptation initiatives, and national benchmarks.

The total estimated funding needed to achieve the *Resilient Rhody 2025* Actions is $119M-$298M, not including construction costs.

The funding requirements span multiple categories, including supporting funding mechanisms, resilient infrastructure programs and initiatives*, planning and coordination activities, data and mapping, workforce development and capacity building, and updating standards and codes.

Rhode Island Department of Environmental Management (RIDEM) is associated with the greatest number of actions (eight) and the widest estimated funding needs range to achieve the *Resilient Rhody 2025* Actions.

Funding, Technical Assistance & Capacity Building are the most cited implementation needs to achieve the *Resilient Rhody 2025* Actions.

Climate Adaptation & Resilience Solutions

This Plan provides a recommended funding approach for the ten priority Climate Adaptation & Resilience Solutions, specifying primary funding mechanisms and the State's responsibilities in advancing these projects. By combining cost projections with targeted funding sources and governance requirements, the Plan equips state and local partners with practical tools to move projects from concept to implementation.

To implement the Actions and Solutions outlined in this Plan, significant funding will be essential for design and construction of physical projects. Two assessments, State Benchmarking and Solution Benchmarking, have been completed to establish a baseline for scaling this need.

The State Benchmarking analysis incorporates budget allocation trends from neighboring and peer states, contextualizing the scale and structure of resilience investments across the region. These insights are intended to support future funding decisions.

Massachusetts has adopted a structured approach to resilience funding by establishing a statutory framework that sets a goal of allocating one percent of its state budget to environmental and climate-related initiatives, including resilience. If Rhode Island adopted a similar allocation model, **the State could advance adaptation and resilience solutions across its highest risk assets.**



Sample Page of the Future Investment Strategy

Solution-Specific Funding Strategies

These solutions will require complex coordination, substantial capital investment, and consistent state leadership to advance. Therefore, each solution demands a tailored, actionable funding strategy rather than a one-size-fits-all approach.

Each strategy outlines viable funding or financing tools that can strengthen competitiveness or meet match requirements, and the optimal sequencing of activities. In addition, each solution defines the State's role in providing data, technical assistance, permitting support, and cross-agency coordination to accelerate implementation.

Refer to Chapter 6: *Future Investment Strategy* for further information on solution-specific funding strategies.

*Costs associated with the design and construction of resilient infrastructure projects are not included in this estimate. This will require project-specific construction cost analysis which will significantly influence the Action's total funding needs depending on the scope and number of projects pursued. These actions include qualifications on their respective pages in Chapter 2: *Resilient Rhody 2025* Actions to acknowledge the significant investment required for large-scale implementation.

A Framework for Prioritizing & Funding Resilience Solutions

Rhode Island's climate resilience priorities extend beyond the Priority Asset List and ten representative solutions described herein.

This Plan therefore includes Chapter 8: Prioritization Framework to provide an effective, transparent, and equitable roadmap to support state and local climate leaders systematically evaluate other candidate assets and projects.

The process below outlines how the State and local leaders can employ the Prioritization Framework to continue planning for and beyond the ten priority solutions and priority assets.

Step 1: Apply the **Asset Prioritization Framework** Criteria to Vulnerable Assets

Step 2: Apply the **Project Prioritization Framework** to Priority Assets

Step 3: Match High-Priority Projects to Available **Funding Mechanisms**

Step 4: Define the State's Specific **Support Role** for Each Project

Refer to Chapter 4: *Priority Assets Lists* for more information on the prioritization process used to identify priority assets for solution development included in this Plan.

Step 1: Apply the **Asset Prioritization Framework** Criteria to Vulnerable Assets

Criteria		
Need: How vital an asset is to the safety, stability, and functioning of interconnected systems or sectors.	N1	**Life Safety**
	N2	**Urgency**
	N3	**Criticality**
	N4	**Redundancy**
	N5	**Number of People Impacted**
Equity and Community Support: Whether an asset serves or protects vulnerable populations, aligns with community priorities, promotes environmental justice, and protects economic opportunities.	E1	**Supports Vulnerable Populations**
	E2	**Community Supported**
	E3	**Advances Environmental Justice**
	E4	**Protects Economic Resources**
Strategic Alignment: How well an asset aligns with broader municipal, regional, or resilience planning goals, including comprehensive and hazard mitigation planning efforts.	S1	**Alignment with Local/Municipal Goals**
	S2	**Identified in Multiple Planning Initiatives**
Holistic Resilience: Whether an asset contributes to long-term environmental, cultural, and social well-being beyond its primary function.	H1	**Advances or Protects Biodiversity**
	H2	**Provides Ecosystems Services or Co-Benefits**
	H3	**Supports Sustainability Goals or Initiatives**
	H4	**Carries Cultural or Historical Value**

Step 2: Apply the **Project Prioritization Framework** to Priority Assets

Criteria		
Cost Factors: Captures the overall financial commitment required to implement and sustain the project.	C1	**Initial Capital Costs**
	C2	**Ongoing Costs**
	C3	**Cost of Doing Nothing**
	C4	**Potential Economy of Scale**
Impact: Reflects the extent to which the project benefits people and businesses in the broader community.	I1	**Impacted Populations**
	I2	**Economic Resilience and Business Impact**
	I3	**Number of Assets and Services Impacted**
	I4	**Ecosystem Health and Environmental Resilience**
Lifespan: Indicates how long the investment will deliver value and remain functional without major reinvestment or degradation in performance.	S1	**Longevity of Investment**
Implementation and Maintenance Feasibility: Measures the ease of successful implementation based on funding availability, organizational capacity, and project complexity.	F1	**Funding Source**
	F2	**Leading Entity**
	F3	**Complexity**
	F4	**Adaptability**

A Framework for Prioritizing & Funding Resilience Solutions, Cont.

Step 3: Match High-Priority Projects to Available **Funding Mechanisms**

To support the implementation of *Resilient Rhody 2025*, a comprehensive inventory of funding mechanisms was developed and mapped to each Action and the ten solutions outlined in Chapter 7: Funding & Financing Mechanism Inventory.

Potential funding sources are organized into three categories: federal funding, state funding, and non-traditional funding.* The list on the right provides a summary of state and non-traditional funding sources available.

Step 4: Define the State's Specific **Support Role** for Each Project

This Plan outlines the role the State can play in advancing the diverse resilience solutions identified herein. It defines how the State can provide critical support—such as technical assistance, funding guidance, regulatory coordination, and equity integration—to ensure projects move from planning to implementation and deliver long-term benefits for Rhode Island's communities and natural resources.

Rhode Island's Evolving Funding Approach**

Initially, Rhode Island supported resilience projects through solely grant funding. Rhode Island's Municipal Resilience Fund is the capital deployment arm of the state's broader Municipal Resilience Program. The program begins with a structured, collaborative risk assessment and planning process in which municipalities receive support to identify and prioritize locally relevant resilience projects. This is an essential first step for smaller or under-resourced jurisdictions, as they may not have in-house climate planning capacity. Thus, the program is designed for more equitable delivery, not just scaled delivery, of vital capital.

This approach succeeded at promoting resilience planning on a small scale, however as demand grew and project size increased, it became clear that a more durable, sustainable financing method was needed. In response, the Rhode Island Infrastructure Bank shifted toward a has leveraged a loan model through the Resilient Rhody Infrastructure Fund (RRIF), using its experience managing state revolving funds to offer long-term, low-cost capital. On a conservative basis, every $1 in public resources can now support $3 in project costs. This turns a finite pool of funds into a self-renewing and significantly more powerful platform to meet mounting demand.

Once projects are ready for implementation, the Rhode Island Infrastructure Bank can now provide funding through a mix of revolving loan capital, state bond proceeds, green bonds, and federal infrastructure funding. The result is a layered sustainable financing model that does not rely on a single funding source. Among other strengths, this model enables small cities and towns to punch above their fiscal weight, accessing both capital and expertise without needing to master the complex mechanics of resilience finance.

**Muro, M., & Kammen, D. (2024, October 31). *Rethinking our assumptions and financing tools for community resilience in the face of growing climate loss and risk.* Brookings. https://www.brookings.edu/articles/rethinking-our-assumptions-and-financing-tools-for-community-resilience-in-the-face-of-growing-climate-loss-and-risk/

State Funding Mechanisms*

Rhode Island Infrastructure Bank (RIIB)

- Resilient Rhody Infrastructure Fund
- Municipal Resilience Program (MRP)
- Municipal Infrastructure Grant Program (MIGP)
- Clean Water State Revolving Fund (CWSRF)
- Drinking Water State Revolving Fund (DWSRF)
- Stormwater Project Accelerator (SPA)
- Municipal Road & Bridge Revolving Loan Fund (MRBRF)

Rhode Island Department of Environmental Management (RIDEM)

- RI Climate Resilience Fund (CRF)
- Bay and Watershed Restoration Fund
- State Land Conservation Program
- Local Open Space Grants
- Wastewater Treatment Facility Resilience Fund (RIDEM & RI Infrastructure Bank – RIIB)
- Ocean State Climate Adaptation & Resilience Fund (OSCAR) (RIDEM & RI Coastal Resources Management Council – CRMC)

Additional State Programs

- RI Green Economy and Clean Water Bonds (State of RI)
- RI Department of Transportation Capital Improvement Program (RIDOT)
- Energy Resilience & Emergency Planning (RI Office of Energy Resources – OER)

Non-Traditional Funding Mechanisms

- Tax Increment Financing (TIF)
- Special Assessment Districts
- Developer Impact Fees / Resilience Exactions
- Transfer of Development Rights (TDR)
- Catastrophe / Resilience Bonds
- Blue Bonds
- Environmental Impact Bonds
- Dedicated Utility Fees
- Community-Based Public-Private Partnerships (CBP3)
- Parametric Insurance
- Insurance Premium Discounts

Refer to Chapter 2: *Resilient Rhody 2025 Actions* and Chapter 5: *Climate Adaptation & Resilience Solutions* for a detailed overview of the recommended funding mechanisms mapped to each priority. Refer to Chapter 6: *Future Investment Strategy* for additional funding guidance by solution type.

*All funding sources should be verified for current availability and applicability before pursuing them.

Assumptions and Qualifications

Data & Information

This report relies on information provided by others to determine current and future climate conditions for hazard and risk assessment and to develop resilience solutions. Arup does not accept responsibility for the content, including the accuracy and completeness, of such information. Arup emphasizes that the forward-looking projections, forecasts, or estimates, are based upon interpretations or assessments of available information at the time of this project.

Priority Assets, Resilience Strategies & Jurisdiction

The current and future natural hazard exposure and risk of any site is dependent on many factors beyond Arup's control, including uncertainties around existing project sites and their construction details, natural hazards, and climate change.

Any climate resilience strategy includes potential residual risks. The resilience solutions described in this report are not guaranteed nor intended to eliminate all climate risk but are intended to be a tool to reduce climate-related damage and/or disruption. Arup shall not be responsible for damages or impacts associated with the performance of the climate resilience systems.

The realization of the prospective risks is dependent upon the continued validity of the assumptions on which it is based. Actual events frequently do not occur as expected, and the differences may be material. For this reason, Arup bears no responsibility for the realization of any projection, forecast, opinion or estimate. Findings are time-sensitive and relevant only to current conditions at the time of writing.

This plan does not confirm the feasibility or effectiveness of the strategies outlined as they relate to the designated Priority Assets. It provides a framework of specific steps to advance the proposed solutions from initial identification through to potential implementation. All proposed strategies require comprehensive due diligence, stakeholder engagement, detailed planning, design, and costing for each strategy and location identified.

Actions and strategies outlined in this plan may fall under municipal rather than state jurisdiction. Therefore, successful implementation of these actions may require local participation and coordination.

Costing

Cost estimates for each solution type are categorized as Class 5 based on the Association for the Advancement of Cost Engineering International (AACEi) cost estimate classification matrix based on indicative scope and benchmark projects.

The accuracy range for these class 5 cost estimates are assumed to be +100% / -50%.

Benchmark projects are sourced from desktop research and Arup's internal database. Benchmark costs are normalized to Rhode Island cost basis using location factors from RS Means. Benchmark costs are escalated to 2025 cost basis using the Construction Cost Index (CCI) from Engineering News Record (ENR).

Scope assumptions are made based on benchmark projects, proposed scope to be included, and sized relative to other strategies considering possible size of potential future projects. Parametric costing (utilizing a defined quantity and unit rate) is employed where possible. Allowances are estimated to account for scope intended to be included in the project when sufficient detail or context for parametric costing was not available.

Costs for actual projects will vary based on a variety of factors including but not limited to defined extent of scope, project-specific risks, site constraints, environmental scope, construction delivery method, stakeholder engagement, funding mechanisms, existing asset operations and potential downtime, and/or market factors.

Funding

Funding sources were identified in Summer 2025 and represent a point in time assessment. This plan does not guarantee the availability, continuation, or applicability of these sources.

All funding sources should be verified for current availability and applicability before pursuing them.

Due to changing federal priorities in both policy and funding, agencies across state government have been facing challenges in program implementation. As these changes impact agency resources including the state budget, timelines and commitments will shift, as necessary.



Nag Marsh Sunset © Narragansett Bay National Estuarine Research Reserve (NBNERR)

Glossary of Acronyms

Federal Agencies and Programs
CDC: Centers for Disease Control
DOD: Department of Defense
- DCIP: Defense Community Infrastructure Program
- OLDCC: Office of Local Defense Community Cooperation

DOE: Department of Energy
- SEP: State Energy Program

DOT: Department of Transportation
- FHWA: Federal Highway Administration
- MARAD: Maritime Administration

EPA: Environmental Protection Agency
- SNEP: Southeast New England Program

FEMA: Federal Emergency Management Agency
- NFIP: National Flood Insurance Program
- FIRM: Flood Insurance Rate Map
- PAPPG: Public Assistance Program and Policy Guide

NOAA: National Oceanic & Atmospheric Administration
- CELCP: Coastal & Estuarine Land Conservation Plan

NPS: National Park Service
USACE: United States Army Corps of Engineers
USDA: United States Department of Agriculture
USFS: United States Forest Service
- NRCS: Natural Resources Conservation Service

USFWS: United States Fish & Wildlife Service
USGS: United States Geological Survey
- 3DEP: 3D Elevation Program

Federal Funding Sources
BRACE: Building Resilience Against Climate Effects
BRIC: Building Resilience in Communities Grant Program
CAP: Continuing Authorities Program
CDBG: Community Development Block Grant
CMAQ: Congestion Mitigation & Air Quality Improvement Program
CRSCI: Climate-Ready States & Cities Initiative
CSP: Conservation Stewardship Program
CZM: Coastal Zone Management Program & Grants
ELP: Environmental Literacy Program
EPMG: Emergency Management Performance Grant
EPSCoR: Established Program to Stimulate Competitive Research
EQIP: Environmental Quality Incentives Program
EWP: Emergency Watershed Protection Program
FMA: Flood Mitigation Assistance Grant Program
HPF: Historic Preservation Fund
IIJA: Bipartisan Infrastructure Law
IRA: Inflation Reduction Act
LIHEAP: US Department of Health and Human Services Low Income Energy Assistance Program
NBEP: Narragansett Bay Estuary Program
NCRF: National Coastal Resilience Fund
NCWCG: National Coastal Wetlands Conservation Grants
NDSP: National Dam Safety Program
NEP: National Estuary Program
NRCS: Natural Resources Conservation Service Incentives
PRO Housing Grant Program: Pathways to Removing Obstacles to Housing Grant Program
PROTECT: Promoting Resilient Operations for Transformative, Efficient, & Cost-saving Transportation Program
REAP: Rural Energy for America Program
REPI: Readiness & Environmental Protection Integration Program
RISG: Rhode Island Sea Grant Program
SOAR: SNEP Opportunity to Advance Resilience
SWIG: SNEP Watershed Implementation Grants
WFIA: Water Infrastructure Finance & Innovation Act
WCPP: Wildlife Crossings Pilot Program
WPDG: Wetland Program Development Grants

State Agencies and Programs
CRMC: Rhode Island Coastal Resources Management Council
- **CEHRTF:** Coastal & Estuarine Habitat Restoration Trust Fund

DBR: Rhode Island Department of Business Regulation
DHS: Rhode Island Department of Human Services
EC4: Rhode Island Executive Climate Change Coordinating Program
EOHHS: Rhode Island Executive Office of Health & Human Services
HEZ: Health Equity Zones
OER: Rhode Island Office of Energy Resources
- **SESP:** State Energy Security Plan

RIDE: Rhode Island Department of Education
- **CTE:** Career and Technical Education

IDEM: Rhode Island Department of Environmental Management
- **CRO:** Chief Resilience Officer
- **RISDISM:** Stormwater Management, Design, & Installation Rules

RIDLT: Rhode Island Department of Labor & Training
RIEMA: Rhode Island Emergency Management Agency
RIGIS: Rhode Island Geographic Information Systems
RIIB: Rhode Island Infrastructure Bank
- **SPA:** Stormwater Project Accelerator

RIDOH: Rhode Island Department of Health
- **RIWARN:** Rhode Island Water/Wastewater Agency Response Network

RIDOT: Rhode Island Department of Health
- **CIP:** RIDOT Capital Improvement Program

State Agencies and Programs
RIPDES: Rhode Island Pollution Discharge Elimination System
STIP: Statewide Transportation Improvement Program
IRA: Inflation Reduction Act
WRB: Water Resources Board

State Funding Sources
OER: Rhode Island Office of Energy Resources
- **REF:** Renewable Energy Fund
- **RGGI:** Regional Greenhouse Gas Initiative

RIDEM: Rhode Island Department of Environmental Management
- **CRF:** Rhode Island Climate Resilience Fund
- **OSCAR:** Ocean State Adaptation and Resilience
- **WWTFRF:** Wastewater Treatment Facility Resilience Fund

RIIB: Rhode Island Infrastructure Bank
- **C-PACE:** Commercial Property Assessed Clean Energy
- **CPAF:** Community Project Assistance Fund
- **CSSLP:** Community Septic System Loan Program
- **CWSRF:** Clean Water State Revolving Fund
- **DWSRF:** Drinking Water State Revolving Fund
- **EBF:** Efficient Building Fund
- **MIGP:** Municipal Infrastructure Grant Program
- **MRP:** Municipal Resilience Program
- **MRBRF:** Municipal Road & Bridge Revolving Loan Fund
- **RRIF:** Resilient Rhody Infrastructure Fund

Schools
CCRI: Community College of Rhode Island
RIC: Rhode Island College
RISD: Rhode Island School of Design
URI: University of Rhode Island

Data and Modeling Sources
ASCE: American Society of Civil Engineers
GDDP: NASA Earth Exchange Global Daily Downscaled Projections
HAZUS: Hazards United States
HEC-RAS: Hydrologic Engineering Center–River Analysis System
IPCC AR6: Intergovernmental Panel on Climate Change Sixth Assessment Report
MarshRAM: Statewide Coastal Rapid Assessment Method
NRCC: Northeast Regional Climate Center
RI-CHAMP: Rhode Island Coastal Hazards Modeling and Prediction
SVI: Social Vulnerability Index
SWMM: EPA Stormwater Management Model
UTCI: Universal Thermal Climate Index

Data and Modeling Sources (cont.)
URI EDC: University of Rhode Island Environmental Data Center
SewerGEMS: Sewer Geospatial Engineering Modeling System
SLAMM: Sea Level Affecting Marshes Model Maps

Other
AACEI: Association for the Advancement of Cost Engineering International
APA: American Planning Association
ARCCA: California Alliance of Regional Collaboratives for Climate Adaptation
BIPC: Block Island Power Center
CCO: University of Oregon Climate Change in Oregon Data Portal
CFROD: Boston Coastal Flood Resilience Overlay District
CIG: University of Washington Climate Impacts Group Data Hub
CRO: Norfolk Coastal Resilience Overlay Zone Update
CRRA: New York Community Risk and Resiliency Act
CSCI: The Climate Smart Communities Initiative
DEEP: Connecticut Department of Energy & Environmental Protection Climate Resilience Fund
DEP: New Jersey Department of Environmental Protection Blue Acres
EAP: Emergency Action Plan
ETAA: Illinois Energy Transition Assistance Act
FMPRA: California Floodplain Management, Protection, & Risk Awareness Grant Program
FTE: Full-Time Equivalent
GLISA: University of Michigan Great Lakes Integrated Sciences & Assessments
HEZ: Health Equity Zone
IBC: International Building Code
IBHS: Insurance Institute for Business & Home Safety
ISR: Infrastructure, Safety, and Reliability Filings
MVP: Massachusetts Municipal Vulnerability Preparedness Program
NCCF: North Carolina Coastal Federation
NCRF: National Coastal Resilience Fund
NEIWPCC: New England Interstate Water Pollution Control Commission*
NFWF: National Fish and Wildlife Foundation
NBC: Narragansett Bay Commission
NRDC: Natural Resources Defense Council
NYSARP: New York State Adaptation & Resilience Plan
PPL: Project Priority List
RIE: Rhode Island Energy
RMAT: Resilient Massachusetts Action Team Climate Resilience Design Standards Tool
SCV: Statewide Climate Vulnerability Assessment
SEA Streets: Street Edge Alternatives

Glossary of Technical Terms

Key Terms

Climate Resilience The capacity of individuals, institutions, businesses, and natural systems within Rhode Island to survive, adapt, and grow no matter what chronic stresses and weather events they experience. While the effects of climate change are felt across the state, these impacts are not equally distributed. Effective climate resilience requires a focus on environmental justice and equity to support local leadership for sustained interaction between community, business, and government.

Adaptive Capacity The ability of a community, agency, or system to adjust its practices and use its resources, including redundancies, to respond effectively to change.

Climate Mitigation Reducing emissions of heat-trapping greenhouse gases into the atmosphere.

Engineering Terms

BFE: Base Flood Elevation Water surface elevation resulting from the flood having a 1-percent chance of being equaled or exceeded in any given year.

CSO: Combined Sewer Overflows A sewer system that collects rainwater runoff, domestic sewage, and industrial wastewater into one pipe.

EUL: End of Useful Life The point at which an asset can no longer safely, effectively, or economically perform its intended function.

GSI: Green Stormwater Infrastructure Infrastructure that uses natural processes such as filtration, infiltration, and evapotranspiration to treat stormwater where it falls.

HRU: Hydrologic Response Unit Areas of common physical characteristics that are expected to respond to precipitation and weather events in a similar way.

I/I: Infiltration/Inflow Sources Sources of water other than domestic wastewater that enters sanitary sewer systems.

LIDAR: Light Detection and Ranging A remote sensing method that uses light in the form of a pulsed laser to measure ranges to the Earth and generate information about the Earth's shape and surface.

MHHW: Mean Higher High Water The average of the higher of the two daily tides observed over a 19-year period.

NbS: Nature-based Solutions Infrastructure projects that intentionally use natural and nature-based habitats and processes to reduce risks and deliver multiple benefits.

PER: Preliminary Engineering Report A technical planning document that assesses the viability, cost, and environmental impact of a proposed project before final design.

ROW: Right-of-Way A legal right granted to pass through or use another person's land for a specific purpose, such as transportation, utilities, or access to support essential infrastructure.

SCP: Stormwater Control Plan A regulated document outlining site-specific strategies and best management practices to control, treat, and minimize pollutants in stormwater runoff.

SLR: Sea Level Rise An increase in the total volume of ocean water over time, driven in part by melting glaciers and polar ice sheets.

SSO: Sanitary Sewer Overflow A release of untreated or partially treated sewage from a municipal sanitary sewer.

STU: Stormwater Treatment Unit Infrastructure that improves stormwater runoff quality, reduces runoff volume, and/or reduces runoff peak flow.

TMDL: Total Maximum Daily Load The maximum amount of a pollutant a waterbody can receive while still meeting water quality standards, along with the pollutant reduction targets assigned to its sources.

WWTF: Wastewater Treatment Facility Facilities that remove contaminants from sewage and wastewater.

Planning & Policy Terms

ADA: Americans with Disabilities Act A federal civil rights law that prohibits discrimination against people with disabilities.

CBO: Community-Based Organization A nonprofit that represents its community and provides educational or related services.

CBP3: Community-Based Public-Private Partnership A partnership between a local government and a private entity with the goal of providing cost-effective, high-quality services.

CCMP: Comprehensive Conservation and Management Plans Document that establishes priorities for activities, research, and funding for the Narragansett Bay Estuary.

EJ: Environmental Justice The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.

GJZ: Green Justice Zone Areas that face a legacy of public health burdens, environmental degradation, and socioeconomic stressors, but are prioritized for resources and support at a variety of levels to implement community-based solutions to achieve change.

MPO: Metropolitan Planning Organization An agency created by federal law to provide local elected officials input into the planning and implementation of federal transportation funds to metropolitan areas with populations of greater than 50,000.

NOFO: Notice of Funding Opportunity A publicly available document by which a Federal Agency makes known its intentions to award discretionary grants or cooperative agreements.

RCP: Representative Concentration Pathways Plausible future scenarios of carbon dioxide emissions and possible reductions in atmospheric concentration.

RFP: Request for Proposals A solicitation method which communicates the government's requirements and requests proposals.

RLF: Resilience Loan Fund A specialized financing mechanism designed to provide loans and capital to fund projects that build resilience to natural hazards.

SAMP: Special Area Management Plan A plan used to collect and examine data, identify potential development trends and anticipates conflicts between different uses. In coastal areas.

SSP: Shared Socioeconomic Pathways A set of narratives describing possible future development pathways in relation to its use of fossil fuels and the social and economic factors which drive fossil fuel use.

SSP2-4.5: Intermediate Emissions Scenario where carbon dioxide emissions continue around current levels until 2050, then decrease but do not reach net zero by 2100.

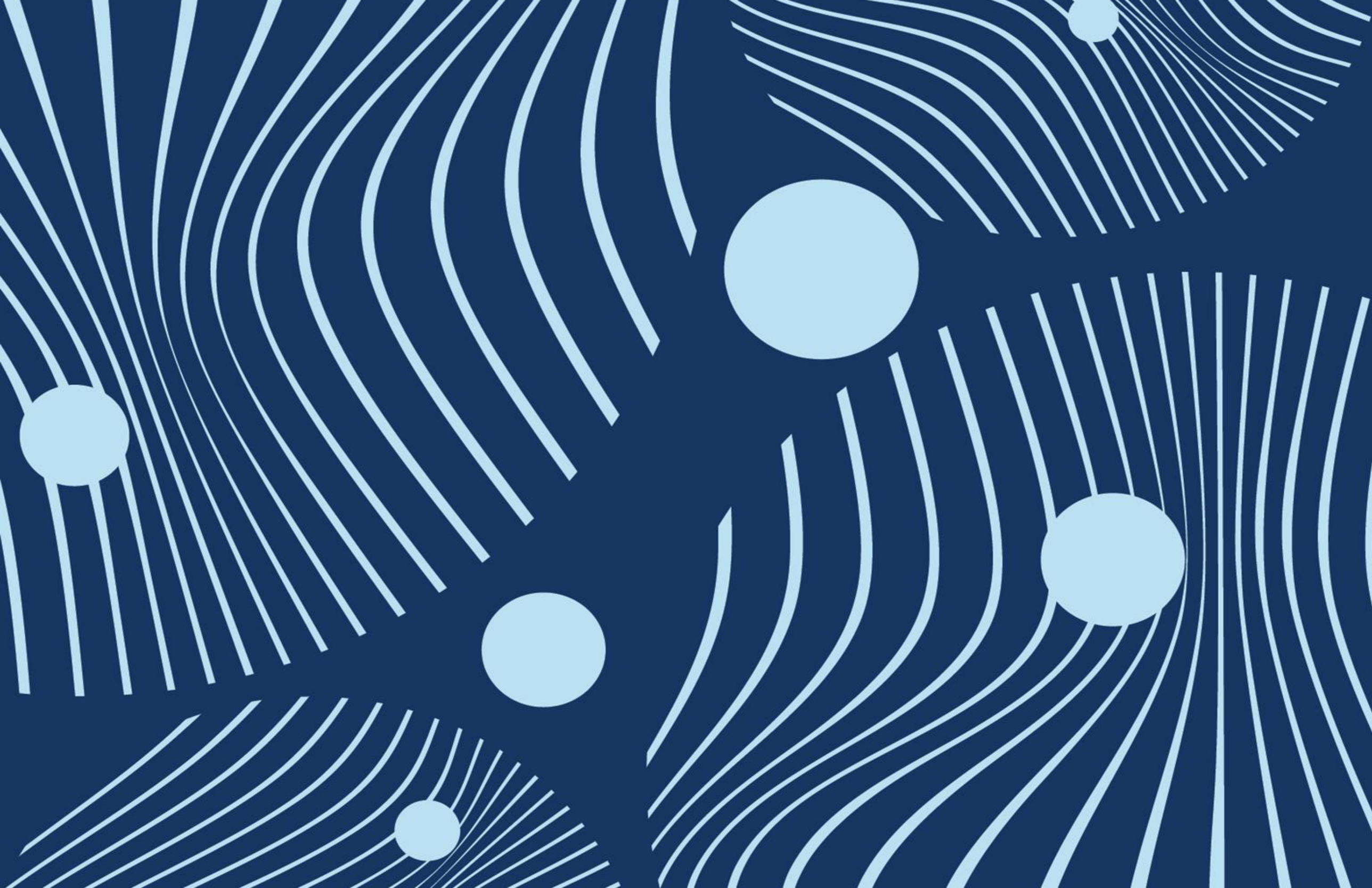
SSP5-8.5: Very High Emissions Scenario characterized by continued growth in carbon dioxide emissions throughout the 21st century, driven by heavy reliance on fossil fuels, with emissions increasing substantially by 2100.

TAP: Technical Assistance Package A support mechanism funded by potentially responsible parties that enables community groups to retain the services of an independent technical advisor.

TDR: Transfer of Development Rights The transfer of development rights from land in a sending area to land in designated receiving areas.

TIF: Tax Increment Financing A value capture tool that uses taxes on future gains in real estate values to pay for new infrastructure.

WUI: Wildland-Urban Interface: The zone of transition between unoccupied land and human development.



Chapter 1
Community Engagement Summary Report

Engagement Process & Goals

The community engagement process for *Resilient Rhody 2025* was designed to ensure that local voices and lived experiences meaningfully shaped the plan's direction.

Through a series of community forums, municipal stakeholder meetings, and a dedicated Health Equity Zone session, the project team sought to understand the diverse needs, challenges, and aspirations of residents and partners across the state. These conversations provided critical context and helped ground the project's strategies in the realities of those most affected.

As a culmination of this work, this final engagement summary report presents a record of who participated, what was shared, and which priorities emerged across the various engagement activities. The purpose of this document is to capture the conversations from community members and municipal stakeholder who attended the engagement meetings for *Resilient Rhody 2025*.

Resilient Rhody 2025 Engagement Goals

1. **Build** trust and interest.
2. **Learn** about community priorities and concerns.
3. **Gather** local knowledge and insights.
4. **Grow** communities' awareness of the Plan.

Engagement Meetings

04

Community Forums

With a total of **116 attendees**

+

06

Municipal Stakeholder Meetings

With a total of **130 attendees**

+

01

HEZ Frontline Community Forum

With a total of **42 attendees**

=

11

Total Meetings

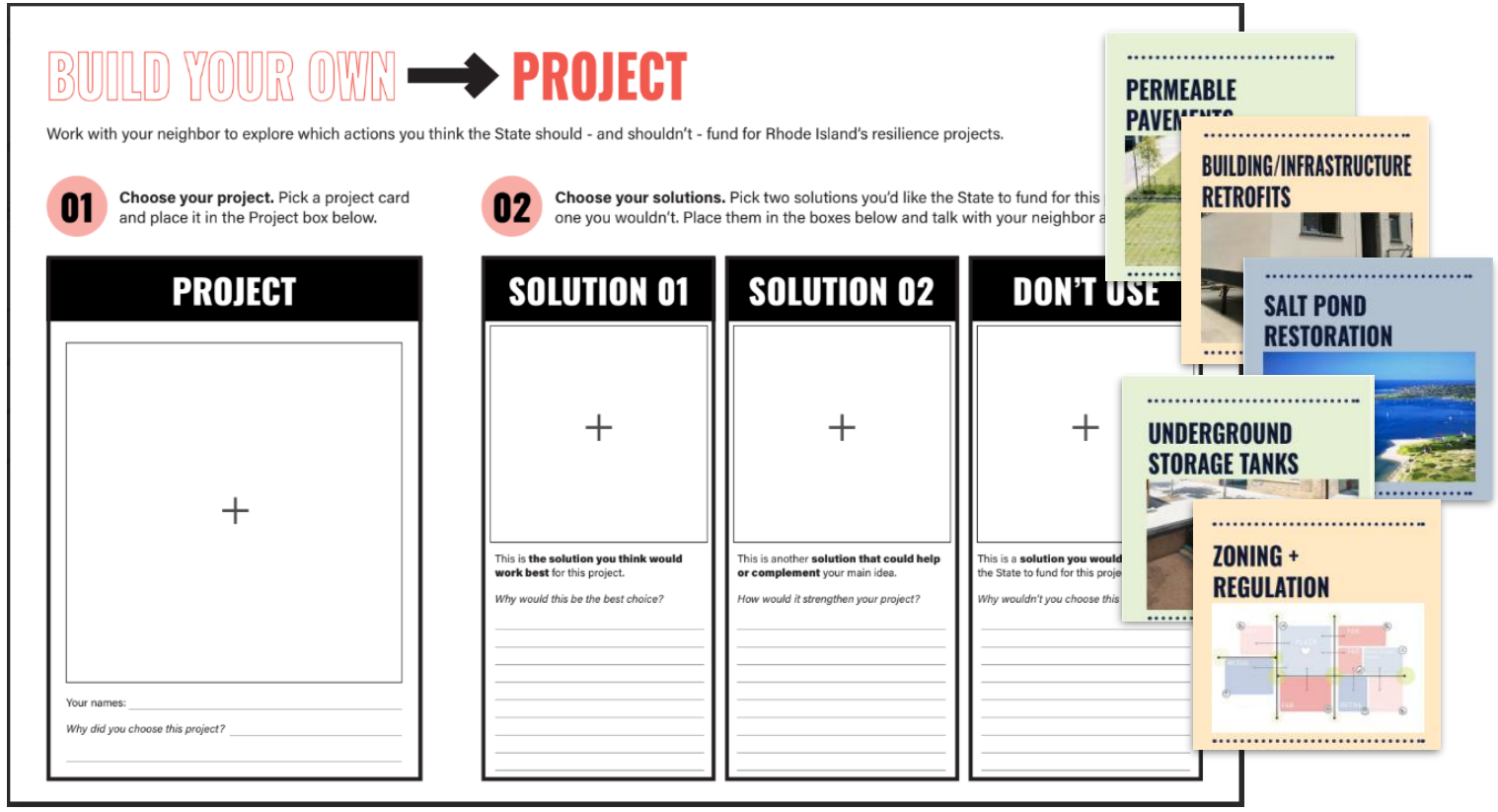
With a total of **288 attendees**

Activities Summary

Each forum and meeting incorporated structured engagement activities designed to spark dialogue, surface priorities, and support collaborative planning. Participants engaged in interactive Mentimeter surveys as well as at-table or Miro-based exercises that encouraged them to share perspectives, identify needs, and contribute directly to shaping the developing plan.

Activities included:

- Engagement Stations
- Asset-Hazard Mapping
- Criteria Weighting
- "Build Your Own Project"
- Asset Prioritization



'Build Your Own Project' Activity Card

At the HEZ Frontline Community Forum, participants selected one of three hypothetical projects and prioritized solution options.

Community Forum Highlights



05

Community & HEZ Frontline Community Forums

With a total of **158 attendees**

Locations:

- Providence Public Library
- Weaver Library, East Providence
- Newport Library
- Rogers Free Library, Bristol
- William D'Abate Elementary School, Olneyville

Dates:

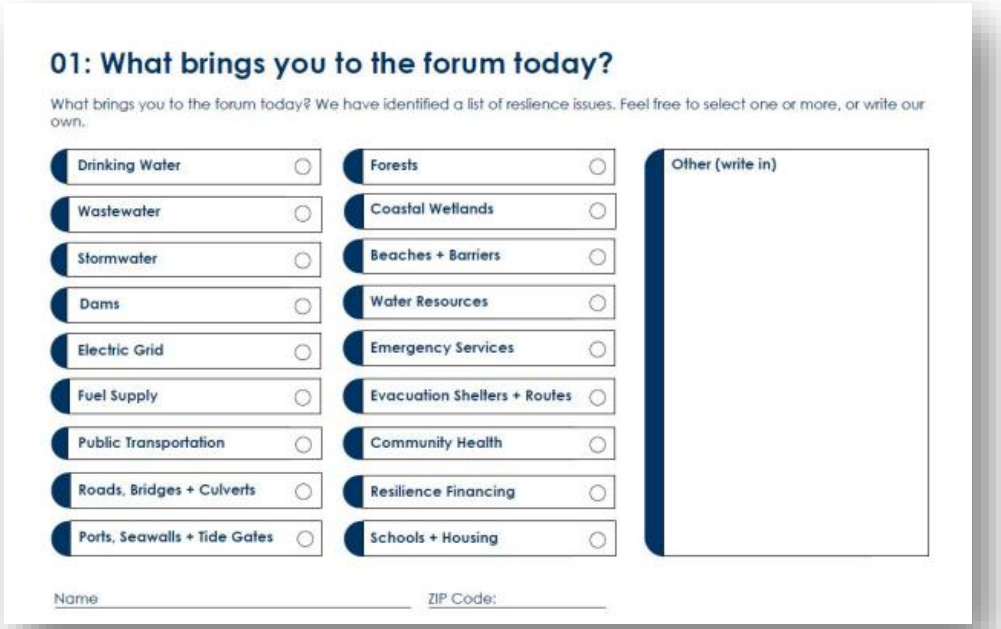
- June 18, 2025
- July 17, 2025
- September 10, 2025
- October 22, 2025
- October 29, 2025

The locations selected for this round of public engagement were chosen to maximize accessibility and participation. Sites with strong public transportation access, opportunities for hybrid (in-person and virtual) participation, and the ability to host large groups were prioritized.

Community Forum invitations were circulated through Department of Environmental Management EC4 mailing lists, DEM social media and climatechange.ri.gov, the Resilience EC4 Subgroup and RI Resilience Partner Group, and the Health Equity Zone Backbone via Department of Health.

Community Forum 01

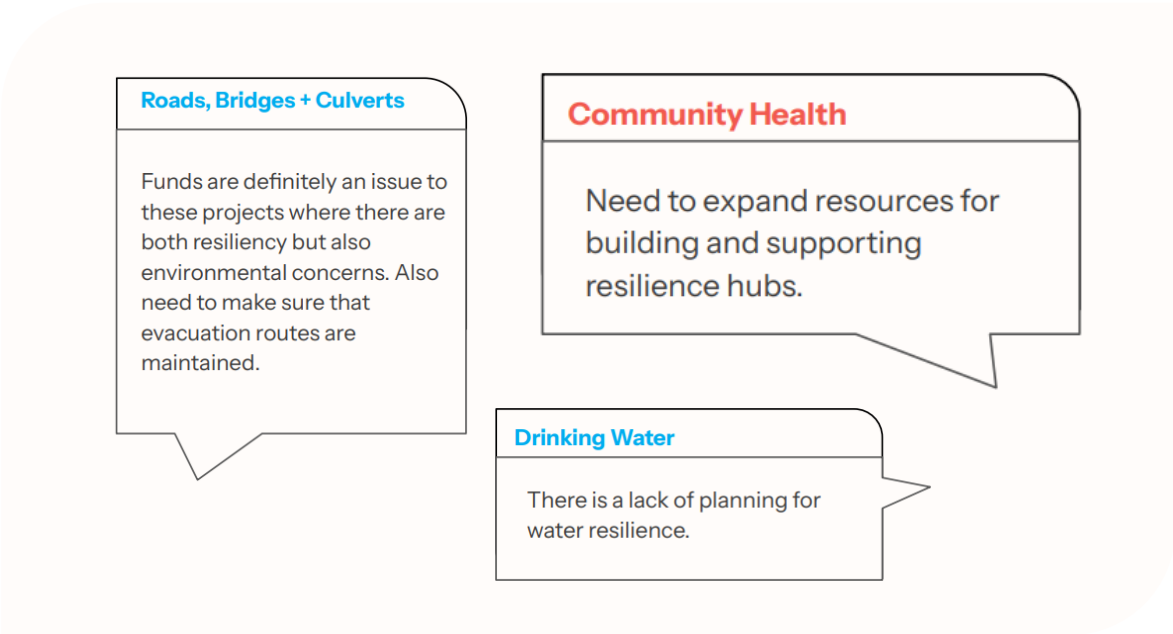
Theme: Gap Analysis + Action Development
Location: Providence Public Library + online
Date: June 18, 2025
Attendees: 20 in person + 22 online



'Turn and Talk' Activity Card

The first Community Forum began with a 'Turn and Talk' activity which asked participants to mark the resilience issue that brought them to the forum.

Participants began in small groups, sharing the resilience issues that motivated their attendance. After these conversations, boards displaying gap analysis findings were placed around the room, and participants were invited to add their concerns and priorities. Key topics included community health, stormwater infrastructure, public transportation, and forest resources.



Community Perspectives

Participants identified multiple asset types as key areas of concern for climate resilience.

Community Forum 01

Key Findings

- Participants emphasized vulnerabilities across multiple assets types including **stormwater systems, drinking water resilience**, and the need to **restore wetlands, dunes, and urban forests.**

- There was strong support for **coordinated, statewide resilience strategies** - such as microgrids, resilience hubs, and green infrastructure.

- Community members highlighted the importance of **equity and community preparedness**, including multilingual communication, and support for grassroots organizations.





Participants at Community Forum 1 in Providence, RI © CIVIC

Community Forum 02

Theme: Asset Exposure + Prioritization
Location: Weaver Library, East Providence + online
Date: July 17, 2025
Attendees: 25 in person + 15 online

Community members shared experiences with climate hazards such as flooding, extreme heat, and high winds, as well as community assets where they had experienced these impacts.

Local experiences were then matched with previously drafted asset and hazard typologies, with the goal of identifying any assets or hazards that should be added to the Statewide Vulnerability Assessment. Stormwater and coastal flooding were the most frequently discussed hazards, while housing and schools were the most identified assets.



Participants at Community Forum 2 in East Providence, RI © CIVIC

Community Forum 02

Key Findings

- Participants identified **stormwater** (41 activity matches) and **coastal flooding** (30 activity matches) as the most common and disruptive hazards.
- **Housing, roads, bridges + culverts, stormwater systems, and ports** among the most frequently impacted assets.

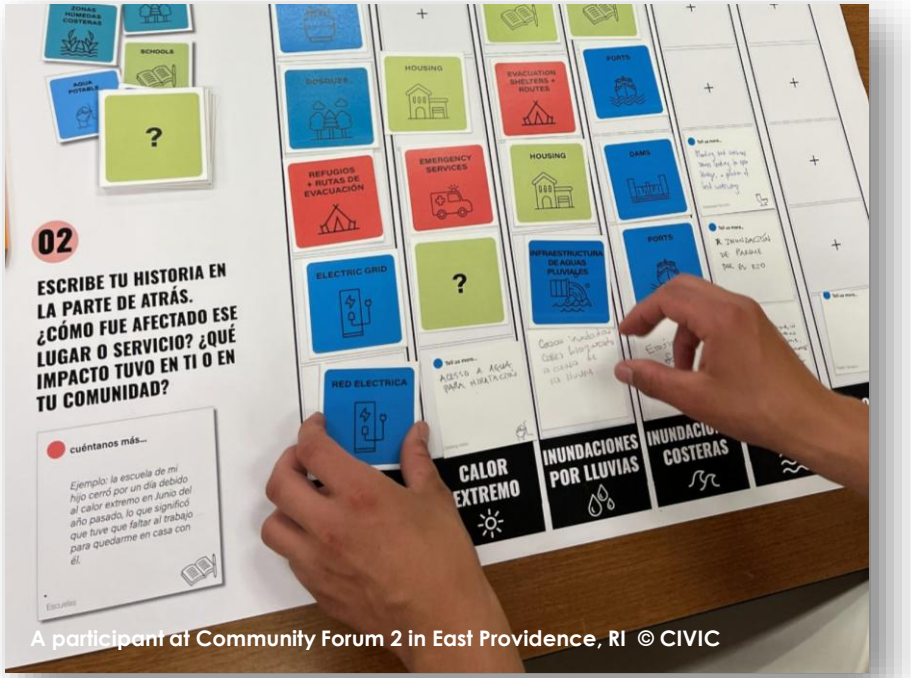
Concerned about drinking water facilities located near shorelines - salt intrusion becoming an issue with rising sea levels? (Drinking Water)

Without HVAC schools close early in June K-12 and university. (Schools)

Developers still building in coastal wetlands - needs to be concerted push from top down with mandates. (Coastal Wetlands)

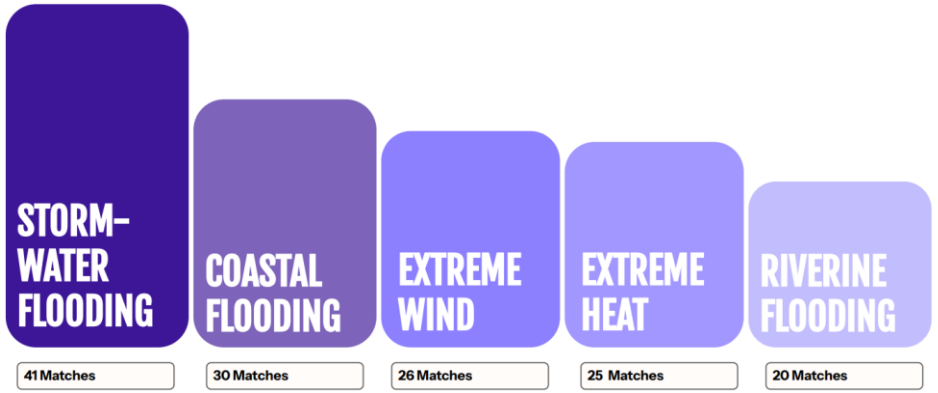
Community Perspectives

Community members shared specific real-world examples of how climate impacts disrupt local services, infrastructure, and daily life.



A participant at Community Forum 2 in East Providence, RI © CIVIC

Community Identified Hazards

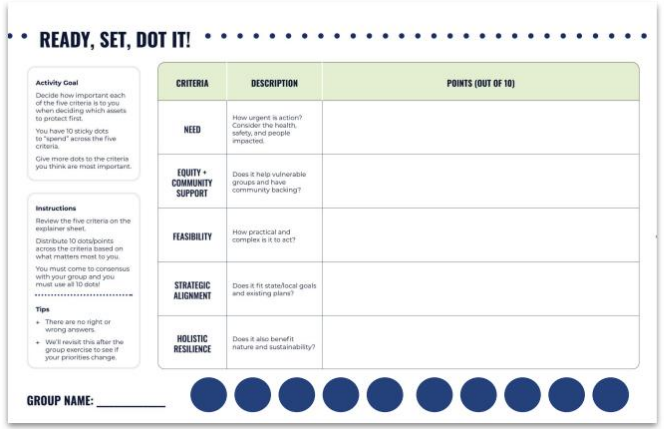


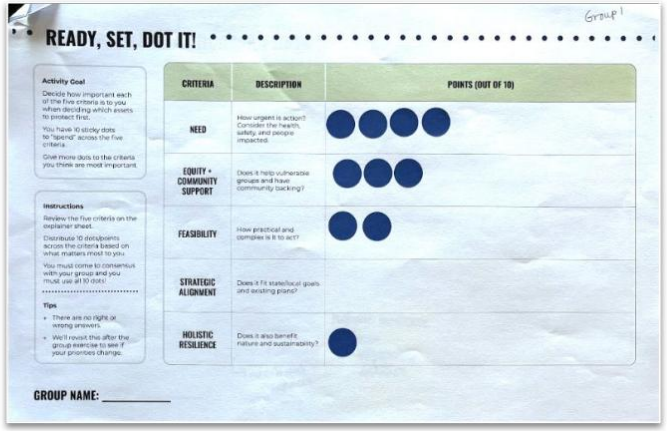
Community Forum 03

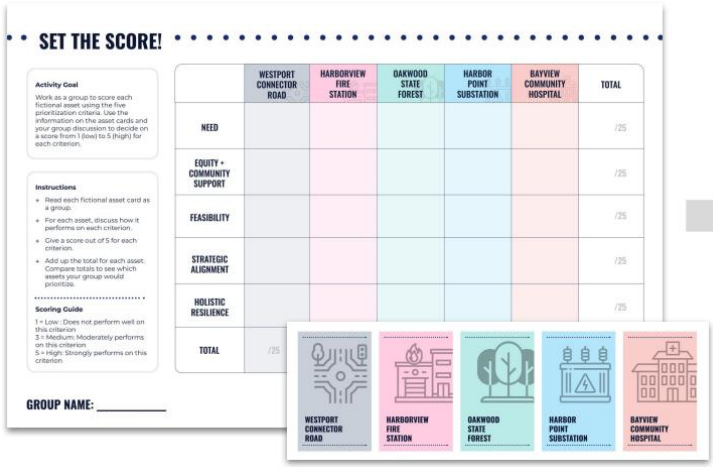
Theme: Asset Prioritization
Location: Newport Library + online
Date: September 10, 2025
Attendees: 15 in person + 6 online

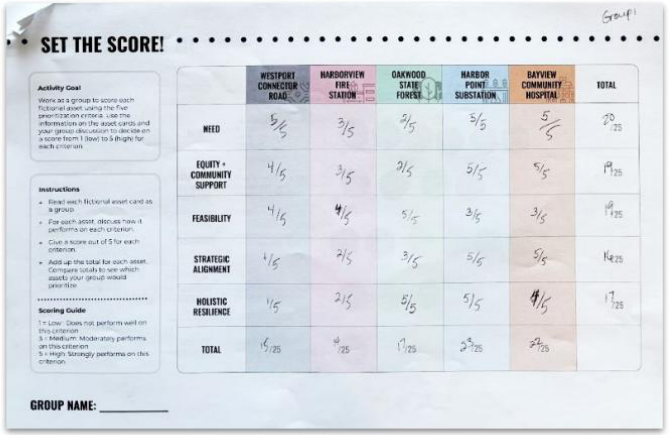
Participants scored hypothetical assets against five drafted criteria under consideration for the prioritization approach.

After scoring, they discussed how weighting of criteria could be applied to ensure fair assessment and inclusion of underrepresented project types. The weighting used in this plan was informed by the average weightings developed across groups during this session, as well as averaged weightings developed during parallel Municipal Stakeholder session.









Completed Asset Prioritization Activity Cards

Completed activity cards illustrating each group's scoring approach and prioritization outcomes.

Community Forum 03

Key Findings

- Participants prioritized **Need, Equity & Community Support,** and **Holistic Resilience** as the most important criteria for asset prioritization.
- Through scoring hypothetical assets, attendees highlighted **hospitals, substations, emergency services, and major roads** as high-need assets.
- After testing the criteria, participants shifted toward **greater emphasis on Strategic Alignment criterion and less on Feasibility criterion.**

NEED

"I'm most concerned about urgency, like a hospital serving many people. Something that urgent is tied to community support."

EQUITY / COMMUNITY

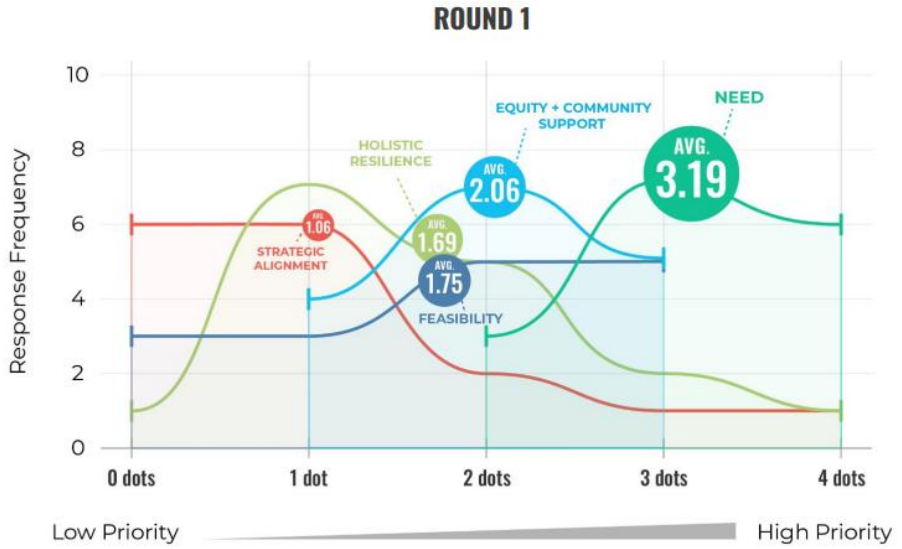
"Hospital, emergency services, and substation help the most households."

HOLISTIC RESILIENCE

"Not prioritizing holistic resilience now makes our future challenges more difficult."

Community Perspectives

Community-expressed perspectives illustrating the values behind prioritization choices.





Criteria Prioritization Results

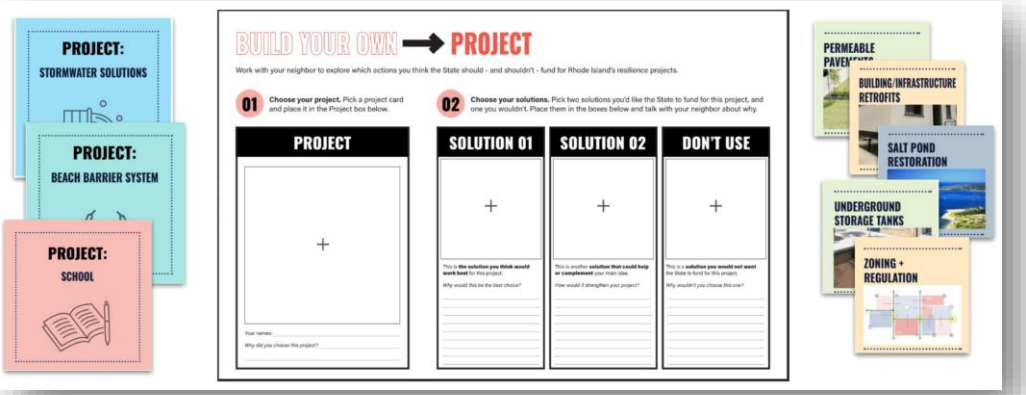
Participants ranked criteria across two scoring rounds.

Community Forum 04

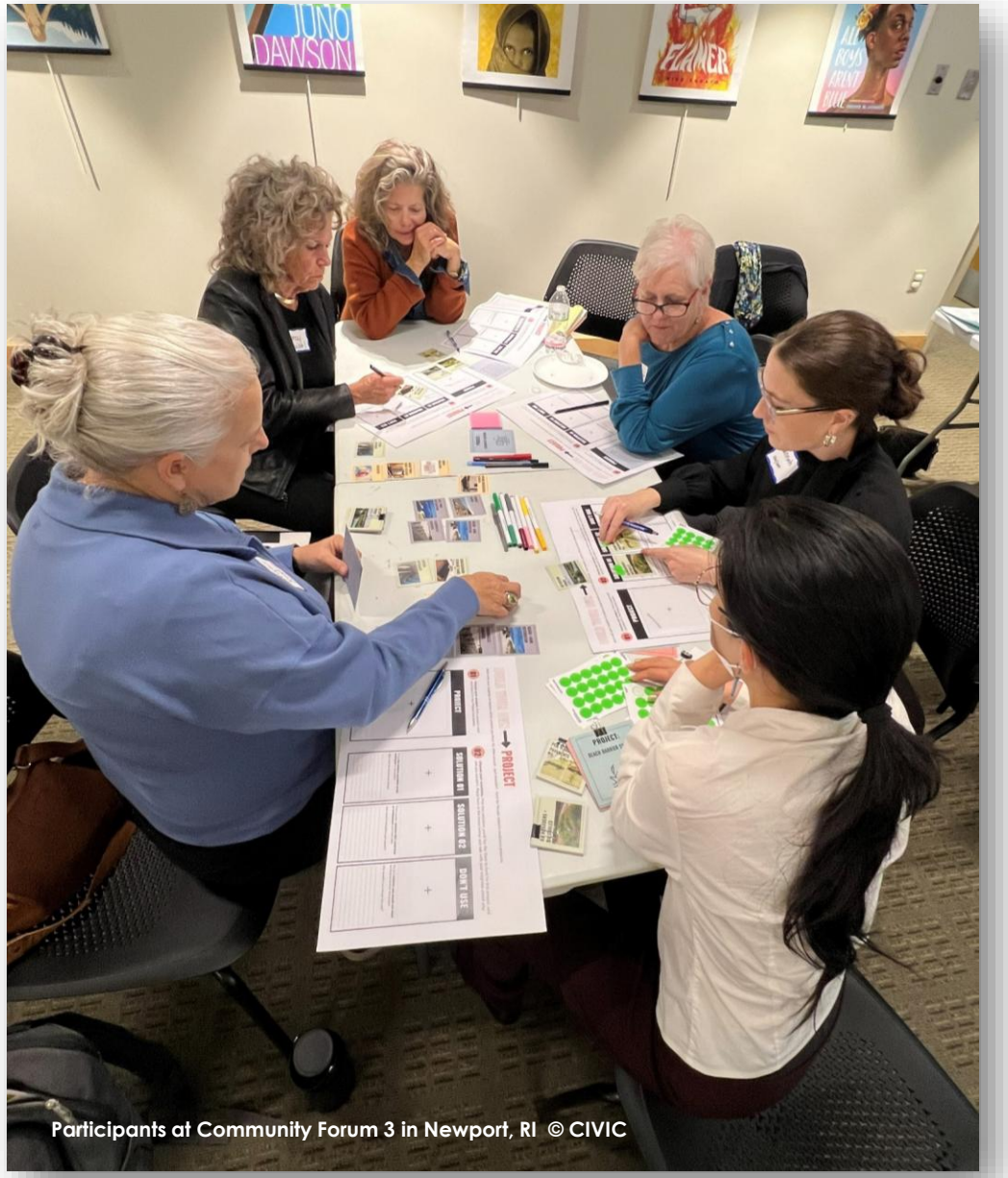
Theme: Priority Assets + Solution Development
Location: Rogers Free Library, Bristol + online
Date: October 22, 2025
Attendees: 7 in person + 6 online

A shortlist of identified priority assets and projects was shared with participants, followed by an anonymous survey to collect feedback. Participants then completed the "Build Your Own Project" activity, selecting hypothetical assets and choosing from a range of solution options for each asset.

Popular strategies included rain gardens and bioswales, relocation, permeable pavements, and zoning regulation. Feedback from this session played a critical role in shaping the Climate Resilience and Adaptation Solutions.



Build Your Own Project Activity Cards



Participants at Community Forum 3 in Newport, RI © CIVIC

Community Forum 04

Key Findings

- Participants emphasized that the State should prioritize **nature-based solutions** and low impact stormwater strategies, consistently selecting rain gardens, bioswales, permeable pavements, and dune and beach restoration.
- Attendees chose **relocation/retreat** and **building retrofits** as viable resilience strategies, particularly when protecting assets like schools or areas facing repeated flooding.
- Participants expressed **strong support for policy and planning interventions** such as updated zoning, regulation, and system upgrades.



HEZ Frontline Community Forum

Theme: Priority Assets + Solution Development
Location: William D'Abate Elementary School + online
Date: October 29, 2025
Attendees: 42

This session focused on Rhode Island's Health Equity Zones (HEZs) and frontline community organizations. In an open discussion, participants identified housing, communication infrastructure, emergency response infrastructure, and local education on emergency preparedness as priority areas. They also completed the "Build Your Own Project" activity to explore potential solutions.



Participants at HEZ Frontline Community Forum in Olneyville, Providence, RI © CIVIC

HEZ Frontline Community Forum

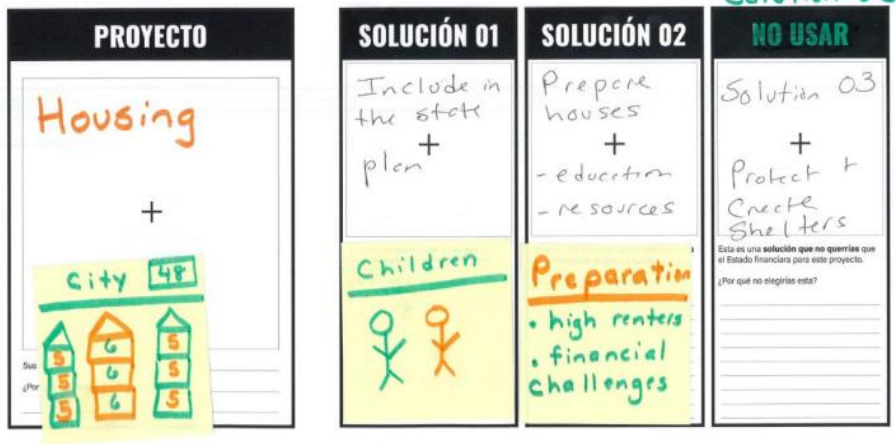
Key Findings

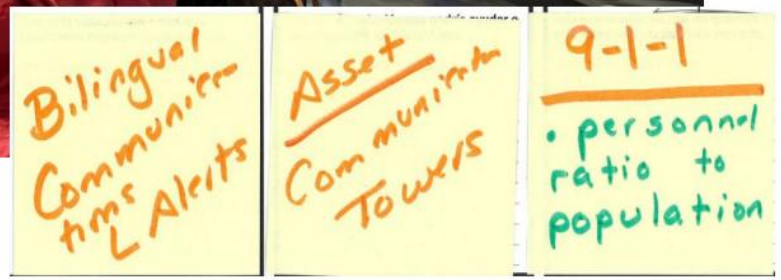
- Participants emphasized that **housing, communications infrastructure, and emergency response** capacity must be core priorities, alongside better local education and **multilingual communication on preparedness** and alerts.
- Participants favored **system upgrades, permeable pavements, rain gardens/bioswales, and zoning/regulatory tools.**
- Community members highlighted the need for **proactive maintenance** and stronger protections for riverbanks and **natural buffers**, stressing that regulations should safeguard these areas as shared natural assets rather than negotiable private property.


Participants at HEZ Frontline Community Forum in Olneyville, Providence, RI © CIVIC

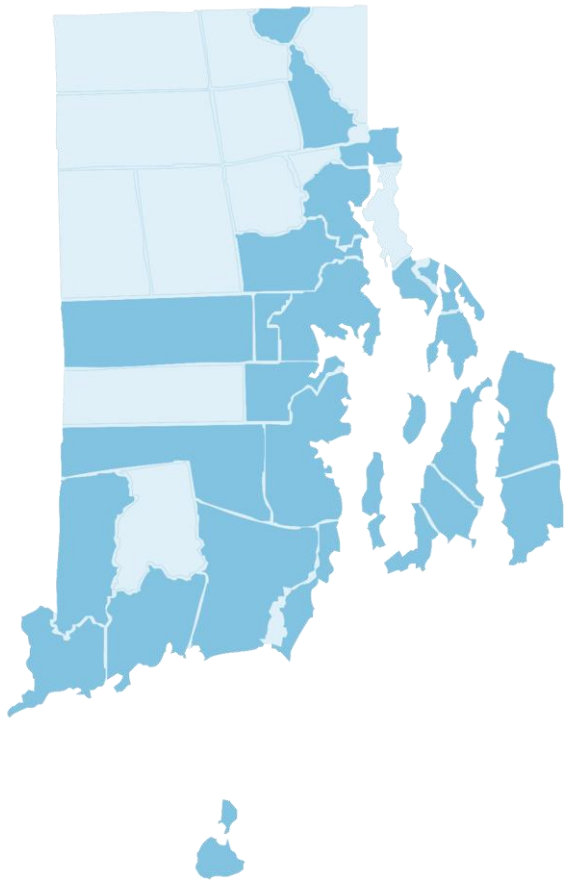
RAIN GARDENS + BIOSWALES

"This could be used as a learning tool for the students, opportunity for the students to learn to plant basics." (x3)





Municipal Stakeholder Working Sessions Highlights



06

Municipal Stakeholder Working Sessions

With a total of **130 attendees**

Dates:

- June 20, 2025
- July 18, 2025
- August 29, 2025
- September 12, 2025
- October 3, 2025
- October 24, 2025

Location:

All meetings were held virtually

Municipal Stakeholder Forum invitations were circulated to all municipal planning staff via Division of Statewide Planning, as well as to all local Municipal Resilience Program (MRP) Core Team members via Department of Environmental Management.

Municipal Resilience Program (MRP) Core Teams consist of municipal staff and leadership that collaboratively conduct their city or town's local resilience planning and project efforts through the MRP, often consisting of planning, DPW, engineering, fire & police, and related staff; planning and environmental commission members; town council members; town administrators; and/or mayors.

Municipal Stakeholder Working Session 01

Theme: Gap Analysis + Action Development
Date: June 20, 2025
Attendees: 30

Activity:

Stakeholders competed a survey on which resilience issues brought them to the working session.

After the survey, virtual whiteboards were presented with asset types and stakeholders were requested to identify asset- specific resilience challenges.

Key Findings:

Stakeholders called for stronger stewardship and coordinated action, including **improved emergency communication protocols**, expanded heat response, and **integrating resilience into schools' curricula.**

Community Health

I think the basics like how sustainability, resilience, and adaptation should be taught with hands-on exercises to K-12! They like cascading consequences!

Stormwater

Want to see state resiliency officers spearhead PL-566 for Moshassuck River for Pawt, PVD, Lincoln, CF. great funding support for this - but need someone to help be through-line for all communities. This is like a 10-yr process.

Participants highlighted major capacity and **funding gaps**, noting delays in resilience projects, **limited staffing**, over-reliance on federal funding, and the **need for State-led coordination, regional grants (multiple municipal applicants), and long-term investment in resilient infrastructure.**

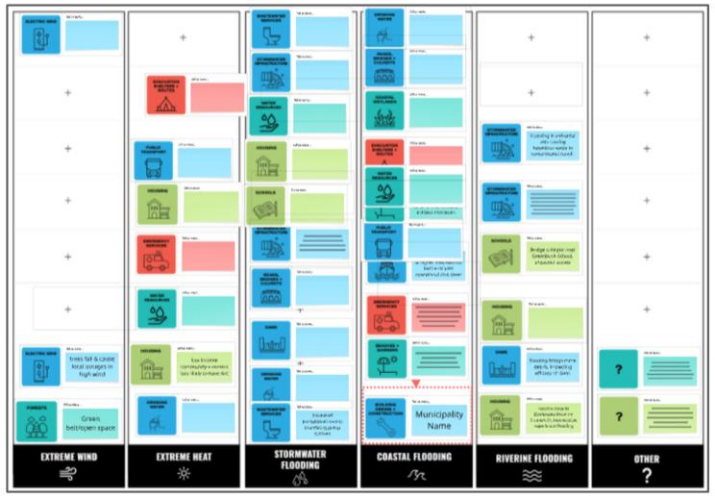
Stakeholders emphasized **critical infrastructure vulnerabilities**, including aging stormwater and sewer systems; aquifer risks, inadequate public awareness of runoff, the **need for clearer policies on development in flood-prone areas.**

Beaches + Barriers

Private residential development on barriers is largely not something that can be protected. We need tools to disincentive investment and incentivize relocation.

Municipal Stakeholder Working Session 02

Theme: Asset + Hazard Mapping
Date: July 18, 2025
Attendees: 30



Asset-Hazard Pair Mapping

Stakeholders shared experiences with climate hazards such as flooding, extreme heat, and high winds, as well as community assets where they had experienced these impacts. Local experiences were then matched with previously drafted asset and hazard typologies.

Activity:

Stakeholders shared their experience with climate hazards as they pertained to different asset types. These asset and hazard pairs were further studied in Chapter 3: Statewide Climate Vulnerability Assessment.

What's one infrastructure type your municipality is most concerned about?

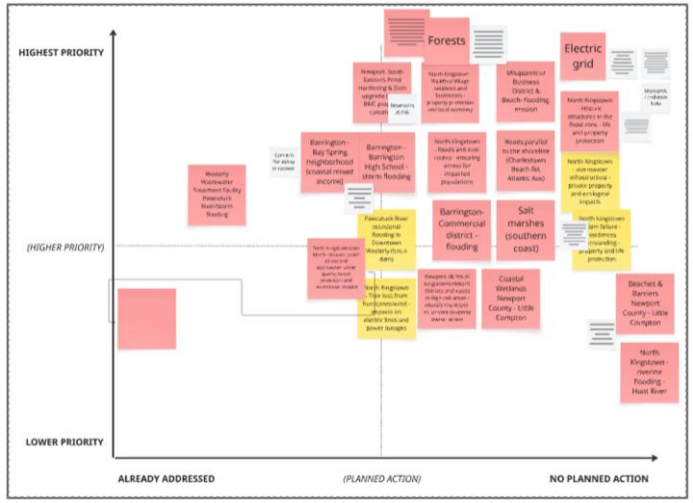


Key Takeaways:

- Municipal stakeholders broadly agreed with the vulnerability assessment findings, emphasizing **flooding-related damage and disruption as the most urgent risks across asset types.**
- Stakeholders prioritized assets based on need, equity, and service criticality, while **stressing that short-term fixes must build toward long-term climate resilience.**
- **Many high-risk assets had no existing planned actions**, particularly housing, wastewater systems, stormwater infrastructure, coastal roads, and historic districts - highlighting major implementation gaps statewide.

Municipal Stakeholder Working Session 03

Theme: Vulnerability Assessment + Asset Prioritization
Date: August 29, 2025
Attendees: 25



Miro Board Activity

Interactive Miro board reflecting the range of priorities discussed during the session.

Activity:

The results from the Statewide Climate Vulnerability Assessment were shared with stakeholders. Stakeholders then prioritized assets based on need, equity, and service criticality, while stressing that short-term fixes must build toward long-term climate resilience.

Need should be the #1 priority. Then we need to see if it's feasible. From there the ranking can be subjective

Need and feasibility are more quantifiable

Need impacts greatest amount of the population

Holistic resilience captures a systems thinking

It's hard to think holistically when there are clear and immediate needs to address

Equitable action can counter a widening gulf between have and have-nots following disruption

Community Perspectives

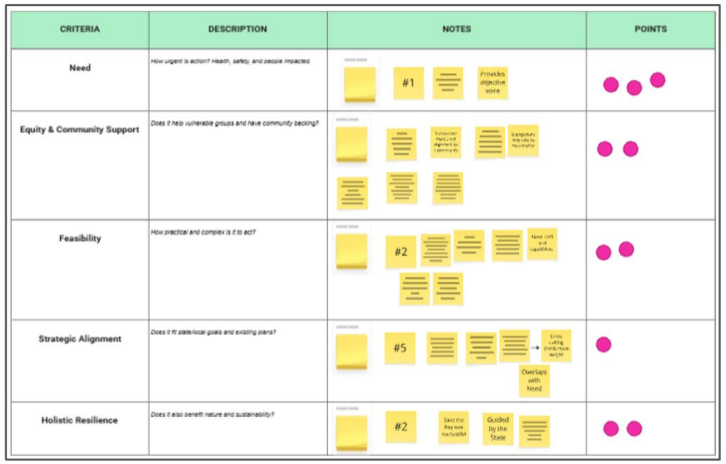
Municipal stakeholders discussed the values behind asset prioritization decisions.

Key Takeaways:

- Municipal stakeholders broadly agreed with the vulnerability assessment findings, emphasizing **flooding-related damage and disruption as the most urgent risks across asset types.**
- Stakeholders prioritized assets based on need, equity, and service criticality, while **stressing that short-term fixes must build toward long-term climate resilience.**
- **Many high-risk assets had no existing planned actions**, particularly housing, wastewater systems, stormwater infrastructure, coastal roads, and historic districts - highlighting major implementation gaps statewide.

Municipal Stakeholder Working Session 04

Theme: Asset Prioritization
Date: September 12, 2025
Attendees: 20



Asset Prioritization Activity

Stakeholders used a point system to weight asset prioritization criteria by level of importance.

Activity:

Stakeholders ranked the importance of various criteria that were to be used for prioritizing assets, with Need and Feasibility emerging as the top priorities.

Stakeholders then prioritized hypothetical assets against these criteria. Hospitals, substations, and major roads ranked highest.

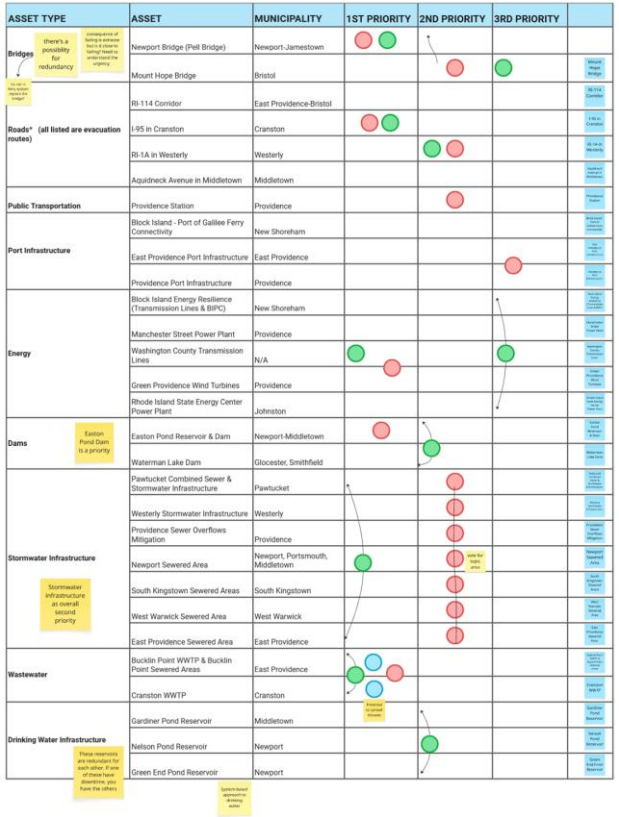
The weighting applied in this plan was based on the average values developed across groups during this session, as well as those derived from parallel Community Forum session.

Key Takeaways:

- Municipal stakeholders emphasized **Need and Feasibility** as the top criteria for prioritizing assets, with strategic alignment and holistic resilience considered secondary.
- Participants noted that **infrastructure assets remain the highest priority**, while natural systems are consistently under-prioritized despite their protective value.
- In scoring exercises, assets like **hospitals, substations, and major roads** ranked highest on need and service criticality, confirming strong alignment across municipalities on what should be addressed first.

Municipal Stakeholder Working Session 05

Theme: Priority Assets
Date: October 3, 2025
Attendees: 10



ASSET TYPE	ASSET	MUNICIPALITY	1ST PRIORITY	2ND PRIORITY	3RD PRIORITY
Bridges	Newport Bridge (Pell Bridge)	Newport-Jamestown			
	Mount Hope Bridge	Bristol			
	RI-114 Corridor	East Providence-Bristol			
Roads* (all listed are evacuation routes)	I-95 in Cranston	Cranston			
	RI-1A in Westerly	Westerly			
	Aquidneck Avenue in Middletown	Middletown			
Public Transportation	Providence Station	Providence			
Port Infrastructure	Block Island - Port of Galilee Ferry Connectivity	New Shoreham			
	East Providence Port Infrastructure	East Providence			
	Providence Port Infrastructure	Providence			
Energy	Block Island Energy Resilience (Transmission Lines & BIPC)	New Shoreham			
	Manchester Street Power Plant	Providence			
	Washington County Transmission Lines	N/A			
	Green Providence Wind Turbines	Providence			
	Rhode Island State Energy Center Power Plant	Johnston			
Dams	Easton Pond Reservoir & Dam	Newport-Middletown			
	Waterman Lake Dam	Glocester, Smithfield			
Stormwater Infrastructure	Pawtucket Combined Sewer & Stormwater Infrastructure	Pawtucket			
	Westerly Stormwater Infrastructure	Westerly			
	Providence Sewer Overflows Mitigation	Providence			
	Newport Sewered Area	Newport, Portsmouth, Middletown			
	South Kingstown Sewered Areas	South Kingstown			
	West Warwick Sewered Area	West Warwick			
	East Providence Sewered Area	East Providence			
Wastewater	Bucklin Point WWTP & Bucklin Point Sewered Areas	East Providence			
	Cranston WWTP	Cranston			
Drinking Water Infrastructure	Gardiner Pond Reservoir	Middletown			
	Nelson Pond Reservoir	Newport			
	Green End Pond Reservoir	Newport			

Activity:

A draft shortlist of identified priority asserts were shared with Municipal stakeholders, who provided feedback on the selections. Stakeholders then discussed the priority assets in small groups.

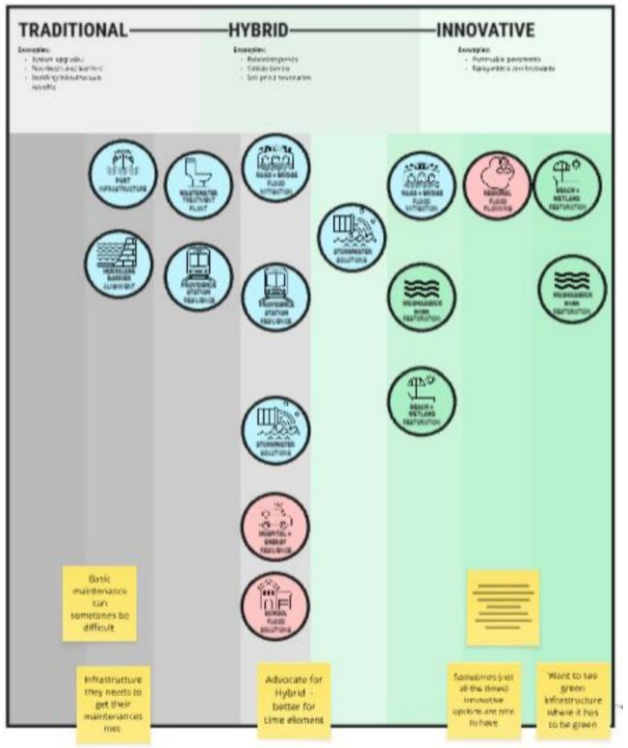
These priority assets informed the Climate Adaptation & Resilience Solutions developed in this plan.

Key Takeaways:

- Stakeholders prioritized critical infrastructure including **wastewater systems, major evacuation roads, hospitals, and energy transmission lines,** reflecting the importance of assets that serve large populations and are essential for emergency response and continuity of services.
- Participants emphasized that **wastewater, stormwater, and sewered areas require urgent investment**, noting widespread aging infrastructure, increased stress from extreme rainfall, and the need for coordinated upgrades across multiple municipalities.
- In both individual and group prioritization rounds, stakeholders **emphasized Providence Port, coastal wetlands, and key bridges**, the importance of economic resilience, **natural system protection**, and maintaining **regional mobility**.

Municipal Stakeholder Working Session 06

Theme: Solution Development
Date: October 24, 2025
Attendees: 15



Activity:

An updated draft of the asset shortlist and Climate Resilience Solutions were shared with municipal stakeholders.

Stakeholders were then asked to review the proposed solutions and respond to questions about the level of innovation, the role of the State can take in implementation, and potential funding approaches.

This session informed the strategies developed for Chapter 5: Climate Adaptation & Resilience Solutions.

Are there resilience strategies that you've seen or heard of in other states you'd like to see adopted in Rhode Island?

- Floating wetlands
- State funding of green infrastructure maintenance (MA)
- Living shoreline techniques
- Making sure that road development includes hybrid/green infra enhancements for drainage and aquifer recharge

Key Takeaways:

- Stakeholders emphasized that **the State must play a major role in funding and technical assistance**, particularly for projects requiring **regional coordination, nature-based solutions, and long-term climate adaptation**—issues that small towns lack capacity to manage.
- Participants prioritized resilience investments that deliver flood-risk reduction, equitable outcomes, and economic stability, while **cautioning against continued investment in shoreline hardening or projects that incentivize development in vulnerable areas**.
- Stakeholders expressed strong support for **hybrid and innovative solutions** while recognizing that limited local capacity often forces communities to rely on more traditional, "fix-it-fast" approaches.

Conclusion

Engagement played a central role in shaping *Resilient Rhody 2025*, informing key decision-making processes throughout the Plan.

This input influenced the development of resilience actions, the asset–hazard pairings used in the vulnerability assessment, the identification and weighting of prioritization criteria, and the selection of the solutions and investment strategies advanced in the Plan.

Examples of how engagement shaped the Plan include:

- Each Action includes indicators noting when it is driven by community input.
- The weighting used in the prioritization framework was derived from the average of scores between community members and municipal stakeholders.
- The Solutions and Actions presented in this Plan directly reflect priorities raised across engagement forums, meetings, and workshops.
- Every Solution features a story, example, or key takeaway rooted in the engagement process, demonstrating how local knowledge and lived experience informed recommended interventions.

Looking Ahead

To maximize accessibility and participation, engagement sessions were held in locations with strong public transportation access, options for hybrid (in-person and virtual) attendance, and the capacity to accommodate large groups.

Looking ahead, use of engagement best practices—such as meeting people where they are, diversifying outreach methods, and incorporating feedback loops—will help ensure that local knowledge and community voices remain central to ongoing plan updates.

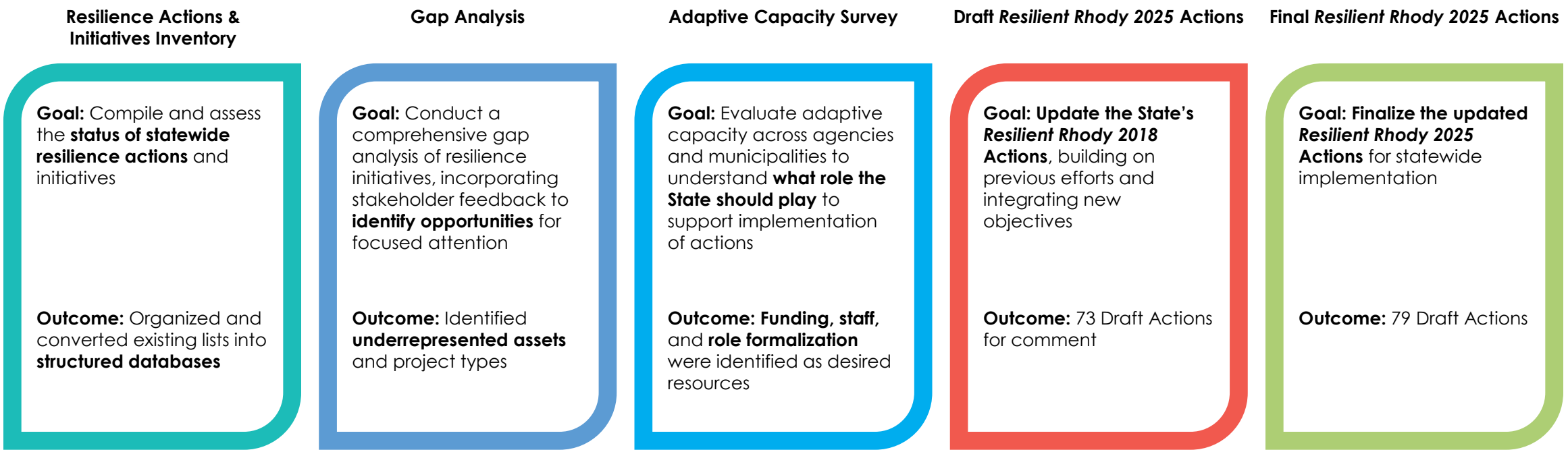
Future outreach efforts will also place additional emphasis on communities that were less represented in this engagement cycle, including inland municipalities and communities in the southwestern region of the state, reinforcing a commitment to equitable and inclusive engagement across Rhode Island.

Chapter 2
Resilient Rhody 2025 Actions

Development of the *Resilient Rhody 2025* Actions

The final *Resilient Rhody 2025* Actions presented herein are the result of a multi-step process conducted from May through November 2025.

These Actions reflect findings from the subtasks outlined below and incorporate feedback from State, municipal, partner, and community stakeholders. Items from the previous *Resilient Rhody* reports and the 2024 Rhode Island State Hazard Mitigation Plan also informed the process.



Resilient Rhody 2025 Actions

Document Structure

The *Resilient Rhody 2025* Actions use an updated identification system as shown on the right.

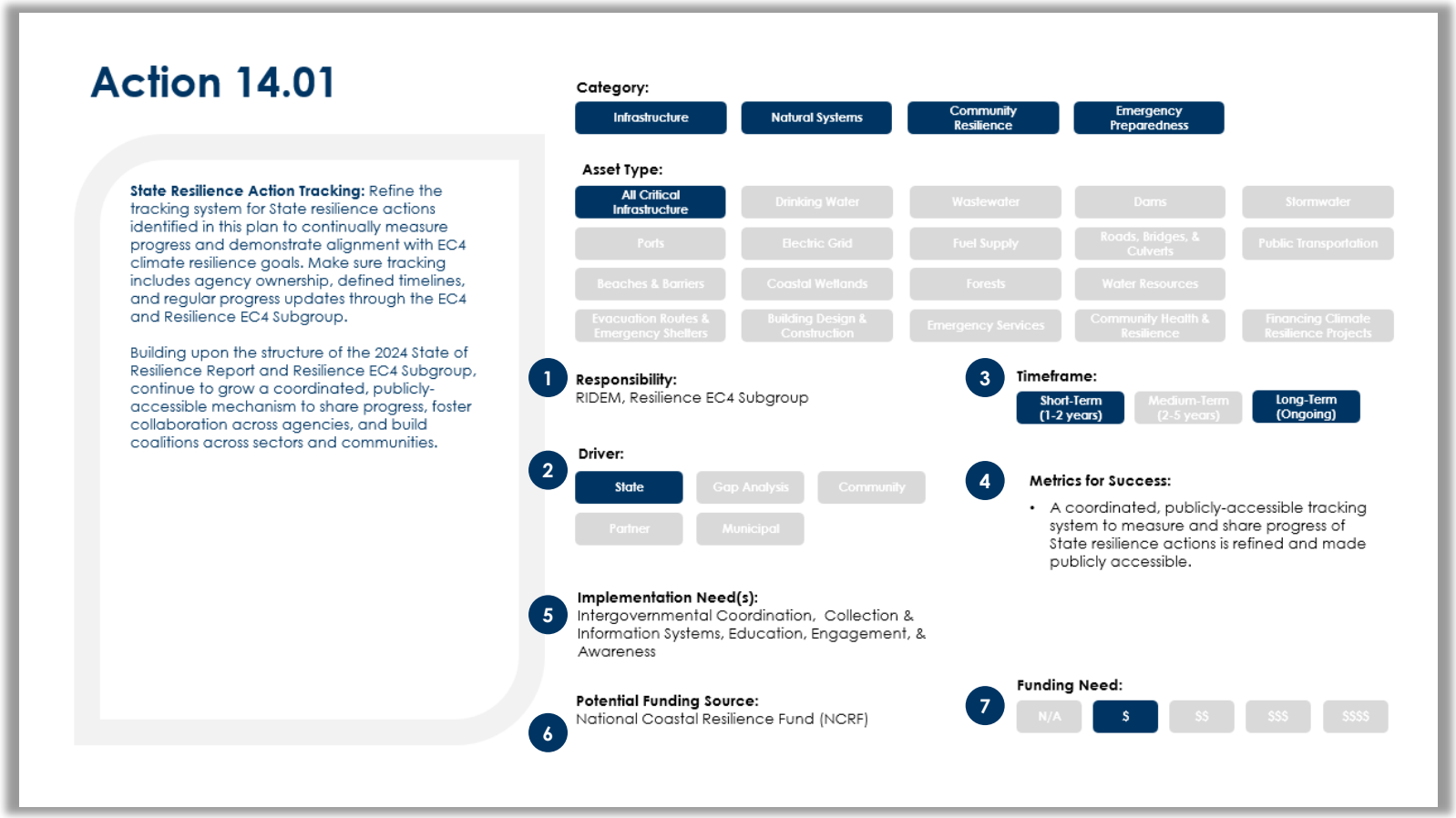
Each Action ID corresponds to the focus areas and asset categories established in the *Resilient Rhody 2018* framework.

The adjacent table includes hyperlinks to the relevant sections to support navigation.

ID	Action Focus
1	Drinking Water Systems
2	Wastewater Treatment Facilities
3	Dams
4	Stormwater Infrastructure
5	Ports
6	Electric Grid
7	Fuel Supply
8	Roads, Bridges and Culverts
9	Public Transportation
10	Beaches and Barriers
11	Coastal Wetlands
12	Forests
13	Water Resources
14	Statewide Resilience: All Critical Systems
15	Building Design & Construction
16	Evacuation Routes & Emergency Shelters
17	Emergency Services
18	Community Health & Resilience
19	Financing Climate Resilience Projects
20	Cross-Sector Coordination

Actions' Presentation

Each action is presented on its own page, detailing the action, category, and asset type, along with the following information:



1. Responsibility
Indicates the lead or partner entities responsible for the action.

2. Action Driver
Identifies the stakeholder group(s) that initiated, influenced, or recommended the action.

3. Timeframe
Indicates short-term, medium-term, or long-term/ongoing actions.

4. Metrics for Success
Indicators of success to measure progress towards the action against.

5. Implementation Need(s)
Indicates policy or legislative needs necessary to implement the action. These are categorized into four groups: Funding, Policy & Compliance, Tools & Training, & Coordination needs.

6. Potential Funding Source:
Indicates potential funding sources ranging from federal, state, local, and innovative mechanisms.

7. Funding Need
Indicates the relative funding amounts necessary to carry forward the action. N/A indicates actions focused on advocacy, efficiency, or priority setting.

Implementation Needs Tags

To guide the steps needed to implement these actions, each action is tagged with corresponding implementation requirements.

The framework on the right defines each of the possible implementation needs' tags. Actions may include multiple tags.

Category	Policy/Legislative Needs Tags	Description
Funding	Funding	Funding required to develop new programming or invest in resilience actions
	Community Incentives	Programs or policy tools that encourage voluntary resilience actions by residents, businesses, or property owners (e.g., tax abatements, rebate programs).
	Direct Government Investment & Procurement	Using government purchasing power and capital investments to drive resilient infrastructure, green procurement policies, or direct public works projects that model climate-resilient practices.
Policy & Compliance	Land Use Policy	Changes to zoning, building codes, or land use planning needed to support resilient development, open space preservation, or managed retreat.
	Rules & Regulations	Regulatory updates needed to remove barriers or mandate climate-resilient practices.
	Enforcement & Compliance Mechanisms	Creating oversight systems, inspection protocols, penalties, or compliance monitoring for existing or new climate resilience requirements.
Tools & Training	Collection & Information Systems	Creating requirements for gathering, standardized reporting, monitoring systems, or information sharing platforms that support resilience decision-making across sectors.
	Technical Assistance & Capacity Building	Establishing government programs to provide technical expertise, professional development, or direct support services to help communities, businesses, or other agencies implement resilience measures.
	Education, Engagement, & Awareness	Public education campaigns, data, and technical training, or stakeholder engagement efforts required to build support or understanding of climate resilience.
Coordination	Intergovernmental Coordination	Establishing formal mechanisms for collaboration between State, federal, and local governments, including interstate compacts, regional authorities, or mandated coordination protocols for climate resilience planning.
	Public-Private Partnership Frameworks	Establishing legal structures and policies that facilitate collaboration between government and private sector for resilience investments, risk-sharing arrangements, or innovative financing mechanisms.
	Emergency Preparedness & Response Authorities	Developing special governmental authorities for climate emergencies, including streamlined permitting during disasters, emergency procurement powers, or mandatory evacuation/relocation authorities.

Funding Need & Potential Funding Source

Understanding funding requirements is essential for advancing these actions.
Therefore, each action includes an estimated Funding Need, determined through targeted research and by adapting cost benchmarks from comparable resilience initiatives. The *Resilient Rhody 2025* Actions Funding Needs estimates reflect a range of implementation scales, from pilot initiatives to comprehensive, statewide programs. These estimates are preliminary and will require further refinement as actions advance through scoping, program design, and implementation planning.

These estimates do not represent full construction costs for large-scale capital or infrastructure projects. The costs for actions involving design and construction, or those establishing funding mechanisms for such projects, were not estimated because they require project-specific cost analysis. These actions indicate when significant investment is anticipated. Inflation adjustments have not been applied due to the preliminary nature of these actions and the lack of sufficient detail for accurate projections. Funding needs for actions tagged as ongoing will require recurring allocations to remain effective; however, timing and funding levels will vary based on the nature of the activity and Rhode Island's evolving priorities. Not all actions will receive the same level of funding or follow the same schedule in each cycle. Funding needs are assessed based on a single cycle. Actions focused on advocacy, efficiency, or priority setting are marked as "N/A." This does not imply that coordination actions require no funding; rather, coordination costs have not been calculated. The possible funding ranges are outlined below.

Funding Need Tags

$	$$	$$$	$$$$	Non-monetary
Less than $500k	$500k - $1M	$1 - $5M	> $5M	Advocacy, efficiency, or priority setting actions where a dollar amount is not applicable, warranted, or quantifiable

Each action highlights potential funding sources.
Each action lists potential funding sources, based on previous funding assignments and the Funding & Financing Mechanisms Inventory developed for this Plan. These assignments are indicative, not exhaustive. The Plan acknowledges that funding availability and continuity cannot be guaranteed, and other sources may apply beyond those listed.

Funding Sources

Based on mechanisms within the Chapter 7: Funding & Financing Mechanisms Inventory and previous assignments for the *Resilient Rhody 2018* Actions.

Drinking Water Systems

Action 1.01

Emergency Water Interconnections Strategy: Emergency Water System interconnections provide redundancy of supply and the ability to address water emergencies rapidly and efficiently across water supply districts. Assist both major and local water suppliers in developing Emergency Interconnection Programs to address supply vulnerability among systems throughout the state.

Conduct a technical review of Emergency Interconnection Strategies. Identify and prioritize, through statewide analysis, needed redundancies and interconnections to be implemented, drawing upon alternative supplies identified in local Water Supply System Management Plans, existing interconnections studies, and an update to the Emergency Water System Interconnection Study (Sep. 2000). Through this process, consider where merging of systems for regional collaboration could be of benefit. Create funded incentive programs to enact projects, building upon existing Emergency Water Systems Interconnections program (490-RICR-00-00-3).

In addition, assist water suppliers in identifying priority adaptation strategies that maximize co-benefits while evaluating potential trade-offs. Incorporate runoff regulation as a key consideration in the development and selection of these strategies.

Category:

- **Infrastructure**
- Natural Systems
- Community Resilience
- Emergency Preparedness

Asset Type:

- All Critical Infrastructure
- **Drinking Water**
- Wastewater
- Dams
- Stormwater
- Ports
- Electric Grid
- Fuel Supply
- Roads, Bridges, & Culverts
- Public Transportation
- Beaches & Barriers
- Coastal Wetlands
- Forests
- Water Resources
- Evacuation Routes & Emergency Shelters
- Building Design & Construction
- Emergency Services
- Community Health & Resilience
- Financing Climate Resilience Projects

Responsibility:
WRB w/ RIDOH Support

Driver:

- State
- Gap Analysis
- **Community**
- Partner
- Municipal

Implementation Need(s):
Rules & Regulations, Emergency Preparedness & Response Authorities, Funding Authorizations

Potential Funding Source:
RIIB - Drinking Water State Revolving Fund (DWSRF), DWSRF - Set Asides, Clean Water State Revolving Fund (CWSRF) (runoff regulation component), USDA Rural Development Water Programs, General Obligation bond funding

Timeframe:

- **Short-Term (1-2 years)**
- Medium-Term (2-5 years)
- Long-Term (Ongoing)

Metrics for Success:

- The emergency water systems interconnections study (Sept. 2000) is updated to identify needs for the interconnections and opportunities for resolving regional water issues across the state.
- Necessary water supply redundancies and interconnections are identified and prioritized.
- Existing programs are funded, and additional incentive programs are identified and created.

Funding Need:

- N/A
- $
- $$
- $$$
- **$$$$**

Establishing and implementing Emergency Interconnection Programs across the state will require significant investment. The funding required for resulting projects will require project-level cost estimation.

Action 1.02

Emergency Water Supply Management: Within Water Supply System Management Plans, ensure all major suppliers maintain up-to-date contingency contracts for emergency water supply purchases and have clearly defined interconnection and protocols for distributing alternative supply of safe drinking water. Establishment and mapping of emergency interconnections, mutual aid agreements, and distribution points for community resources. Establish mechanisms for bottled water purchase and distribution. Create a centralized coordination framework across drinking water utilities that allows for knowledge transfer and information sharing, as well as fosters partnerships for interconnection, merging, and mutual aid.

Category:

Infrastructure	Natural Systems	Community Resilience	Emergency Preparedness

Asset Type:

All Critical Infrastructure	**Drinking Water**	Wastewater	Dams	Stormwater
Ports	Electric Grid	Fuel Supply	Roads, Bridges, & Culverts	Public Transportation
Beaches & Barriers	Coastal Wetlands	Forests	Water Resources	
Evacuation Routes & Emergency Shelters	Building Design & Construction	Emergency Services	Community Health & Resilience	Financing Climate Resilience Projects

Responsibility:
RIEMA w/ RIDOH Support, WRB

Timeframe:

Short-Term (1-2 years)	Medium-Term (2-5 years)	Long-Term (Ongoing)

Driver:

State	Gap Analysis	**Community**
Partner	Municipal	

Metrics for Success:

- All major water suppliers maintain and update contingency contracts for emergency water supply purchases.
- and mapping of emergency interconnections is completed.

Implementation Need(s):
Intergovernmental Coordination, Collection & Information Systems, Enforcement & Compliance Mechanisms, Emergency Preparedness & Response Authorities

Potential Funding Source:
FEMA Emergency Management Performance Grant (EMPG), RIIB – Drinking Water State Revolving Fund (DWSRF), DWSRF - Set Asides

Funding Need:

N/A	$	$$	**$$$**	$$$$

Action 1.03

Spillway Management: Develop protocols and formal mechanisms to support proactive spillway management that mitigates downstream flooding without adverse impacts on water supply operations. Develop regional spillway management agreements between State government, local governments, and water suppliers, incorporating both upstream and downstream entities. Generate overview of best practices for resilient spillway management drawing from local, regional, and national examples.

Develop a formal interagency coordination framework for water utility climate preparedness, assigning lead roles and establishing shared platforms to advance common goal setting and communication between water suppliers that manage reservoirs and downstream municipalities.

Category:

- **Infrastructure**
- Natural Systems
- Community Resilience
- Emergency Preparedness

Asset Type:

- All Critical Infrastructure
- **Drinking Water**
- Wastewater
- Dams
- Stormwater
- Ports
- Electric Grid
- Fuel Supply
- Roads, Bridges, & Culverts
- Public Transportation
- Beaches & Barriers
- Coastal Wetlands
- Forests
- Water Resources
- Evacuation Routes & Emergency Shelters
- Building Design & Construction
- Emergency Services
- Community Health & Resilience
- Financing Climate Resilience Projects

Responsibility:
RIDEM w/ WRB Support

Timeframe:

- Short-Term (1-2 years)
- **Medium-Term (2-5 years)**
- Long-Term (Ongoing)

Driver:

- **State**
- Gap Analysis
- Community
- Partner
- Municipal

Implementation Need(s):
Rules & Regulations, Intergovernmental Coordination, Collection & Information Systems, Technical Assistance & Capacity Building, Emergency Preparedness & Response Authorities

Potential Funding Source:
USDA Rural Development Water Programs, RIIB - Clean Water State Revolving Fund (CWSRF), National Estuary Program (Narragansett Bay Estuary)

Metrics for Success:

- Regional spillway management agreements are developed.
- Interagency water utility climate preparedness coordination framework is developed and implemented.
- A shared platform is established between water suppliers and municipalities.

Funding Need:

- N/A
- $
- $$
- **$$$**
- $$$$

Action 1.04

Drinking Water Studies & Program: Continue to assess the vulnerability of drinking water supplies, including wells, to projected coastal and inland flooding, groundwater impacts and drought utilizing scenario modeling to inform capital investment planning. Conduct tabletop exercises with RIEMA, municipal public works, and other relevant stakeholders.

Conduct specific saltwater intrusion studies along the coast, drawing upon the knowledge and existing work of state subject matter experts. Saltwater intrusion studies should incorporate geologic, hydrogeologic, and numerical modeling to effectively address storm surge, sea level rise and groundwater impacts. In scenarios of saltwater contamination, identify best practices for adaptation solutions drawing upon local, regional, and national examples (ex. abandoning brackish water supplies and securing backup water supplies and assessing the feasibility of desalination as a long-term drought and saltwater intrusion resilience strategy) and provide funding for these solutions.

Continue evaluating the health and social impacts of climate-related contamination and establish monitoring programs. Develop public education materials that communicate the climate-related risks to drinking water and groundwater aquifers, summarizing key findings from these assessments. Continue to assess the vulnerability of drinking water supplies to projected coastal and inland flooding, groundwater impacts and drought utilizing scenario modeling to inform capital investment planning. In this process, consider compounding impacts such as water quality, human health, and ecological considerations.

Category:

Infrastructure	Natural Systems	Community Resilience	Emergency Preparedness

Asset Type:

All Critical Infrastructure	**Drinking Water**	Wastewater	Dams	Stormwater
Ports	Electric Grid	Fuel Supply	Roads, Bridges, & Culverts	Public Transportation
Beaches & Barriers	Coastal Wetlands	Forests	Water Resources	
Evacuation Routes & Emergency Shelters	Building Design & Construction	Emergency Services	Community Health & Resilience	Financing Climate Resilience Projects

Responsibility:
WRB w/ RIDOH and RIEMA

Timeframe:

Short-Term (1-2 years)	Medium-Term (2-5 years)	**Long-Term (Ongoing)**

Driver:

State	Gap Analysis	**Community**
Partner	Municipal	

Metrics for Success:

- Saltwater Intrusion studies are completed in vulnerable coastal areas.
- Public education materials about climate-related risks to drinking water are developed.

Implementation Need(s):
Education, Engagement, & Awareness, Collection & Information Systems, Direct Government Investment & Procurement

Potential Funding Source:
RIIB - Drinking Water State Revolving Fund (DWSRF), Clean Water State Revolving Fund (CWSRF), FEMA Flood Mitigation Assistance Grant Program

Funding Need:

N/A	$	$$	**$$$**	$$$$

*Estimate is based on a single implementation cycle.

Wastewater Treatment Facilities

Action 2.01

Wastewater Emergency Management: Ensure major wastewater systems have adequate backup power systems to sustain operations during long-term power outages through annual performance reporting and status updates to a statewide base.

After federally or state declared disaster events, conduct safety assessments for wastewater infrastructure (facilities and pump stations).

Category:

- **Infrastructure**
- Natural Systems
- Community Resilience
- Emergency Preparedness

Asset Type:

- All Critical Infrastructure
- Drinking Water
- **Wastewater**
- Dams
- Stormwater
- Ports
- Electric Grid
- Fuel Supply
- Roads, Bridges, & Culverts
- Public Transportation
- Beaches & Barriers
- Coastal Wetlands
- Forests
- Water Resources
- Evacuation Routes & Emergency Shelters
- Building Design & Construction
- Emergency Services
- Community Health & Resilience
- Financing Climate Resilience Projects

Responsibility:
RIDEM w/ support from RIEMA

Timeframe:

- **Short-Term (1-2 years)**
- Medium-Term (2-5 years)
- **Long-Term (Ongoing)**

Driver:

- **State**
- Gap Analysis
- Community
- Partner
- Municipal

Metrics for Success:

- Annual performance reporting is completed.
- Number of wastewater infrastructure safety assessments increases after federally or State declared disaster events.

Implementation Need(s):
Collection & Information Systems

Potential Funding Source:
RIIB - Clean Water State Revolving Fund (CWSRF), RIDEM Climate Resilience Fund (CRF), RIDEM Wastewater Treatment Facility (WWTF) Resilience Fund, USACE Continuing Authorities Program

Funding Need:

- N/A
- **$**
- $$
- $$$
- $$$$

*Not inclusive of physical installation

Action 2.02

Wastewater System Adaptation: Accelerate actions to enhance the resiliency of wastewater infrastructure at the local level, including resilience projects identified in Implications of Climate Change for RI Wastewater Collection & Treatment Infrastructure. Proactively address projected coastal & inland flooding and saltwater backflow impacts in project planning and design phases, prioritizing infrastructure located within flood zones. All projects should align with local hazard mitigation, comprehensive, and municipal resilience plans, using shared risk (ex. STORMTOOLS) to ensure consistency. Convene stakeholders and research viable alternatives to centralized wastewater treatment including opportunities to recover heat, phosphorus, and other wastewater components, as well as opportunities to recharge groundwater and increase ecosystem resilience.

Following outcomes of the *Resilient Rhody 2025*, design adaptation strategies for identified flood vulnerable facilities (ex. interconnections and abandonment of highly vulnerable stations). Ensure continual analysis of vulnerable on-site septic systems following the 2025 Resilience Plan. Review and establish expanded funding for the Wastewater Treatment Facility Resilience Fund and Community Septic System Loan Program (CSSLP), and similar funds, to support resilience of wastewater facilities and upgrading of septic systems.

Throughout these initiatives, consider compounding impacts of wastewater facility flood hazards, such as interaction with known pollutants such as PFAS, and provide funding and technical support to minimize these concurrent water quality hazards.

Category:

Infrastructure	Natural Systems	Community Resilience	Emergency Preparedness

Asset Type:

All Critical Infrastructure	Drinking Water	**Wastewater**	Dams	Stormwater
Ports	Electric Grid	Fuel Supply	Roads, Bridges, & Culverts	Public Transportation
Beaches & Barriers	Coastal Wetlands	Forests	Water Resources	
Evacuation Routes & Emergency Shelters	Building Design & Construction	Emergency Services	Community Health & Resilience	Financing Climate Resilience Projects

Responsibility:
RIDEM

Timeframe:

Short-Term (1-2 years)	Medium-Term (2-5 years)	Long-Term (Ongoing)

Driver:

State	Gap Analysis	Community
Partner	Municipal	

Metrics for Success:

- Resilience projects identified by Implications of Climate Change for RI Wastewater Collection & Treatment infrastructure are completed.
- Adaptation strategies are implemented for flood vulnerable facilities identified in *Resilient Rhody 2025*.
- Funding for Wastewater Treatment Facility Resilience Fund and Community Septic System Loan Program is expanded.

Implementation Need(s):
Land Use Policy, Collection & Information Systems

Potential Funding Source:
NOAA Coastal Zone Management (CZM) Program, RIDEM Climate Resilience Fund (CRF), RIDEM Wastewater Treatment Facility (WWTF) Resilience Fund, RIIB - Clean Water State Revolving Fund (CWSRF), RIIB Municipal Resilience Program (MRP) Action Grant, RIIB Community Septic System Loan Program (CSSLP)

Funding Need:

N/A	$	$$	**$$$**	$$$$

*Does not account for project-specific construction costs. Estimate for on-going elements is based on a single implementation cycle.

Action 2.03

Wastewater Workforce Development: Establish a workforce development program for resilient wastewater infrastructure planning, design, construction, and maintenance.

Category:

- **Infrastructure**
- Natural Systems
- Community Resilience
- Emergency Preparedness

Asset Type:

- All Critical Infrastructure
- Drinking Water
- **Wastewater**
- Dams
- Stormwater
- Ports
- Electric Grid
- Fuel Supply
- Roads, Bridges, & Culverts
- Public Transportation
- Beaches & Barriers
- Coastal Wetlands
- Forests
- Water Resources
- Evacuation Routes & Emergency Shelters
- Building Design & Construction
- Emergency Services
- Community Health & Resilience
- Financing Climate Resilience Projects

Responsibility:
RI DLT, RIDEM

Timeframe:

- Short-Term (1-2 years)
- **Medium-Term (2-5 years)**
- Long-Term (Ongoing)

Driver:

- **State**
- Gap Analysis
- Community
- Partner
- Municipal

Metrics for Success:

- A wastewater resilience workforce development program is established.

Implementation Need(s):
Technical Assistance & Capacity Building

Potential Funding Source:
USDA Rural Development Training Programs, NOAA Environmental Literacy Program, RIIB Wastewater Treatment Facility Resilience Fund (WWTFRF), RIIB Municipal Resilience Fund (MRP), Resilient Rhody Infrastructure Fund (RRIF)

Funding Need:

- N/A
- **$**
- $$
- $$$
- $$$$

Dams

Action 3.01

Dam Safety: Develop updated Emergency Action Plans (EAPs) for all statewide high hazard and significant hazard dams, including identifying evacuation routes. Coordinate the development of Emergency Action Plans (EAPs) for dams with municipal emergency management agencies and regional watershed resilience plans to ensure consistency and operational readiness.

Develop a robust and enforceable statewide program to ensure compliance with dam safety and resilience standards. Conduct a statewide, state-funded legal assessment of dam ownership, including a legal analysis of State and municipal rights regarding orphaned dams. Create procedures for those building downstream of dams to consider inundation area below the dam through the State Building Code Commission, as required by regulation. Continue to implement the Dam Failure Warning System.

Continue to prioritize remediation and removal investments as informed by the 2017 Dam Hazard Study, as well as through findings of this statewide resilience plan. Establish State funding program for dam resilience & removal, to benefit both community resilience and habitat connectivity.

Category:

- **Infrastructure**
- Natural Systems
- Community Resilience
- Emergency Preparedness

Asset Type:

- All Critical Infrastructure
- Drinking Water
- Wastewater
- **Dams**
- Stormwater
- Ports
- Electric Grid
- Fuel Supply
- Roads, Bridges, & Culverts
- Public Transportation
- Beaches & Barriers
- Coastal Wetlands
- Forests
- Water Resources
- Evacuation Routes & Emergency Shelters
- Building Design & Construction
- Emergency Services
- Community Health & Resilience
- Financing Climate Resilience Projects

Responsibility:
RIDEM w/ support from RIEMA

Timeframe:

- **Short-Term (1-2 years)**
- Medium-Term (2-5 years)
- **Long-Term (Ongoing)**

Driver:

- **State**
- Gap Analysis
- Community
- Partner
- Municipal

Metrics for Success:

- Emergency Action Plans are updated for all high and significant hazard dams.
- A dam safety compliance program is updated, including statewide legal assessment of dam ownership and downstream building procedures.

Implementation Need(s):
Rules & Regulations, Enforcement & Compliance Mechanisms, Emergency Preparedness & Response Authorities

Potential Funding Source:
FEMA Flood Mitigation Assistance Grant Program, FEMA National Dam Safety Program, USACE Section 206 & Section 14 (Planning Assistance to States), RIDEM Climate Resilience Fund (CRF), RIIB Municipal Resilience Program (MRP), RIIB Resilient Rhody Infrastructure Fund (RRIF), RI Green Bonds, RIDSP Resilience Technical Assistance Program

Funding Need:

- N/A
- $
- $$
- $$$
- **$$$$**

*Establishing a State funding program for dam resilience & removal will require significant investment. The funding required for this program and resulting projects will require project-level cost estimation.

Stormwater Infrastructure

Action 4.01

Stormwater Design Rules: Update the Stormwater Design and Installation Rules to reflect changing precipitation patterns, advances in available technology, and other policy developments. Reference regional, national, and international resources to develop these updates, including SNEP Stormwater Management Guide. Ensure alignment with most up-to-date standards laid out by the American Society of Civil Engineers and the International Building Code. Include guidance on conducting re-evaluations of stormwater system capacities in conjunction with regular maintenance and cleaning of stormwater system components.

Through these updates, establish a statewide accessible language standard around design storms, moving from yearly occurrence (100yr, 500yr) to % annual chance (1% chance, 0.2% chance).

Ensure all projects adhere to updated rules and clearly demonstrate how impact minimization measures have been integrated into their planning and design. Design trainings for State agencies on the new rule. Integrate requirements into the RI Pollutant Discharge Elimination System (RIPDES) stormwater permitting. The New England Stormwater Retrofit Manual should be used to inform and support initiation of the revision of the Rhode Island MS4 Permit.

Category:

- **Infrastructure**
- Natural Systems
- Community Resilience
- Emergency Preparedness

Asset Type:

- All Critical Infrastructure
- Drinking Water
- Wastewater
- Dams
- **Stormwater**
- Ports
- Electric Grid
- Fuel Supply
- Roads, Bridges, & Culverts
- Public Transportation
- Beaches & Barriers
- Coastal Wetlands
- Forests
- Water Resources
- Evacuation Routes & Emergency Shelters
- Building Design & Construction
- Emergency Services
- Community Health & Resilience
- Financing Climate Resilience Projects

Responsibility:
RIDEM

Timeframe:

- **Short-Term (1-2 years)**
- Medium-Term (2-5 years)
- Long-Term (Ongoing)

Driver:

- **State**
- Gap Analysis
- Community
- Partner
- Municipal

Metrics for Success:

- Stormwater Design and Installation Rules are updated to reflect updated precipitation and alignment with ASCE and IBC standards, SNEP Stormwater Management Guide, and other resources.
- Language around design storms is changed from yearly occurrence to percentage annual chance statewide.

Implementation Need(s):
Rules & Regulations

Funding Need:

- N/A
- **$**
- $$
- $$$
- $$$$

Potential Funding Source:
RIIB - Clean Water State Revolving Fund (CWSRF) CWSRF - Set Aside, RIDEM Climate Resilience Fund (CRF), RIDEM Ocean State Climate Adaptation and Resilience (OSCAR) Fund, FEMA Flood Mitigation Assistance Grant Program

Action 4.02

Green Infrastructure & Water Quality: Use Total Maximum Daily Loads (TMDL) and watershed management plans to prioritize resilience projects that also provide water pollution control benefits to existing drainage systems and remove existing impervious cover.

Encourage the integration of green infrastructure to enhance the capacity of traditional stormwater systems while delivering co-benefits such as improved water quality, ecosystem health, and community resilience. Strengthen state-level commitments to tree retention, native plantings, and pollution reduction—including marine debris and plastics—to minimize damage and cleanup needs following heavy precipitation events. Expand the use of storage areas for combined sewer overflows (CSOs) to increase storage capacity and containment of polluted materials after extreme weather events. Integrate green infrastructure into the Sustainable SITES Initiative program.

Build incentives to utilize green infrastructure solutions into criteria for funding programs. Publicize successful examples of green infrastructure projects. Simplify the permitting process for these projects (eg. streamlining, certification, etc.) and ensure guidance is clear on requirements for retrofits versus new development. Ensure there is also guidance on the maintenance requirements for green infrastructure.

Category:

Infrastructure	Natural Systems	Community Resilience	Emergency Preparedness

Asset Type:

All Critical Infrastructure	Drinking Water	Wastewater	Dams	**Stormwater**
Ports	Electric Grid	Fuel Supply	Roads, Bridges, & Culverts	Public Transportation
Beaches & Barriers	Coastal Wetlands	Forests	Water Resources	
Evacuation Routes & Emergency Shelters	Building Design & Construction	Emergency Services	Community Health & Resilience	Financing Climate Resilience Projects

Responsibility:
RIDEM, CRMC

Timeframe:

Short-Term (1-2 years)	**Medium-Term (2-5 years)**	**Long-Term (Ongoing)**

Driver:

State	Gap Analysis	Community
Partner	Municipal	

Metrics for Success:

- Green infrastructure is integrated into stormwater system projects, with projects documented and publicized.
- Water quality improves in watersheds that implement green infrastructure.
- Funding and permitting processes are updated to incentivize green infrastructure and streamline approvals.

Implementation Need(s):
Rules & Regulations, Community Incentives

Potential Funding Source:
RIIB - Clean Water State Revolving Fund, Municipal Resilience Program (MRP), Municipal Infrastructure Grant Program (MIGP), RIDEM Climate Resilience Fund, RIDEM Ocean State Climate Adaptation and Resilience (OSCAR) Funds, USACE Section 206 & Section 14(Planning Assistance to States)

Funding Need:

N/A	$	$$	$$$	**$$$$**

*Green infrastructure solutions will require significant investment. The total funding required for construction costs will require project-level cost estimation.

Action 4.03

Stormwater Management Funding: Work with local governments to establish sustainable revenue sources for the operation and maintenance of local stormwater management systems and investment in needed upgrades (ex. culvert upsizing, etc.) to address drainage issues, water quality, and other flooding concerns. Gather, develop, and convey information regarding model stormwater utility district approaches that municipalities can implement locally. In this process, highlight national approaches with local relevance that are successful, feasible, and equitable. Work with municipalities who are actively exploring these measures to convey lessons learned on the ground statewide.

Develop State-led funding streams for townwide stormwater vulnerability assessments and the purchase of stormwater maintenance equipment to be shared across regions, including vacuum trucks and excavators. Direct technical assistance services and additional funding support to small and rural municipalities.

Category:

- **Infrastructure**
- Natural Systems
- Community Resilience
- Emergency Preparedness

Asset Type:

- All Critical Infrastructure
- Drinking Water
- Wastewater
- Dams
- **Stormwater**
- Ports
- Electric Grid
- Fuel Supply
- Roads, Bridges, & Culverts
- Public Transportation
- Beaches & Barriers
- Coastal Wetlands
- Forests
- Water Resources
- Evacuation Routes & Emergency Shelters
- Building Design & Construction
- Emergency Services
- Community Health & Resilience
- Financing Climate Resilience Projects

Responsibility:
RIIB

Timeframe:

- **Short-Term (1-2 years)**
- Medium-Term (2-5 years)
- **Long-Term (Ongoing)**

Driver:

- State
- Gap Analysis
- **Community**
- Partner
- Municipal

Metrics for Success:

- Water quality and stormwater drainage improves across the State.
- Assessment of model stormwater utility district approaches is completed, with findings shared with municipalities.
- Funding streams for townwide stormwater assessments, maintenance equipment purchasing, and direct technical assistance are established.

Implementation Need(s):
Funding, Technical Assistance & Capacity Building

Potential Funding Source:
RIIB - Clean Water State Revolving Fund (CWSRF), Drinking Water State Revolving Fund (DWSRF) Small Systems Technical Assistance Set Aside, RIIB Community Project Assistance Fund (CPAF), RIIB Municipal Resilience Program (MRP) Action Grant, RIDEM Climate Resilience Fund, RIDEM Ocean State Climate Adaptation and Resilience (OSCAR) Fund, USDA Rural Development Water Programs, EPA Southeast New England Program Opportunity to Advance Resilience (SOAR) Fund

Funding Need:

- N/A
- $
- $$
- $$$
- **$$$$**

Establishing a State funding program for stormwater assessments and equipment will require significant investment. The funding required for this program and resulting projects will require project-level cost estimation.

Ports

Action 5.01

Port Resilience: Strengthen storm resilience and post-storm recovery at RI ports through strategic partnerships and planning. Shipping lines will turn to ports that rapidly resume normal operations after Nor'easter's, tropical cyclones, hurricanes and other extreme weather events. Rhode Island and cities like Providence and East Providence should approach storm resilience and climate change as a business opportunity through the inclusion of resilience planning and port electrification.

Continue to support collaborative partnership between the State and port community (e.g. the State Port Manager position, the Port/Community Working Group, the Freight Advisory Committee, People's Port Authority, and Racial and Environmental Justice Committee), as well as the inclusion of resilience in port planning processes such as the ProvPort Master Plan.

Conduct a State Port Economic Vulnerability Study to demonstrate how climate change will impact maritime economic sectors including tourism, supply chains, and fisheries.

Category:

Infrastructure	Natural Systems	Community Resilience	Emergency Preparedness

Asset Type:

All Critical Infrastructure	Drinking Water	Wastewater	Dams	Stormwater
Ports	Electric Grid	Fuel Supply	Roads, Bridges, & Culverts	Public Transportation
Beaches & Barriers	Coastal Wetlands	Forests	Water Resources	
Evacuation Routes & Emergency Shelters	Building Design & Construction	Emergency Services	Community Health & Resilience	Financing Climate Resilience Projects

Responsibility:
RIDEM, CRMC, RIEMA

Timeframe:

Short-Term (1-2 years)	Medium-Term (2-5 years)	**Long-Term (Ongoing)**

Driver:

State	Gap Analysis	Community
Partner	Municipal	

Metrics for Success:

- Climate resilience is integrated into the ProvPort Master Plan.
- A State Port Economic Vulnerability Study is completed.

Implementation Need(s):
Intergovernmental Coordination, Technical Assistance & Capacity Building, Public-Private Partnership Frameworks

Potential Funding Source:
USDOT Port Infrastructure Development Program (PIDP) RIIB - Municipal Resilience Program (MRP), Municipal Infrastructure Grant Program (MIGP), Clean Water State Revolving Fund (CWSRF), Efficient Building Fund (EBF)

Funding Need:

N/A	**$**	$$	$$$	$$$$

Action 5.02

Port Resilience Funding: Seek collaborative funding opportunities to construct storm protection systems along port infrastructure aimed at safeguarding neighboring and disadvantaged communities from storm surges while enhancing access to emergency and medical facilities. Provide State funding for port resilience improvements that implement bulkhead resilience standards. Develop pre-contracts for debris removal after hurricanes.

This initiative not only addresses critical flood protection needs but also fosters resilience in vulnerable neighborhoods, ensuring that residents can reach essential services during severe weather events. By investing in this infrastructure, Providence and Rhode Island can mitigate both immediate risks and the long-term impacts of climate change, ultimately promoting environmental equity and community safety.

Category:

- **Infrastructure**
- Natural Systems
- Community Resilience
- Emergency Preparedness

Asset Type:

- All Critical Infrastructure
- Drinking Water
- Wastewater
- Dams
- Stormwater
- **Ports**
- Electric Grid
- Fuel Supply
- Roads, Bridges, & Culverts
- Public Transportation
- Beaches & Barriers
- Coastal Wetlands
- Forests
- Water Resources
- Evacuation Routes & Emergency Shelters
- Building Design & Construction
- Emergency Services
- Community Health & Resilience
- **Financing Climate Resilience Projects**

Responsibility:
RIDEM

Timeframe:

- **Short-Term (1-2 years)**
- Medium-Term (2-5 years)
- Long-Term (Ongoing)

Driver:

- State
- Gap Analysis
- Community
- **Partner**
- Municipal

Metrics for Success:

- Storm protection systems supporting port infrastructure increases throughout the State.

Implementation Need(s):
Funding, Emergency Preparedness & Response Authorities

Potential Funding Source:
HUD Community Development Block Grant (CDBG) Program, USDOT Promoting Resilient Operations for Transformative, Efficient, and Cost-saving Transportation Program (PROTECT) Grant Program, USDOT Port Infrastructure Development Program (PIDP), RIIB - Municipal Resilience Program (MRP), Municipal Infrastructure Grant Program (MIGP), Municipal Road & Bridge Revolving Loan Fund (MRBRF)

Funding Need:

- N/A
- $
- $$
- $$$
- **$$$$**

*Not inclusive of physical installation. The funding required for these projects will require project-level cost estimation.

Electric Grid

Action 6.01

Grid Resilience & Modernization Reforms:
Advance grid modernization and complementary reforms, aligning with recommendations from the State energy plan and the House Energy Security Resolution Report. Reevaluate regulatory frameworks to better support innovation, transparency, and resilience—ensuring energy projects are clearly identified, appropriately funded, and effectively tracked through existing dockets and performance systems.

Category:

- **Infrastructure**
- Natural Systems
- Community Resilience
- Emergency Preparedness

Asset Type:

- All Critical Infrastructure
- Drinking Water
- Wastewater
- Dams
- Stormwater
- Ports
- **Electric Grid**
- Fuel Supply
- Roads, Bridges, & Culverts
- Public Transportation
- Beaches & Barriers
- Coastal Wetlands
- Forests
- Water Resources
- Evacuation Routes & Emergency Shelters
- Building Design & Construction
- Emergency Services
- Community Health & Resilience
- Financing Climate Resilience Projects

Responsibility:
DPUC, PUC, OER, and Utilities

Timeframe:

- **Short-Term (1-2 years)**
- Medium-Term (2-5 years)
- **Long-Term (Ongoing)**

Driver:

- **State**
- Gap Analysis
- Community
- Partner
- Municipal

Metrics for Success:

- Recommendations from State energy plan and the House Energy Security Resolution Report are implemented.
- Regulatory frameworks are reevaluated.

Implementation Need(s):
Rules & Regulations, Technical Assistance & Capacity Building

Potential Funding Source:
DOE 40101(d) Funding

Funding Need:

- **N/A**
- $
- $$
- $$$
- $$$$

Action 6.02

Energy Security Strategy & Solutions: Continue to implement the Energy Security Strategy and State Energy Security Plan (SESP), which addresses energy security vulnerabilities at the municipal or facility level and is based on findings of the Energy Assurance Plan.

Implemented measures should address risks specific to discrete critical infrastructure assets, including hospitals, police and fire stations, water and sewage treatment plants, senior centers and nursing homes, shelters, correctional facilities, fueling stations, and grocery stores.

Smart energy security investments at these locations and energy resilience solutions can alleviate the impacts of power outages in energy emergencies. Examples of such solutions are backup generation, resilience hubs, distributed generation, combined heat and power, energy storage, and microgrids. Prioritize outreach and support to under-resourced and rural towns, and offer tailored assistance for smaller municipalities lacking grant-writing capacity or staff support.

Category:

Infrastructure	Natural Systems	Community Resilience	Emergency Preparedness

Asset Type:

All Critical Infrastructure	Drinking Water	Wastewater	Dams	Stormwater
Ports	**Electric Grid**	Fuel Supply	Roads, Bridges, & Culverts	Public Transportation
Beaches & Barriers	Coastal Wetlands	Forests	Water Resources	
Evacuation Routes & Emergency Shelters	Building Design & Construction	Emergency Services	Community Health & Resilience	Financing Climate Resilience Projects

Responsibility:
OER and RIEMA w/ support from DPUC

Timeframe:

Short-Term (1-2 years)	**Medium-Term (2-5 years)**	**Long-Term (Ongoing)**

Driver:

State	Gap Analysis	Community
Partner	Municipal	

Metrics for Success:

- Increase in the number of energy resilience solutions implemented at hospitals, police and fire stations, water and sewage treatment plants, nursing homes, shelters, correctional facilities, fueling stations, and grocery stores.

Implementation Need(s):
Funding, Technical Assistance & Capacity Building, Emergency Preparedness & Response Authorities

Potential Funding Source:
Bond/Legislative Request

Funding Need:

N/A	$	$$	$$$	**$$$$**

*Energy security solutions will require significant investment. The funding required for these projects will require project-level cost estimation.

Action 6.03

Energy Resilience & Reduced Power Outages: Foster energy resilience and reduce the frequency and severity of power outages as outlined in Division Docket No. D-17-45 by enhancing storm forecasting tools, enabling real-time weather classification adjustments, enhancing vegetation management, strengthening communications, reducing energy demand, and refining mutual aid agreements for timely crew deployment.

Continue to implement actions proposed in the Electric Infrastructure, Safety, and Reliability Plan.

Category:

- **Infrastructure**
- Natural Systems
- Community Resilience
- Emergency Preparedness

Asset Type:

- All Critical Infrastructure
- Drinking Water
- Wastewater
- Dams
- Stormwater
- Ports
- **Electric Grid**
- Fuel Supply
- Roads, Bridges, & Culverts
- Public Transportation
- Beaches & Barriers
- Coastal Wetlands
- Forests
- Water Resources
- Evacuation Routes & Emergency Shelters
- Building Design & Construction
- Emergency Services
- Community Health & Resilience
- Financing Climate Resilience Projects

Responsibility:
DPUC, PUC, Utilities

Timeframe:

- **Short-Term (1-2 years)**
- Medium-Term (2-5 years)
- **Long-Term (Ongoing)**

Driver:

- State
- **Gap Analysis**
- Community
- Partner
- Municipal

Metrics for Success:

- Energy resilience actions outlined in Division Docket No. D-17-45, Docket 25-25-EL, and the Electric Infrastructure, Safety, and Reliability Plan are implemented.

Implementation Need(s):
Intergovernmental Coordination

Potential Funding Source:
FEMA Emergency Management Performance Grant (EMPG), RI OER Clean Energy Programs & Power System Transformation Coordination, RIIB Municipal Resilience Program (MRP), RIDSP Resilience Technical Assistance Program

Funding Need:

- N/A
- $
- $$
- $$$
- **$$$$**

Energy resilience solutions will require significant investment. The funding required for these projects will require project-level cost estimation.

Action 6.04

Microgrid Resilience: Use the Resilient Microgrid for Critical Services Report and Program, as well as the RI Public Utilities Commission's (PUC) microgrid report, to inform an updated statewide microgrid program and establish long term state budget funding mechanism to support the grid resiliency and microgrid deployment technical assistance programs, particularly in rural communities.

Category:

- **Infrastructure**
- Natural Systems
- Community Resilience
- Emergency Preparedness

Asset Type:

- All Critical Infrastructure
- Drinking Water
- Wastewater
- Dams
- Stormwater
- Ports
- **Electric Grid**
- Fuel Supply
- Roads, Bridges, & Culverts
- Public Transportation
- Beaches & Barriers
- Coastal Wetlands
- Forests
- Water Resources
- Evacuation Routes & Emergency Shelters
- Building Design & Construction
- Emergency Services
- Community Health & Resilience
- Financing Climate Resilience Projects

Responsibility:
OER

Timeframe:

- **Short-Term (1-2 years)**
- Medium-Term (2-5 years)
- **Long-Term (Ongoing)**

Driver:

- State
- Gap Analysis
- **Community**
- Partner
- Municipal

Metrics for Success:

- A long-term State budget funding mechanism is established for microgrid deployment technical assistance, with a particular focus on rural areas.

Implementation Need(s):
Funding, Technical Assistance & Capacity Building

Potential Funding Source:
DOE State Energy Program (SEP), Clean Energy Programs & Power System Transformation Coordination, RIIB - Efficient Building Fund (EBF), Municipal Resilience Program (MRP), Bond/Legislative Request

Funding Need:

- N/A
- $
- $$
- $$$
- **$$$$**

Energy resilience solutions will require significant investment. The funding required for these projects will require project-level cost estimation.

Fuel Supply

Action 7.01

Energy Storage & Set-Aside: Develop an Energy Storage Program, including battery energy storage systems, in alignment with the revised Long-Term Contracting Standard for Renewable Energy (R.I. Gen. Laws § 39-26.1-10) to achieve the 600 MW target set for 2033 and that prioritizes non-fossil fuel solutions, to ensure essential public needs are met during a severe fuel shortage.

This program should specify best practices to ensure back-up solutions to priority end-users, such as hospitals, police and fire stations, water and sewage treatment plants, senior centers and nursing homes, shelters, correctional facilities, fueling stations, and grocery stores. This program should also define best practices, such as avoidance of using diesel, and prioritize critical infrastructure assets.

Category:

- **Infrastructure**
- Natural Systems
- Community Resilience
- Emergency Preparedness

Asset Type:

- All Critical Infrastructure
- Drinking Water
- Wastewater
- Dams
- Stormwater
- Ports
- Electric Grid
- **Fuel Supply**
- Roads, Bridges, & Culverts
- Public Transportation
- Beaches & Barriers
- Coastal Wetlands
- Forests
- Water Resources
- Evacuation Routes & Emergency Shelters
- Building Design & Construction
- Emergency Services
- Community Health & Resilience
- Financing Climate Resilience Projects

Responsibility:
OER, RIIB, PUC, DPUC, RIE

Timeframe:

- Short-Term (1-2 years)
- **Medium-Term (2-5 years)**
- **Long-Term (Ongoing)**

Driver:

- State
- Gap Analysis
- **Community**
- Partner
- Municipal

Metrics for Success:

- An Energy Storage Program is established.
- Increased number of energy storage projects implemented at hospitals, police and fire stations, water and sewage treatment plants, senior centers and nursing homes, shelters, correctional facilities, fueling stations, and grocery stores.
- Continued tracking of installed energy storage projects.

Implementation Need(s):
Funding, Direct Government Investment & Procurement

Potential Funding Source:
US DOE State Energy Program (SEP), RIIB - Building Fund (EBF), Municipal Resilience Program (MRP), Municipal Infrastructure Grant Program (MIGP)

Funding Need:

- N/A
- $
- $$
- $$$
- **$$$$**

Establishing an Energy Storage Program will require significant investment. The funding required for this program will require project-level cost estimation.

Action 7.02

Fuel Terminals: As part of the development of the State Energy Security Plan, a comprehensive climate vulnerability assessment of fuel terminals and above ground storage facilities was conducted. Continue implementation of the plan to ensure fuel terminals have undertaken all appropriate resilience measures to protect their facilities from future storms and have made provisions to restore operations after storms. This includes continuing strategic long-term planning for improving the resilience of marine terminals. Continue to incorporate this as an asset type into State resilience planning. Establish State flood design standards or guidance for above ground storage tanks and work with regional partners to develop coordination, monitoring, and response frameworks for critical energy supply infrastructure.

Category:

Infrastructure	Natural Systems	Community Resilience	Emergency Preparedness

Asset Type:

All Critical Infrastructure	Drinking Water	Wastewater	Dams	Stormwater
Ports	Electric Grid	**Fuel Supply**	Roads, Bridges, & Culverts	Public Transportation
Beaches & Barriers	Coastal Wetlands	Forests	Water Resources	
Evacuation Routes & Emergency Shelters	Building Design & Construction	Emergency Services	Community Health & Resilience	Financing Climate Resilience Projects

Responsibility:
OER, RIEMA

Timeframe:

Short-Term (1-2 years)	Medium-Term (2-5 years)	**Long-Term (Ongoing)**

Driver:

State	**Gap Analysis**	Community
Partner	Municipal	

Metrics for Success:

- Continued compliance with the State Energy Security Plan (SESP) and expanded SESP activity with regional energy security coordination efforts.

Implementation Need(s):
Enforcement & Compliance Mechanisms, Rules and Regulations

Potential Funding Source:
USDOT Port Infrastructure Development Program (PIDP) RIIB - Commercial Property Assessed Clean Energy (C-PACE), Municipal Resilience Program (Strategic planning only), Municipal Infrastructure Grant Program (MIGP)

Funding Need:

N/A	$	**$$**	$$$	$$$$

*Not inclusive of physical installation. The funding required for these projects will require project-level cost estimation.

Roads, Bridges, and Culverts

Action 8.01

Active Transportation Funding: Establish dedicated bond funding and a State budget line item to support climate-resilient active transportation projects, including adaptation and mitigation efforts aligned with the Bike Mobility Plan, State Transit Plan, and others. Ensure these projects also incorporate green infrastructure and nature-based solutions for flood control and heat reduction at these locations, with a focus on improving the resilience and safety of pedestrian, cycling, and transit bridges that serve as key connectors within active transportation networks.

Category:

- **Infrastructure**
- Natural Systems
- Community Resilience
- Emergency Preparedness

Asset Type:

- All Critical Infrastructure
- Drinking Water
- Wastewater
- Dams
- Stormwater
- Ports
- Electric Grid
- Fuel Supply
- **Roads, Bridges, & Culverts**
- Public Transportation
- Beaches & Barriers
- Coastal Wetlands
- Forests
- Water Resources
- Evacuation Routes & Emergency Shelters
- Building Design & Construction
- Emergency Services
- Community Health & Resilience
- **Financing Climate Resilience Projects**

Responsibility:
Commerce

Timeframe:

- Short-Term (1-2 years)
- **Medium-Term (2-5 years)**
- Long-Term (Ongoing)

Driver:

- **State**
- Gap Analysis
- Community
- Partner
- Municipal

Metrics for Success:

- Dedicated bond funding and State budget line item are established for active transportation resilience projects.
- The number of green infrastructure and nature-based solutions that are incorporated into active transportation projects increases.

Implementation Need(s):
Funding

Potential Funding Source:
Bond/Legislative Request

Funding Need:

- N/A
- $
- $$
- $$$
- **$$$$**

*The funding required for these projects will require project-level cost estimation.

Action 8.02

Wildlife Corridors: Establish a wildlife crossing initiative to study, identify, and prioritize target areas for restoring habitat connectivity, enhancing biodiversity corridors, and improving public safety through reduced wildlife-vehicle collisions. Identify undersized culverts and bridge crossings, and prioritize for upgrades and up-sizing to both improve aquatic connectivity and reduce flooding.

Category:

- **Infrastructure**
- Natural Systems
- Community Resilience
- Emergency Preparedness

Asset Type:

- All Critical Infrastructure
- Drinking Water
- Wastewater
- Dams
- Stormwater
- Ports
- Electric Grid
- Fuel Supply
- **Roads, Bridges, & Culverts**
- Public Transportation
- Beaches & Barriers
- Coastal Wetlands
- Forests
- Water Resources
- Evacuation Routes & Emergency Shelters
- Building Design & Construction
- Emergency Services
- Community Health & Resilience
- Financing Climate Resilience Projects

Responsibility:
RIDOT, RIDEM

Timeframe:

- Short-Term (1-2 years)
- **Medium-Term (2-5 years)**
- Long-Term (Ongoing)

Driver:

- **State**
- Gap Analysis
- Community
- Partner
- Municipal

Metrics for Success:

- A wildlife crossing initiative is established and target areas are identified.

Implementation Need(s):
Land Use Policy, Intergovernmental Coordination, Education, Engagement, & Awareness

Potential Funding Source:
US Fish and Wildlife Service State Wildlife Grants
Wildlife Crossing Pilot Program (FHWA),
RI Department of Transportation Capital Improvement Program (CIP)

Funding Need:

- N/A
- **$**
- $$
- $$$
- $$$$

*Not inclusive of physical installation. The funding required for these projects will require project-level cost estimation.

Action 8.03

Green & Complete Streets: Establish a Rhode Island Green & Complete Streets Program with focus on implementation of projects on the ground (dollars and advocacy) incorporating transparency with social and infrastructure information. Ensure proper maintenance after implementation. Build upon examples from neighboring states (ex., Massachusetts) and those already implemented in local municipalities (ex., Providence and Pawtucket). Integrate the program with ongoing projects for LEED for Neighborhood Development and The Sustainable SITES Initiative. Support Green & Complete Streets initiatives, which provide stormwater reduction benefit, through funding and technical assistance.

Category:

- **Infrastructure**
- Natural Systems
- Community Resilience
- Emergency Preparedness

Asset Type:

- All Critical Infrastructure
- Drinking Water
- Wastewater
- Dams
- Stormwater
- Ports
- Electric Grid
- Fuel Supply
- **Roads, Bridges, & Culverts**
- Public Transportation
- Beaches & Barriers
- Coastal Wetlands
- Forests
- Water Resources
- Evacuation Routes & Emergency Shelters
- Building Design & Construction
- Emergency Services
- Community Health & Resilience
- Financing Climate Resilience Projects

Responsibility:
RIDOT

Timeframe:

- Short-Term (1-2 years)
- **Medium-Term (2-5 years)**
- Long-Term (Ongoing)

Driver:

- State
- Gap Analysis
- Community
- **Partner**
- Municipal

Metrics for Success:

- A Rhode Island Green & Complete Streets Program is established.

Implementation Need(s):
Intergovernmental Coordination, Collection & Information Systems, Funding, Technical Assistance & Capacity Building

Funding Need:

- N/A
- $
- **$$**
- $$$
- $$$$

Potential Funding Source:
USDOT Promoting Resilient Operations for Transformative, Efficient, and Cost-saving Transportation Program (PROTECT) Grant Program, RIIB - Municipal Road & Bridge Revolving Loan Fund, Municipal Resilience Fund (MRP), Municipal Infrastructure Grant Program (MIGP), Clean Water State Revolving Fund (CWSRF), RIDEM Climate Resilience Fund, RIDEM Ocean State Climate Adaptation and Resilience (OSCAR) Funds

Public Transportation

Action 9.01

Transportation Resilience: Update the Transit Asset Management Plan for the Rhode Island Public Transit Authority (RIPTA) assets that creates measurable benchmarks and communication approach to ensure a state of good repair and investments that consider future climate risks.

Update the RIPTA Transit Asset Management Plan in 2026. Address high priority sites identified through the Rhode Island Department of Transportation (RIDOT) Resilience Improvement Plan and ensure continued funding to implement resilience measures at these locations. Continue to incorporate resilience findings of the Resilience Improvement Plan into the State Transportation Improvement Program (STIP) and RIPTA Transit Asset Management Plan. Continue to support and fund environmental planning staff at DOT to support this work. Align with Act on Climate priorities and strategies.

Category:

- **Infrastructure**
- Natural Systems
- Community Resilience
- Emergency Preparedness

Asset Type:

- All Critical Infrastructure
- Drinking Water
- Wastewater
- Dams
- Stormwater
- Ports
- Electric Grid
- Fuel Supply
- Roads, Bridges, & Culverts
- **Public Transportation**
- Beaches & Barriers
- Coastal Wetlands
- Forests
- Water Resources
- Evacuation Routes & Emergency Shelters
- Building Design & Construction
- Emergency Services
- Community Health & Resilience
- Financing Climate Resilience Projects

Responsibility:
RIPTA, RIDOT, RI Div. of Statewide Planning

Timeframe:

- **Short-Term (1-2 years)**
- Medium-Term (2-5 years)
- Long-Term (Ongoing)

Driver:

- State
- **Gap Analysis**
- Community
- Partner
- Municipal

Metrics for Success:

- The RIPTA Transit Asset Management Plan is updated to integrate priorities from the Resilience Improvement Plan.
- Findings from the RIDOT Resilience Improvement Plan are incorporated into the State Transportation Improvement Program.
- Resilience benchmarks are established.

Implementation Need(s):
Intergovernmental Coordination, Collection & Information Systems, Funding

Funding Need:

- N/A
- $
- **$$**
- $$$
- $$$$

Potential Funding Source:
USDOT Promoting Resilient Operations for Transformative, Efficient, and Cost-saving Transportation Program (PROTECT) Planning Grant, RI Department of Transportation Capital Improvement Program, RIPTA Capital Funds, Rhode Island Infrastructure Bank, Bus and Bus Facilities Grant Program

Action 9.02

Public Transportation Continuity: Ensure continuity of the Rhode Island Public Transit Authority (RIPTA) operations following extreme weather events through implementation of hardening projects and backup power generation at key facilities, prioritizing bus service continuity. Publicly communicate any alternative routes or schedules with passengers during events.

Category:

- **Infrastructure**
- Natural Systems
- Community Resilience
- Emergency Preparedness

Asset Type:

- All Critical Infrastructure
- Drinking Water
- Wastewater
- Dams
- Stormwater
- Ports
- Electric Grid
- Fuel Supply
- Roads, Bridges, & Culverts
- **Public Transportation**
- Beaches & Barriers
- Coastal Wetlands
- Forests
- Water Resources
- Evacuation Routes & Emergency Shelters
- Building Design & Construction
- Emergency Services
- Community Health & Resilience
- Financing Climate Resilience Projects

Responsibility:
RIPTA

Timeframe:

- Short-Term (1-2 years)
- Medium-Term (2-5 years)
- **Long-Term (Ongoing)**

Driver:

- State
- Gap Analysis
- **Community**
- Partner
- Municipal

Metrics for Success:

- RIPTA downtime after extreme weather events decreases.
- The number of RIPTA facilities with backup power and hardened infrastructure increases.

Implementation Need(s):
Enforcement & Compliance Mechanisms

Potential Funding Source:
USDOT Promoting Resilient Operations for Transformative, Efficient, and Cost-saving Transportation Program (PROTECT) Grant Program, RIIB - Efficient Building Fund (EBF), Bus and Bus Facilities Grant Program

Funding Need:

- N/A
- $
- $$
- $$$
- **$$$$**

*Hardening and back-up power solutions will require significant investment. The funding required for these projects will require project-level cost estimation.

Beaches and Barriers

Action 10.01

Coastal Resilience & Restoration Partnership: Increase the State's ability to advance coastal resilience and habitat restoration by dedicating staff capacity and resources to planning, prioritizing and implementing coastal ecological and community resilience projects.

Through existing and newly created programs, prioritize preserving the dynamic nature of beaches and barriers by advancing strategies such as land acquisition and the placement of conservation easements to protect these critical natural resources. All projects and initiatives will ensure consistency with RI Coastal Resources Management Council (CRMC) regulation as defined in the Coastal Resources Management Program. Partner with local, regional, and national subject matter experts to inform initiatives.

Category:

Infrastructure	**Natural Systems**	Community Resilience	Emergency Preparedness

Asset Type:

All Critical Infrastructure	Drinking Water	Wastewater	Dams	Stormwater
Ports	Electric Grid	Fuel Supply	Roads, Bridges, & Culverts	Public Transportation
Beaches & Barriers	**Coastal Wetlands**	Forests	Water Resources	
Evacuation Routes & Emergency Shelters	Building Design & Construction	Emergency Services	Community Health & Resilience	Financing Climate Resilience Projects

Responsibility:
RIDEM (NBNERR), CRMC

Timeframe:

Short-Term (1-2 years)	Medium-Term (2-5 years)	**Long-Term (Ongoing)**

Driver:

State	Gap Analysis	Community
Partner	Municipal	

Metrics for Success:

- Additional FTEs allow for creation of an Ecological and Community Resilience team within RIDEM.
- State coastal land acquisition program is created.
- Increased State funding support for coastal conservation and habitat restoration projects.

Implementation Need(s):
Rules & Regulations, Intergovernmental Coordination, Technical Assistance & Capacity Building

Potential Funding Source:
N/A

Funding Need:

N/A	$	$$	$$$	$$$$

Action 10.02

Beach Renourishment: Strategically support renourishment programs, ensuring structurally effective implementation, cost-benefit analyses of projects, and equitable distribution of beach replenishment and planning resources.

Integrate green stabilization techniques such as dune restoration, coir products, and revegetation into renourishment projects. Bring United States Army Corps of Engineers (USACE) beneficial use into RIGIS and collaborate with the Chief Resilience Officer (CRO) on Beach Erosion Commission's recommendations to prioritize State beaches for renourishment.

Create accessible guidance for the beneficial use of dredged sediment material, incorporating innovative placement strategies that enhance coastal habitats. Expand the use of dredged material for multiple uses including salt marsh creation and public access area enhancement.

Category:

Infrastructure	**Natural Systems**	Community Resilience	Emergency Preparedness

Asset Type:

All Critical Infrastructure	Drinking Water	Wastewater	Dams	Stormwater
Ports	Electric Grid	Fuel Supply	Roads, Bridges, & Culverts	Public Transportation
Beaches & Barriers	Coastal Wetlands	Forests	Water Resources	
Evacuation Routes & Emergency Shelters	Building Design & Construction	Emergency Services	Community Health & Resilience	Financing Climate Resilience Projects

Responsibility:
CRMC

Timeframe:

Short-Term (1-2 years)	**Medium-Term (2-5 years)**	**Long-Term (Ongoing)**

Driver:

State	Gap Analysis	Community
Partner	Municipal	

Metrics for Success:

- The number of beach renourishment projects using green stabilization techniques increases throughout the State.
- Priority beaches for renourishment are identified using recommendations of the Beach Erosion Commission.
- A plan for beneficial sediment use is initiated.

Implementation Need(s):
Community Incentives, Technical Assistance & Capacity Building, Collection & Information Systems

Potential Funding Source:
USACE Continuing Authorities Program, RIDEM Ocean State Climate Adaptation and Resilience (OSCAR) Fund, National Coastal Resilience Fund (NCRF), RIDEM Climate Resilience Fund

Funding Need:

N/A	$	$$	**$$$**	$$$$

*Estimate is based on a single implementation cycle.

Action 10.03

Nature-Based Shoreline Solutions: Develop a map of existing hardened shoreline structures and utilize to identify areas for nature-based solutions with Save The Bay's existing map. Identify areas where future hardening would impact adjacent habitats and public access. Support the enforcement of state coastal regulations that encourage nature-based shoreline solutions and prohibit structural shoreline protection and increase resources and capacity for enforcement.

Ensure that state funding programs include dedicated funds and incentives for nature-based solutions. Support identification of opportunities for less utilized offshore nature-based solutions, such as reefs and sills, through funding and assistance. Identify areas where future hardening would impact adjacent habitats and public access and assess public use of existing hardened spaces to ensure future nature-based solutions are designed to maintain cultural uses.

Category:

Infrastructure	**Natural Systems**	Community Resilience	Emergency Preparedness

Asset Type:

All Critical Infrastructure	Drinking Water	Wastewater	Dams	Stormwater
Ports	Electric Grid	Fuel Supply	Roads, Bridges, & Culverts	Public Transportation
Beaches & Barriers	Coastal Wetlands	Forests	Water Resources	
Evacuation Routes & Emergency Shelters	Building Design & Construction	Emergency Services	Community Health & Resilience	Financing Climate Resilience Projects

Responsibility:
CRMC

Timeframe:

Short-Term (1-2 years)	Medium-Term (2-5 years)	Long-Term (Ongoing)

Driver:

State	Gap Analysis	Community
Partner	Municipal	

Metrics for Success:

- Existing hardened shoreline structures are mapped.
- Priority areas for nature-based solutions are identified.
- Coastal regulatory programs that prevent shoreline hardening and their enforcement are supported.
- State funding sources include dedicated funds and incentives for nature-based solutions.

Implementation Need(s):
Rules & Regulations, Collection & Information Systems

Funding Need:

N/A	$	**$$**	$$$	$$$$

Potential Funding Source:
USACE Section 206 & Section 14 (Planning Assistance to States), National Coastal Resilience Fund (NCRF), RIDEM Climate Resilience Fund, RIDEM Ocean State Climate Adaptation and Resilience (OSCAR) Fund

Action 10.04

Resilience of Coastal Features: Continue initiatives for coastal resilience activities, such as scoping & designing shoreline resilience projects with a focus on nature-based solutions; monitoring existing pilot projects; developing offshore sand sources suitable for beach replenishment; prioritizing beaches to be re-nourished, where demonstrated to be feasible; and identifying & funding the establishment of beach, barrier, and marsh migration pathways through property acquisition and relocation of structures.

Prioritize protection of existing beaches in Type 2 waters and prevention of further shoreline hardening. Reference State and federal mapping resources and the findings of the 2025 Beach Erosion Commission as a part of this work. In particular, continue to fund and update State SLAMM maps as a part of this work.

Assess the specific vulnerability of coastal parks and public beaches to sea level rise and coastal storms. Develop new models for resilient visitor facility construction, parking, and access. Create a long-term schedule for the financing and construction of modifications to parks and beaches to adapt to climate change.

Category:

Infrastructure	**Natural Systems**	Community Resilience	Emergency Preparedness

Asset Type:

All Critical Infrastructure	Drinking Water	Wastewater	Dams	Stormwater
Ports	Electric Grid	Fuel Supply	Roads, Bridges, & Culverts	Public Transportation
Beaches & Barriers	**Coastal Wetlands**	Forests	Water Resources	
Evacuation Routes & Emergency Shelters	Building Design & Construction	Emergency Services	Community Health & Resilience	Financing Climate Resilience Projects

Responsibility:
CRMC, RIDEM

Timeframe:

Short-Term (1-2 years)	Medium-Term (2-5 years)	**Long-Term (Ongoing)**

Driver:

State	Gap Analysis	Community
Partner	Municipal	

Metrics for Success:

- Existing beaches are preserved and shoreline hardening does not increase.
- State SLAMM maps are updated.

Implementation Need(s):
Intergovernmental Coordination, Direct Government Investment & Procurement, Funding, Collection & Information Systems

Potential Funding Source:
USACE Continuing Authorities Program, RIDEM Ocean State Climate Adaptation and Resilience (OSCAR) Fund, National Coastal Resilience Fund (NCRF), NOAA Coastal Zone Management (CZM) Program/Grants

Funding Need:

N/A	$	$$	$$$	**$$$$**

*Acquisitions and relocation of properties will require significant investment. The funding required for these initiatives will require project-level cost estimation.

Action 10.05

Coastal Resources Planning: Update the Coastal and Estuarine Land Conservation Plan (CELCP) plan to incorporate State resilience objectives and create public education materials for this plan and for the need to protect coastal lands.

Revisit and revise Special Area Management Plans for Greenwich Bay, Narrow River, Metro Bay, and the Salt Pond Region. Update Shoreline Change SAMP to incorporate most recent climate and coastal hazard.

Category:

- **Infrastructure**
- Natural Systems
- Community Resilience
- Emergency Preparedness

Asset Type:

- All Critical Infrastructure
- Drinking Water
- Wastewater
- Dams
- Stormwater
- Ports
- Electric Grid
- Fuel Supply
- Roads, Bridges, & Culverts
- Public Transportation
- **Beaches & Barriers**
- **Coastal Wetlands**
- Forests
- Water Resources
- Evacuation Routes & Emergency Shelters
- Building Design & Construction
- Emergency Services
- Community Health & Resilience
- Financing Climate Resilience Projects

Responsibility:
DEM, CRMC

Timeframe:

- **Short-Term (1-2 years)**
- Medium-Term (2-5 years)
- Long-Term (Ongoing)

Driver:

- **State**
- Gap Analysis
- Community
- Partner
- Municipal

Implementation Need(s):
Intergovernmental Coordination, Education, Engagement, & Awareness

Metrics for Success:

- State resilience objectives are incorporated into the Coastal and Estuarine Land Conservation Plan (CELCP).
- Public education materials are created for the CELCP plan.
- Special Area Management Plans for Greenwich Bay, Narrow River, Metro Bay, and the Salt Pond Region are updated.

Potential Funding Source:
NOAA Coastal Zone Management (CZM) Program/Grants, RIDEM Ocean State Climate Adaptation and Resilience(OSCAR) Fund, RIDEM Climate Resilience Fund (CRF), RIDSP Resilience Technical Assistance Program

Funding Need:

- N/A
- $
- **$$**
- $$$
- $$$$

Coastal Wetlands

Action 11.01

Coastal Wetland Restoration & Migration:
Continue monitoring and assessment of coastal wetland habitats and management practices to evaluate and prioritize future actions. Statewide models, such as the Sea Level Affecting Marshes Model (SLAMM) and the Statewide Coastal Rapid Assessment Method (MarshRAM) should be expanded and updated to identify opportunities for conservation and restoration to assist in planning for future marsh migration. Expand wetland and riparian protection.

Establish habitat restoration standards that incorporate climate resilience and develop incentives for these standards to be implemented locally. Increase resources and technical assistance for coastal habitat restoration and protection.

Category:

Infrastructure	**Natural Systems**	Community Resilience	Emergency Preparedness

Asset Type:

All Critical Infrastructure	Drinking Water	Wastewater	Dams	Stormwater
Ports	Electric Grid	Fuel Supply	Roads, Bridges, & Culverts	Public Transportation
Beaches & Barriers	**Coastal Wetlands**	Forests	Water Resources	
Evacuation Routes & Emergency Shelters	Building Design & Construction	Emergency Services	Community Health & Resilience	Financing Climate Resilience Projects

Responsibility:
CRMC, RIDEM

Timeframe:

Short-Term (1-2 years)	**Medium-Term (2-5 years)**	**Long-Term (Ongoing)**

Driver:

State	Gap Analysis	Community
Partner	Municipal	

Implementation Need(s):
Rules & Regulations, Community Incentives, Technical Assistance & Capacity Building, Collection & Information Systems, Enforcement & Compliance Mechanisms

Potential Funding Source:
NOAA Coastal Zone Management (CZM) Program/Grants, National Estuary Program (Narragansett Bay Estuary), National Coastal Resilience Fund (NCRF), US DOD Readiness and Environmental Protection Integration (REPI), RIDEM Climate Resilience Fund, RIDEM Ocean State Climate Adaptation and Resilience (OSCAR) Fund, PL566, Emergency Watershed Protection Program

Metrics for Success:

- Habitat restoration standards that incorporate climate resilience principles are adopted.
- Existing wetland and riparian area is preserved, and marsh migration corridors are identified.
- Incentives are developed to encourage local implementation of standards.
- The number of municipalities accessing state-provided technical assistance increases.

Funding Need:

N/A	$	**$$**	$$$	$$$$

*Estimate is based on a single implementation cycle.

Action 11.02

Coastal Resource Emergency Response: Establish coastal resources hurricane response procedures between the Coastal Resources Management Council (CRMC), RI Department of Environmental Management (RIDEM), RI Emergency Management Agency (RIEMA), and coastal municipalities to ensure natural resources are protected during emergency response. Utilize the Comprehensive Emergency Management Plan (CEMP) to develop procedures.

Category:

Infrastructure	**Natural Systems**	Community Resilience	Emergency Preparedness

Asset Type:

All Critical Infrastructure	Drinking Water	Wastewater	Dams	Stormwater
Ports	Electric Grid	Fuel Supply	Roads, Bridges, & Culverts	Public Transportation
Beaches & Barriers	**Coastal Wetlands**	Forests	Water Resources	
Evacuation Routes & Emergency Shelters	Building Design & Construction	**Emergency Services**	Community Health & Resilience	Financing Climate Resilience Projects

Responsibility:
CRMC, RIEMA, RIDEM

Timeframe:

Short-Term (1-2 years)	Medium-Term (2-5 years)	Long-Term (Ongoing)

Driver:

State	Gap Analysis	Community
Partner	Municipal	

Metrics for Success:

- Emergency hurricane response procedures to protect natural systems are established and coordinated by CRMC, RIDEM, RIEMA, and coastal municipalities.
- Establish the Debris Management Team and with members from CRMC, RIDEM and RIEMA.

Implementation Need(s):
Rules & Regulations, Intergovernmental Coordination, Emergency Preparedness & Response Authorities

Funding Need:

N/A	**$**	$$	$$$	$$$$

Potential Funding Source:
RIDEM Ocean State Climate Adaptation and Resilience (OSCAR) Fund, NOAA Coastal Zone Management (CZM) Program/Grants, FEMA Emergency Management Performance Grant (EMPG)

Action 11.03

Retreat & Voluntary Buyouts: Identify opportunities for retreat, infrastructure removal, and restoration on state-owned and municipally-owned properties, which can serve as demonstration sites for shoreline adaptation. Identify priority areas for voluntary buyouts and potential coastal retreat, such as marsh migration corridors and areas vulnerable to coastal flooding. In this process, consider how CRMC buffer and setback regulations, as well as water classifications, can support. Where possible, retreat rather than fortification should be considered as a coastal adaptation strategy. State agencies and their partners should continue to work with municipalities to identify opportunities for retreat, removal of derelict infrastructure, and enhancement of natural shoreline areas. Implemented restoration projects should continue to be monitored to evaluate the effectiveness of different restoration practices.

Establish a State grant funding program to support voluntary acquisition of flood prone and repetitive loss properties.

Category:

Infrastructure	**Natural Systems**	Community Resilience	Emergency Preparedness

Asset Type:

All Critical Infrastructure	Drinking Water	Wastewater	Dams	Stormwater
Ports	Electric Grid	Fuel Supply	Roads, Bridges, & Culverts	Public Transportation
Beaches & Barriers	**Coastal Wetlands**	Forests	Water Resources	
Evacuation Routes & Emergency Shelters	Building Design & Construction	Emergency Services	**Community Health & Resilience**	Financing Climate Resilience Projects

Responsibility:
CRMC, RIDEM

Timeframe:

Short-Term (1-2 years)	**Medium-Term (2-5 years)**	**Long-Term (Ongoing)**

Driver:

State	Gap Analysis	**Community**
Partner	Municipal	

Metrics for Success:

- Opportunities for retreat and infrastructure removal at state-owned sites are identified.
- Priority areas for voluntary buyout and potential coastal retreat programs are identified.
- State grant funding program for voluntary buyout programs is established.

Implementation Need(s):
Funding, Collection & Information Systems, Intergovernmental Coordination, Community Incentives

Potential Funding Source:
NOAA Coastal Zone Management (CZM) Program/Grants, HUD Community Development Block Grant (CDBG), RIDEM Climate Resilience Fund, RIDEM Ocean State Climate Adaptation and Resilience (OSCAR) Fund, PL566, Emergency Watershed Protection Program

Funding Need:

N/A	$	$$	$$$	**$$$$**

Establishing a grant program for voluntary acquisitions will require significant investment. The funding required for this initiative will require further cost estimation.

Forests

Action 12.01

Forest Preservation: Encourage the protection and restoration of remaining intact forest cover and migration corridors between them, conserving the landscape values of larger, unbroken tracts of land. Consider wildfire and drought risk in planning efforts. This will require considerable collaboration, outreach, and communication with private landowners, who own about 72% of forested land area in the State, as well as creative sustainable investment ideas.

To accomplish this, support coordination among forestry plans (such as The Value of Rhode Island Forests and the State Forest Action Plan), stakeholders, and agencies. Support implementation and enforcement of solar siting legislation to ensure that clean energy solutions do not conflict with the resilience benefits of forested lands (ex. flood and heat reduction). In addition, continue to provide State funding for the preservation of open space, and study and reduce the regulatory and financial barriers between State and local resources.

Category:

Infrastructure	**Natural Systems**	Community Resilience	Emergency Preparedness

Asset Type:

All Critical Infrastructure	Drinking Water	Wastewater	Dams	Stormwater
Ports	Electric Grid	Fuel Supply	Roads, Bridges, & Culverts	Public Transportation
Beaches & Barriers	Coastal Wetlands	**Forests**	Water Resources	
Evacuation Routes & Emergency Shelters	Building Design & Construction	Emergency Services	Community Health & Resilience	Financing Climate Resilience Projects

Responsibility:
RIDEM

Timeframe:

Short-Term (1-2 years)	Medium-Term (2-5 years)	**Long-Term (Ongoing)**

Driver:

State	Gap Analysis	Community
Partner	Municipal	

Metrics for Success:

- Coordination among forestry plans and stakeholders is established.
- Implementation and enforcement of solar siting legislation is improved.
- State funding is maintained or expanded for open space preservation.

Implementation Need(s):
Community Incentives, Intergovernmental Coordination, Technical Assistance & Capacity Building, Public-Private Partnership Frameworks

Potential Funding Source:
USDA Urban and Community Forestry Grant Program, American Forests Tree Equity Catalyst Fund, RIDEM Open Space Grants

Funding Need:

N/A	$	$$	**$$$**	$$$$

*Estimate is based on a single implementation cycle.

Action 12.02

Forest Stewardship: Encourage the creation and utilization of Forest Stewardship Plans that helps protect soil and water quality, fish and wildlife habitat, timber and other forest products, and outdoor recreation. Support landowners in adopting climate-smart forestry practices to build resilient forest landscapes in response to climate change and optimize carbon storage and sequestration. Promote the permanent conservation of RI's most important forests through the Forest Service's Forest Legacy Program and Natural Resources Conservation Service (NRCS) incentives. Landowners with RIDEM approved Forest Stewardship Plans can take advantage of the Farm, Forest, and Open Space Act, which can provide significant reductions in property taxes, as well as other State and federal grant programs.

Category:

Infrastructure	**Natural Systems**	Community Resilience	Emergency Preparedness

Asset Type:

All Critical Infrastructure	Drinking Water	Wastewater	Dams	Stormwater
Ports	Electric Grid	Fuel Supply	Roads, Bridges, & Culverts	Public Transportation
Beaches & Barriers	Coastal Wetlands	**Forests**	Water Resources	
Evacuation Routes & Emergency Shelters	Building Design & Construction	Emergency Services	Community Health & Resilience	Financing Climate Resilience Projects

Responsibility:
RIDEM

Timeframe:

Short-Term (1-2 years)	Medium-Term (2-5 years)	**Long-Term (Ongoing)**

Driver:

State	Gap Analysis	Community
Partner	Municipal	

Metrics for Success:

- Adoption of Forest Stewardship Plans by private landowners increases.
- Participation in forest conservation programs increases.
- Implementation of climate-smart forestry practices increases.

Implementation Need(s):
Community Incentives

Potential Funding Source:
Department of Environmental Management Forest Stewardship Program,
Natural Resources Conservation Service (NRCS) incentives (such as Environmental Quality Incentives Program (EQIP))

Funding Need:

N/A	$	$$	**$$$**	$$$$

Action 12.03

Urban Forestry: Support municipalities in developing and regularly updating their urban tree inventories and implementing community forest plans, including strategic tree canopy plans. These efforts should establish a municipal tree canopy goal and outline strategies to improve air quality, reduce urban heat, improve stormwater management, and promote biodiversity. Continue to utilize and build upon the Tree Equity Score Analyzer tool and other resources to assist in these efforts.

Category:

Infrastructure	**Natural Systems**	Community Resilience	Emergency Preparedness

Asset Type:

All Critical Infrastructure	Drinking Water	Wastewater	Dams	Stormwater
Ports	Electric Grid	Fuel Supply	Roads, Bridges, & Culverts	Public Transportation
Beaches & Barriers	Coastal Wetlands	**Forests**	Water Resources	
Evacuation Routes & Emergency Shelters	Building Design & Construction	Emergency Services	Community Health & Resilience	Financing Climate Resilience Projects

Responsibility:
RIDEM

Timeframe:

Short-Term (1-2 years)	Medium-Term (2-5 years)	**Long-Term (Ongoing)**

Driver:

State	Gap Analysis	Community
Partner	Municipal	

Metrics for Success:

- Number of municipalities with up-to-date urban tree inventories and community forest plans, including strategic tree canopy plans, increases.
- Utilization of Tree Equity Score Analyzer tool and other resources, such as the RI Habitat Resilience Hub, increases.

Implementation Need(s):
Community Incentives, Education, Engagement, & Awareness, Collection & Information Systems, Technical Assistance & Capacity Building

Potential Funding Source:
American Forests Tree Equity Catalyst Fund, RIIB Municipal Resilience Program (MRP), RIDEM Urban and Community Forestry Grant Program, USF & USDA Landscape Scale Restoration (LSR) Grant Program, Climate Smart Communities Initiative (CSCI)

Funding Need:

N/A	$	$$	**$$$**	$$$$

Action 12.04

Forestry Data: Establish funding for needed natural resource mapping (including but not limited to LIDAR for timer typing and conservation planning tools) to support planning and management at the private, municipal, and State levels.

In this work, utilize existing & developing efforts such as the landscape scale forest plan, dirt to trees to wildlife, and wildfire risk mapping.

Ensure that forest resilience vulnerability is assessed at the State level.

Category:

Infrastructure	**Natural Systems**	Community Resilience	Emergency Preparedness

Asset Type:

All Critical Infrastructure	Drinking Water	Wastewater	Dams	Stormwater
Ports	Electric Grid	Fuel Supply	Roads, Bridges, & Culverts	Public Transportation
Beaches & Barriers	Coastal Wetlands	**Forests**	Water Resources	
Evacuation Routes & Emergency Shelters	Building Design & Construction	Emergency Services	Community Health & Resilience	Financing Climate Resilience Projects

Responsibility:
RIDEM

Timeframe:

Short-Term (1-2 years)	**Medium-Term (2-5 years)**	Long-Term (Ongoing)

Driver:

State	Gap Analysis	Community
Partner	Municipal	

Metrics for Success:

- Funding for natural resource mapping is established.
- Forest resilience vulnerability is assessed.

Implementation Need(s):
Collection & Information Systems

Potential Funding Source:
USGS 3D Elevation Program (3DEP),
State Bond Funding (RI Green Bond / Resilience Bonds)

Funding Need:

N/A	$	$$	$$$	**$$$$**

Establishing funding for robust forestry efforts will require significant investment.

Water Resources

Action 13.01

Water Resources Coordination & Monitoring: Develop a comprehensive, updated water resources monitoring strategy that aligns with regional climate change, aquatic ecosystem, and water quality collection efforts.

Strengthen coordination between freshwater and saltwater systems by advancing holistic watershed management across eco-geophysical boundaries and integrating this approach into existing regulatory and funding frameworks. Specifically, align planning and monitoring efforts with existing Watershed Plans and Special Area Management Plans (ex. Salt Pond Region and Narrow River SAMPs) which address critical environmental concerns in poorly flushed estuaries and other vulnerable coastal areas.

Category:

Infrastructure	**Natural Systems**	Community Resilience	Emergency Preparedness

Asset Type:

All Critical Infrastructure	Drinking Water	Wastewater	Dams	Stormwater
Ports	Electric Grid	Fuel Supply	Roads, Bridges, & Culverts	Public Transportation
Beaches & Barriers	Coastal Wetlands	Forests	**Water Resources**	
Evacuation Routes & Emergency Shelters	Building Design & Construction	Emergency Services	Community Health & Resilience	Financing Climate Resilience Projects

Responsibility:
RIDEM, CRMC

Timeframe:

Short-Term (1-2 years)	Medium-Term (2-5 years)	**Long-Term (Ongoing)**

Driver:

State	Gap Analysis	Community
Partner	Municipal	

Metrics for Success:

- A comprehensive, updated water resources monitoring strategy is developed.
- Monitoring strategies are aligned with existing Watershed Plans and SAMPs, particularly for vulnerable coastal and estuarine areas.

Implementation Need(s):
Rules & Regulations, Collection & Information Systems, Intergovernmental Coordination

Funding Need:

N/A	$	**$$**	$$$	$$$$

Potential Funding Source:
RIIB - Clean Water State Revolving Fund (CWSRF), CWSRF - Set Asides, EPA Southeast New England Program (SNEP) Watershed Implementation Grant, NOAA Coastal Zone Management (CZM) Program/Grants Implementation Grants, RIDEM Ocean State Climate Adaptation and Resilience (OSCAR) Fund

Action 13.02

Riparian Buffers: Identify, map, and assess inland riparian buffer conditions statewide (e.g., using aerial photos and field reconnaissance). The assessment should seek to develop priority areas (ex. headwater streams) for buffer restoration and protection, thereby preventing further loss and restoring vegetated riparian buffers. Coordinate the identification of priority areas with existing Watershed Plans, and support riparian buffer restoration through State funding and incentives.

Support health of riparian habitats through prioritizing statewide dams for removal and culvert upgrades needed, which will also increase flood resilience and improve aquatic connectivity.

Category:

Infrastructure	**Natural Systems**	Community Resilience	Emergency Preparedness

Asset Type:

All Critical Infrastructure	Drinking Water	Wastewater	Dams	Stormwater
Ports	Electric Grid	Fuel Supply	Roads, Bridges, & Culverts	Public Transportation
Beaches & Barriers	Coastal Wetlands	Forests	**Water Resources**	
Evacuation Routes & Emergency Shelters	Building Design & Construction	Emergency Services	Community Health & Resilience	Financing Climate Resilience Projects

Responsibility:
RIDEM

Timeframe:

Short-Term (1-2 years)	**Medium-Term (2-5 years)**	Long-Term (Ongoing)

Driver:

State	Gap Analysis	Community
Partner	Municipal	

Metrics for Success:

- Riparian buffer conditions are identified and mapped statewide.
- Priority riparian buffer restoration areas are identified in coordination with existing Watershed Plans.

Implementation Need(s):
Collection & Information Systems

Potential Funding Source:
USACE Section 206 & Section 14 (Planning Assistance to States), RIDEM Climate Resilience Fund, RIDEM Ocean State Climate Adaptation and Resilience (OSCAR) Fund

Funding Need:

N/A	$	$$	**$$$**	$$$$

*Not inclusive of physical installation. The funding required for these projects will require project-level cost estimation.

Statewide Resilience: All Critical Systems

Action 14.01

State Resilience Action Tracking: Refine the tracking system for State resilience actions identified in this plan to continually measure progress and demonstrate alignment with EC4 climate resilience goals. Make sure tracking includes agency ownership, defined timelines, and regular progress updates through the EC4 and Resilience EC4 Subgroup.

Building upon the structure of the 2024 State of Resilience Report and Resilience EC4 Subgroup, continue to grow a coordinated, publicly-accessible mechanism to share progress, foster collaboration across agencies, and build coalitions across sectors and communities.

Category:

- **Infrastructure**
- **Natural Systems**
- **Community Resilience**
- **Emergency Preparedness**

Asset Type:

- **All Critical Infrastructure**
- Drinking Water
- Wastewater
- Dams
- Stormwater
- Ports
- Electric Grid
- Fuel Supply
- Roads, Bridges, & Culverts
- Public Transportation
- Beaches & Barriers
- Coastal Wetlands
- Forests
- Water Resources
- Evacuation Routes & Emergency Shelters
- Building Design & Construction
- Emergency Services
- Community Health & Resilience
- Financing Climate Resilience Projects

Responsibility:
RIDEM, Resilience EC4 Subgroup

Timeframe:

- **Short-Term (1-2 years)**
- Medium-Term (2-5 years)
- **Long-Term (Ongoing)**

Driver:

- **State**
- Gap Analysis
- Community
- Partner
- Municipal

Metrics for Success:

- A coordinated, publicly-accessible tracking system to measure and share progress of State resilience actions is refined and made publicly accessible.

Implementation Need(s):
Intergovernmental Coordination, Collection & Information Systems, Education, Engagement, & Awareness

Potential Funding Source:
National Coastal Resilience Fund (NCRF)

Funding Need:

- N/A
- **$**
- $$
- $$$
- $$$$

Action 14.02

State Resilience Partnerships: Continue to research, learn from, and establish collaborative and supportive partnerships with neighboring states, national resilience organizations, and outside professional organizations to inform Rhode Island's resilience efforts.

In particular, Rhode Island should continue to look to successful regional examples, such as Massachusetts' Municipal Vulnerability Preparedness program and New Jersey's Blue Acres program, to continue to model municipal and non-profit partnerships that move from planning to project assistance and funding.

Continue to host the RI Resilience Partner Group, as a point of collaboration between statewide non-profits, universities, and resilience subject matter experts.

Category:

- **Infrastructure**
- **Natural Systems**
- **Community Resilience**
- **Emergency Preparedness**

Asset Type:

- **All Critical Infrastructure**
- Drinking Water
- Wastewater
- Dams
- Stormwater
- Ports
- Electric Grid
- Fuel Supply
- Roads, Bridges, & Culverts
- Public Transportation
- Beaches & Barriers
- Coastal Wetlands
- Forests
- Water Resources
- Evacuation Routes & Emergency Shelters
- Building Design & Construction
- Emergency Services
- **Community Health & Resilience**
- **Financing Climate Resilience Projects**

Responsibility:
RIDEM, Resilience EC4 Subgroup

Timeframe:

- Short-Term (1-2 years)
- Medium-Term (2-5 years)
- **Long-Term (Ongoing)**

Driver:

- **State**
- Gap Analysis
- **Community**
- **Partner**
- Municipal

Metrics for Success:

- Partnerships between Rhode Island and neighboring states, national resilience organizations, and professional organizations are strengthened.
- RI Resilience Partner Group is actively and regularly convened.

Implementation Need(s):
Intergovernmental Coordination, Technical Assistance & Capacity Building

Potential Funding Source:
NOAA's Rhode Island Sea Grant

Funding Need:

- **N/A**
- $
- $$
- $$$
- $$$$

Action 14.03

State Resilience Office: Support the development of the State Resilience Office, led by the State's Chief Resilience Officer (CRO), through legislation and funding. This office will oversee State resilience planning and the integration State resilience goals with municipal planning, as well as provide buyout and adaptation support, and other resilience services, through grant funding and regulation. The office will coordinate resilience efforts across all State departments, agencies, and quasi-governmental entities. The office's Resilience EC4 Subgroup will serve as a statewide body for collaboration on State agency resilience initiatives, and the office's RI Resilience Partner Group will serve as a statewide forum for non-agency stakeholders on resilience initiatives. The Resilience EC4 Subgroup will also serve as the review body for climate adaptation related EC4 budget requests, and standardize the process by which EC4 budget requests are reviewed and decided upon.

Category:

- **Infrastructure**
- **Natural Systems**
- **Community Resilience**
- **Emergency Preparedness**

Asset Type:

- **All Critical Infrastructure**
- Drinking Water
- Wastewater
- Dams
- Stormwater
- Ports
- Electric Grid
- Fuel Supply
- Roads, Bridges, & Culverts
- Public Transportation
- Beaches & Barriers
- Coastal Wetlands
- Forests
- Water Resources
- Evacuation Routes & Emergency Shelters
- Building Design & Construction
- Emergency Services
- Community Health & Resilience
- Financing Climate Resilience Projects

Responsibility:
RIDEM, Resilience EC4 Subgroup

Timeframe:

- **Short-Term (1-2 years)**
- Medium-Term (2-5 years)
- **Long-Term (Ongoing)**

Driver:

- **State**
- Gap Analysis
- Community
- Partner
- Municipal

Metrics for Success:

- The State Resilience Office is established.
- Resilience EC4 Subgroup and Resilience Partner Group are regularly convened.

Implementation Need(s):
Funding, Rules & Regulations, Technical Assistance & Capacity Building

Potential Funding Source:
RIDEM Climate Resilience Fund (CRF), RIDEM Ocean State Climate Adaptation and Resilience (OSCAR) Fund, NOAA Coastal Zone Management (CZM) Program/Grants

Funding Need:

- N/A
- $
- **$$**
- $$$
- $$$$

*Bi-annual need, inclusive of *Resilient Rhody* plan updates

Action 14.04

Regional Resilience Coordinators: Secure Full-Time Equivalent (FTE) funding for the State's three Regional Resilience Coordinators (RRC) long term to support the State Resilience Office, and continue to expand RRC coordination across all State agency resilience initiatives. RRCs offer resilience technical assistance to municipalities and communities through grant writing, project management, community outreach, resilience planning, research & case study development, and regional coordination on open funding opportunities.

Category:

- **Infrastructure**
- **Natural Systems**
- **Community Resilience**
- **Emergency Preparedness**

Asset Type:

- **All Critical Infrastructure**
- Drinking Water
- Wastewater
- Dams
- Stormwater
- Ports
- Electric Grid
- Fuel Supply
- Roads, Bridges, & Culverts
- Public Transportation
- Beaches & Barriers
- Coastal Wetlands
- Forests
- Water Resources
- Evacuation Routes & Emergency Shelters
- Building Design & Construction
- Emergency Services
- Community Health & Resilience
- **Financing Climate Resilience Projects**

Responsibility:
RIDEM, CRMC

Timeframe:

- **Short-Term (1-2 years)**
- Medium-Term (2-5 years)
- **Long-Term (Ongoing)**

Driver:

- **State**
- Gap Analysis
- Community
- Partner
- Municipal

Metrics for Success:

- Long term Full-Time Equivalent funding is secured for three Regional Resilience Coordinator positions.

Implementation Need(s):
Funding, Intergovernmental Coordination

Potential Funding Source:
National Coastal Resilience Fund (NCRF), NOAA Coastal Zone Management (CZM) Program/ Grant, Bond/Legislative Request

Funding Need:

- N/A
- **$**
- $$
- $$$
- $$$$

*Annual need, inclusive of *Resilient Rhody* plan updates

Action 14.05

State Resilience Standards: Develop strengthened resilience standards across agencies and programs that consider various assets, such as residential, commercial, roads, wastewater, stormwater, drinking water infrastructure, electrical infrastructure, and open space. Ensure that these resilience standards and any related permitting processes are streamlined and time-effective.

Consider different timelines & scenarios across these categories, and establish a statewide, EC4 determination for SLR projection timelines to consider for specific assets. Build upon existing State building codes and stormwater design standards to inform this process. Create a collaborative, consensus-driven process—featuring municipal workshops and community engagement—to shape these standards, ensuring they reflect local needs and include input from vulnerable populations.

Conduct a socioeconomic analysis of potential impacts to communities and businesses to inform this process. As a part of this analysis, consider interaction of standards with insurance markets and funding & financing programs.

Provide outreach and educational opportunities to raise awareness of the new standards and clearly communicate them to municipalities (beyond just property owners).

Category:

- **Infrastructure**
- **Natural Systems**
- **Community Resilience**
- **Emergency Preparedness**

Asset Type:

- **All Critical Infrastructure**
- Drinking Water
- Wastewater
- Dams
- Stormwater
- Ports
- Electric Grid
- Fuel Supply
- Roads, Bridges, & Culverts
- Public Transportation
- Beaches & Barriers
- Coastal Wetlands
- Forests
- Water Resources
- Evacuation Routes & Emergency Shelters
- **Building Design & Construction**
- Emergency Services
- Community Health & Resilience
- Financing Climate Resilience Projects

Responsibility:
RIDEM, Resilience EC4 Subgroup

Timeframe:

- **Short-Term (1-2 years)**
- Medium-Term (2-5 years)
- **Long-Term (Ongoing)**

Driver:

- **State**
- Gap Analysis
- Community
- Partner
- Municipal

Metrics for Success:

- Municipal resilience standards are established across agencies and asset types.
- A comprehensive socioeconomic analysis of climate impacts is conducted and incorporated into resilience standards.

Implementation Need(s):
Funding, Rules & Regulations, Education, Engagement, & Awareness, Land Use Policy, Public-Private Partnership Frameworks

Funding Need:

- N/A
- $
- $$
- **$$$**
- $$$$

Potential Funding Source:
RIIB – Drinking Water State Revolving Fund (DWSRF) State Program Management Set-Aside, Clean Water State Revolving Fund (CWSRF) - Set Aside, USDOT Promoting Resilient Operations for Transformative, Efficient, and Cost-saving Transportation Program (PROTECT) Grant Program

Action 14.06

Sea Level Rise Standard: Establish a statewide, EC4 determination that Rhode Island adopt the National Oceanic and Atmospheric Administration (NOAA) High Curve for sea level rise projections for resiliency planning initiatives performed by all State agencies, in alignment with the Shoreline Change Special Area Management Plan. Based on NOAA's 2022 analysis of SLR scenarios, NOAA projects up to 6.4 feet of SLR in Rhode Island by 2100. This particular statistic is based on the "High" Curve and is estimated at the 83% confidence interval.

Category:

- **Infrastructure**
- **Natural Systems**
- **Community Resilience**
- **Emergency Preparedness**

Asset Type:

- **All Critical Infrastructure**
- Drinking Water
- Wastewater
- Dams
- Stormwater
- Ports
- Electric Grid
- Fuel Supply
- Roads, Bridges, & Culverts
- Public Transportation
- Beaches & Barriers
- Coastal Wetlands
- Forests
- Water Resources
- Evacuation Routes & Emergency Shelters
- Building Design & Construction
- Emergency Services
- Community Health & Resilience
- Financing Climate Resilience Projects

Responsibility:
CRMC

Timeframe:

- **Short-Term (1-2 years)**
- Medium-Term (2-5 years)
- Long-Term (Ongoing)

Driver:

- **State**
- Gap Analysis
- Community
- Partner
- Municipal

Metrics for Success:

- The National Oceanic and Atmospheric Administration (NOAA) High Curve is adopted across all State agencies.

Implementation Need(s):
Rules & Regulations

Potential Funding Source:
N/A

Funding Need:

- **N/A**
- $
- $$
- $$$
- $$$$

Action 14.07

State Land Use Planning: Incorporate climate resilience priorities into Land Use 2050, including but not limited to managed retreat, saltmarsh migration, impacts of inland flooding, stormwater water management needs, policies, and actions for stormwater utility districts. In addition, incorporate guiding frameworks and specifics on high performance green building standards from the Green Building Act.

Align the actions to the updated goals and priorities set by the Long-Range Transportation Plan.

Category:

- **Infrastructure**
- **Natural Systems**
- **Community Resilience**
- **Emergency Preparedness**

Asset Type:

- **All Critical Infrastructure**
- Drinking Water
- Wastewater
- Dams
- **Stormwater**
- Ports
- Electric Grid
- Fuel Supply
- **Roads, Bridges, & Culverts**
- Public Transportation
- Beaches & Barriers
- Coastal Wetlands
- Forests
- Water Resources
- Evacuation Routes & Emergency Shelters
- Building Design & Construction
- Emergency Services
- **Community Health & Resilience**
- Financing Climate Resilience Projects

Responsibility:
RI Div. of Statewide Planning

Timeframe:

- **Short-Term (1-2 years)**
- Medium-Term (2-5 years)
- Long-Term (Ongoing)

Driver:

- State
- Gap Analysis
- Community
- Partner
- **Municipal**

Metrics for Success:

- Land Use 2050 is updated to include resilience priorities and is aligned with the Long-Range Transportation Plan.

Implementation Need(s):
Land Use Policy, Intergovernmental Coordination

Potential Funding Source:
EPA Southeast New England Program Opportunity to Advance Resilience (SOAR) Fund

Funding Need:

- N/A
- **$**
- $$
- $$$
- $$$$

Action 14.08

Municipal Resilience Planning: Continue to support regular municipal resilience planning through the State's Municipal Resilience Program, providing regulatory and funding support for continuity of planning services through this program. Support streamlining of Municipal Resilience Program plans with existing efforts such as Local Hazard Mitigation Planning and Health Equity Zone Collaboration. Complete Annual Resilience Updates with cities and towns to keep this information up to date, and to assist municipalities on initiatives and projects when needed.

Provide an annual funding source for municipalities to complete vulnerability studies, hydrologic analyses, and watershed assessments, to inform best placement of resilience solutions.

Category:

- **Infrastructure**
- **Natural Systems**
- **Community Resilience**
- **Emergency Preparedness**

Asset Type:

- **All Critical Infrastructure**
- Drinking Water
- Wastewater
- Dams
- Stormwater
- Ports
- Electric Grid
- Fuel Supply
- Roads, Bridges, & Culverts
- Public Transportation
- Beaches & Barriers
- Coastal Wetlands
- Forests
- Water Resources
- Evacuation Routes & Emergency Shelters
- Building Design & Construction
- Emergency Services
- **Community Health & Resilience**
- **Financing Climate Resilience Projects**

Responsibility:
RIDEM

Timeframe:

- **Short-Term (1-2 years)**
- Medium-Term (2-5 years)
- **Long-Term (Ongoing)**

Driver:

- State
- Gap Analysis
- Community
- Partner
- **Municipal**

Metrics for Success:

- Annual Resilience Updates are completed for all participating cities and towns.
- An additional annual funding source for local resilience assessments and planning initiatives is established.

Implementation Need(s):
Technical Assistance & Capacity Building, Funding

Potential Funding Source:
Bond/Legislative Request

Funding Need:

- N/A
- $
- $$
- **$$$**
- $$$$

*Estimate is based on a single implementation cycle.

Action 14.09

Local Land Use Planning: Establish climate resilience as a priority across all sections of local Comprehensive Plans to ensure coordinated, forward-looking planning. All elements and categories required in the comprehensive plans should integrate and speak to themes of resilience and sustainability.

Category:

- **Infrastructure**
- **Natural Systems**
- **Community Resilience**
- **Emergency Preparedness**

Asset Type:

- **All Critical Infrastructure**
- Drinking Water
- Wastewater
- Dams
- Stormwater
- Ports
- Electric Grid
- Fuel Supply
- Roads, Bridges, & Culverts
- Public Transportation
- Beaches & Barriers
- Coastal Wetlands
- Forests
- Water Resources
- Evacuation Routes & Emergency Shelters
- Building Design & Construction
- Emergency Services
- **Community Health & Resilience**
- Financing Climate Resilience Projects

Responsibility:
RI Div. of Statewide Planning, RI Dep. of Administration

Timeframe:

- Short-Term (1-2 years)
- Medium-Term (2-5 years)
- **Long-Term (Ongoing)**

Driver:

- **State**
- Gap Analysis
- Community
- Partner
- Municipal

Metrics for Success:

- Climate resilience is integrated into all sections of local Comprehensive Plans.

Implementation Need(s):
Land Use Policy

Potential Funding Source:
Bond or Legislative Request

Funding Need:

- N/A
- $
- $$
- **$$$**
- $$$$

*Estimate is based on a single implementation cycle.

Action 14.10

Vulnerability Assessment: Building off the *Resilient Rhody 2025*, use State resilience sources to regularly update Rhode Island's current and future climate change vulnerabilities across all critical infrastructure. Use established modeling strategies to complete three-dimensional visualizations of storm impacts for this infrastructure.

Identify and map existing municipal and State stormwater management structures, including culverts, and conduct local watershed scale vulnerability analyses to explore the impacts of this flooding on stormwater infrastructure performance. Establish a regular State funding source for municipalities to complete and update these local stormwater vulnerability assessments.

Expand assessments of RIEMA critical facilities, bridges, wells, libraries, and historic structures. Complete vulnerability analysis of resilience needs at these assets.

Category:

Infrastructure	Natural Systems	Community Resilience	**Emergency Preparedness**

Asset Type:

All Critical Infrastructure	Drinking Water	Wastewater	Dams	**Stormwater**
Ports	Electric Grid	Fuel Supply	Roads, Bridges, & Culverts	Public Transportation
Beaches & Barriers	Coastal Wetlands	Forests	Water Resources	
Evacuation Routes & Emergency Shelters	Building Design & Construction	**Emergency Services**	Community Health & Resilience	Financing Climate Resilience Projects

Responsibility:
RIDEM, RIEMA, RIDOT, RI Div. of Statewide Planning

Timeframe:

Short-Term (1-2 years)	Medium-Term (2-5 years)	**Long-Term (Ongoing)**

Driver:

State	Gap Analysis	Community
Partner	Municipal	

Metrics for Success:

- Local watershed scale vulnerability analyses are completed.
- A regular State funding source for local stormwater vulnerability assessments is established.
- Resilience needs of EMA critical facilities not identified in this Plan are identified and documented.

Implementation Need(s):
Collection & Information Systems, Emergency Preparedness & Response Authorities

Potential Funding Source:
NOAA Coastal Zone Management (CZM) Program/Grants, NOAA National Coastal Resilience Fund (NCRF), USACE Continuing Authorities Program, RIIB - Clean Water State Revolving Fund (CWSRF)– Set Asides, RIIB Community Project Assistance Fund (CPAF), RIDEM Ocean State Climate Adaptation and Resilience (OSCAR) Fund

Funding Need:

N/A	$	**$$**	$$$	$$$$

*Estimate is based on a single implementation cycle.

Action 14.11

University Collaboration: Develop a university collaborative around resilience to coordinate across climate tools and ensure products are streamlined in messaging and mission. For university tools, establish and support end user engagement processes, in order to coordinate end user input with developer methodology.

Support and fund continued development of the Rhode Island Climate Resilience Learning Network, which serves as a community of practice and provider of resilience educational materials, webinars, and events.

Support development of municipal resilience ordinance implementation assistance through law schools located in the State.

Category:

- **Infrastructure**
- **Natural Systems**
- **Community Resilience**
- **Emergency Preparedness**

Asset Type:

- **All Critical Infrastructure**
- Drinking Water
- Wastewater
- Dams
- Stormwater
- Ports
- Electric Grid
- Fuel Supply
- Roads, Bridges, & Culverts
- Public Transportation
- Beaches & Barriers
- Coastal Wetlands
- Forests
- Water Resources
- Evacuation Routes & Emergency Shelters
- Building Design & Construction
- Emergency Services
- **Community Health & Resilience**
- **Financing Climate Resilience Projects**

Responsibility:
University Partners (URI, Brown, Roger Williams, RISD, RIC, CCRI, etc.)

Timeframe:

- Short-Term (1-2 years)
- **Medium-Term (2-5 years)**
- Long-Term (Ongoing)

Driver:

- **State**
- Gap Analysis
- Community
- Partner
- Municipal

Metrics for Success:

- A university resilience collaborative is established.
- Additional funding is secured for the Rhode Island Climate Resilience Learning Network.
- Law schools offer municipal resilience ordinance implementation assistance.

Implementation Need(s):
Education, Engagement, & Awareness, Collection & Information Systems

Potential Funding Source:
NOAA's Rhode Island Sea Grant Program

Funding Need:

- N/A
- **$**
- $$
- $$$
- $$$$

Action 14.12

Data & Mapping: Establish State funding to ensure that are consistent across agencies and municipalities. Developing, updating, coordinating, requiring, standardizing, and maintaining foundational resilience including monitoring systems and GIS layers (e.g., STORMTOOLS, Inland STORMTOOLS, Wind STORMTOOLS, MyCoast, sensor networks such as Network for Environmental Sensing and Technology (NEST) Rhode Island Coastal Hazards Analysis, Modeling and Prediction System (RI-CHAMP), Shoreline Change Maps, Coastal Environmental Risk Index (CERI), RainSnap, Statewide Flood Toolkit) and related meta should be centralized. should include updated statewide precipitation projections that can be used for other sectors as well. Ensure STORMTOOLS is updated to expand statewide, including both Coastal and Inland components, as well as a wind damage component.

Create a centralized public platform for State climate resilience and continue to encourage the use of this GIS mapping for State level work, including policy planning and resilience design standards. Ensure all and materials are offered in multiple languages. Create a statewide working group that reviews climate among State agencies, universities, and the private sector (e.g. insurance sector, commercial real estate) to ensure all are using best available.

Category:

- **Infrastructure**
- **Natural Systems**
- **Community Resilience**
- **Emergency Preparedness**

Asset Type:

- **All Critical Infrastructure**
- Drinking Water
- Wastewater
- Dams
- Stormwater
- Ports
- Electric Grid
- Fuel Supply
- Roads, Bridges, & Culverts
- Public Transportation
- Beaches & Barriers
- Coastal Wetlands
- Forests
- Water Resources
- Evacuation Routes & Emergency Shelters
- Building Design & Construction
- Emergency Services
- Community Health & Resilience
- Financing Climate Resilience Projects

Responsibility:
CRMC, RIDEM, URI

Timeframe:

- **Short-Term (1-2 years)**
- Medium-Term (2-5 years)
- **Long-Term (Ongoing)**

Driver:

- **State**
- Gap Analysis
- Community
- Partner
- Municipal

Metrics for Success:

- Funding is established for a centralized State climate platform.
- A centralized State climate platform is developed.

Implementation Need(s):
Funding, Rules & Regulations, Collection & Information Systems, Intergovernmental Coordination

Potential Funding Source:
RIIB - Drinking Water State Revolving Fund (DWSRF) Administration & Technical Assistance Set Aside, RIDEM Climate Resilience Fund

Funding Need:

- N/A
- $
- **$$**
- $$$
- $$$$

Action 14.13

GIS Capacity: Continue to support Full-Time Equivalent (FTE) analyst positions within the GIS department to support climate resilience integration and mapping.

Responsibilities should include: 1) Developing recommendations for integrating State systems with person-centered climate impact on critical assets. 2) Incorporating climate resilience and Southeast New England Program (SNEP) Hydrologic Response Unit (HRU) maps into the new statewide GIS framework.

Category:

- **Infrastructure**
- **Natural Systems**
- **Community Resilience**
- **Emergency Preparedness**

Asset Type:

- **All Critical Infrastructure**
- Drinking Water
- Wastewater
- Dams
- Stormwater
- Ports
- Electric Grid
- Fuel Supply
- Roads, Bridges, & Culverts
- Public Transportation
- Beaches & Barriers
- Coastal Wetlands
- Forests
- Water Resources
- Evacuation Routes & Emergency Shelters
- Building Design & Construction
- Emergency Services
- Community Health & Resilience
- Financing Climate Resilience Projects

Responsibility:
RI Div. of Statewide Planning

Timeframe:

- **Short-Term (1-2 years)**
- Medium-Term (2-5 years)
- **Long-Term (Ongoing)**

Driver:

- **State**
- Gap Analysis
- Community
- Partner
- Municipal

Metrics for Success:

- Full-Time Equivalent (FTE) analyst positions are allocated within the GIS department to support climate resilience efforts.

Implementation Need(s):
Collection & Information Systems, Technical Assistance & Capacity Building

Potential Funding Source:
EPA Southeast New England Program (SNEP) Watershed Implementation Grants (SWIG)

Funding Need:

- N/A
- **$**
- $$
- $$$
- $$$$

*Annual need per employee

Action 14.14

Adaptation Carbon Emissions: Hire an energy fellow to assess current carbon emissions standards across State agencies and their programs, and identify opportunities for alignment and improvement. Review past carbon dividend legislation proposed and introduced by Energize Rhode Island: the Economic and Climate Resilience act of 2019. Establish a consistent standard for evaluating the carbon intensity of adaptation solutions across all climate resilience policies and funding programs. This standard should explicitly consider the trade-offs between grey and green infrastructure to support low-carbon, nature-based solutions wherever feasible.

Category:

- **Infrastructure**
- Natural Systems
- Community Resilience
- Emergency Preparedness

Asset Type:

- **All Critical Infrastructure**
- Drinking Water
- Wastewater
- Dams
- Stormwater
- Ports
- Electric Grid
- Fuel Supply
- Roads, Bridges, & Culverts
- Public Transportation
- Beaches & Barriers
- Coastal Wetlands
- Forests
- Water Resources
- Evacuation Routes & Emergency Shelters
- Building Design & Construction
- Emergency Services
- Community Health & Resilience
- Financing Climate Resilience Projects

Responsibility:
RIDEM, OER

Timeframe:

- **Short-Term (1-2 years)**
- Medium-Term (2-5 years)
- Long-Term (Ongoing)

Driver:

- **State**
- Gap Analysis
- Community
- Partner
- Municipal

Metrics for Success:

- An energy fellow is hired to assess carbon emissions standards across agencies.
- A consistent standard for evaluating the carbon intensity of adaptation solutions is established.

Implementation Need(s):
Funding, Technical Assistance & Capacity Building

Potential Funding Source:
N/A

Funding Need:

- N/A
- **$**
- $$
- $$$
- $$$$

Building Design & Construction

Action 15.01

Building Commission: Establish climate resilience representation on RI Building Commission, Building Codes and Standard Committee to support the impacts of climate change on building standards. Add a representative of the RI Building Commission to the EC4 to facilitate collaboration regarding climate impacts on the standards. Establish clear communication pathways with the State Resilience Office on this topic. Align with Act on Climate priorities and strategies.

Category:

- **Infrastructure**
- Natural Systems
- Community Resilience
- **Emergency Preparedness**

Asset Type:

- All Critical Infrastructure
- Drinking Water
- Wastewater
- Dams
- Stormwater
- Ports
- Electric Grid
- Fuel Supply
- Roads, Bridges, & Culverts
- Public Transportation
- Beaches & Barriers
- Coastal Wetlands
- Forests
- Water Resources
- Evacuation Routes & Emergency Shelters
- **Building Design & Construction**
- Emergency Services
- Community Health & Resilience
- Financing Climate Resilience Projects

Responsibility:
State Building Commission, RIEMA, RIDEM

Timeframe:

- **Short-Term (1-2 years)**
- Medium-Term (2-5 years)
- Long-Term (Ongoing)

Driver:

- **State**
- Gap Analysis
- Community
- Partner
- Municipal

Metrics for Success:

- Climate resilience is represented in Building Commission discussions.

Implementation Need(s):
Intergovernmental Coordination, Technical Assistance & Capacity Building

Potential Funding Source:
N/A

Funding Need:

- **N/A**
- $
- $$
- $$$
- $$$$

Action 15.02

State Building Code: Update the State Building Code and the RI Department of Environmental Management (RIDEM) Wastewater Design Standards to reflect the American Society of Civil Engineers (ASCE) design storm standards (ASCE 24-24) and most recent International Building Code (IBC) and FEMA standards. Align updates with the statutory Green Building Act to promote climate-adaptive, energy efficient, and environmentally responsible practices. Ensure that updates to agency programs and policies (including Stormwater Design Rule and RIDEM Wastewater Standards) similarly reflect these national and international standards and are aligned with this State Building Code update. Align with Act on Climate priorities and strategies.

Establish further clarification around the 50% rule (definition of substantial improvement or repair of substantial damage) in State building code through development of more formalized criteria.

Category:

- **Infrastructure**
- Natural Systems
- Community Resilience
- **Emergency Preparedness**

Asset Type:

- All Critical Infrastructure
- Drinking Water
- Wastewater
- Dams
- Stormwater
- Ports
- Electric Grid
- Fuel Supply
- Roads, Bridges, & Culverts
- Public Transportation
- Beaches & Barriers
- Coastal Wetlands
- Forests
- Water Resources
- Evacuation Routes & Emergency Shelters
- **Building Design & Construction**
- Emergency Services
- Community Health & Resilience
- Financing Climate Resilience Projects

Responsibility:
State Building Commission, RIEMA, CRMC, RIDEM, RIWARN

Timeframe:

- **Short-Term (1-2 years)**
- Medium-Term (2-5 years)
- Long-Term (Ongoing)

Driver:

- **State**
- Gap Analysis
- Community
- Partner
- Municipal

Metrics for Success:

- The State Building Code and the Department of RI Environmental Management (RIDEM) Wastewater Design Standards are update to reflect the most recent American Society of Civil Engineers (ASCE) and International Building Code (IBC) standards.
- Criteria are formalized to clarify the 50% rule in State building code.

Implementation Need(s):
Land Use Policy, Rules & Regulations, Intergovernmental Coordination

Funding Need:

- N/A
- **$**
- $$
- $$$
- $$$$

Potential Funding Source:
Bond or Legislation Request

Action 15.03

Facility Preparedness: Continue to support Rhode Island's disaster response for critical facilities through Emergency Support Functions programming and Continuity of Operations plans. Utilize and mapping resources to continually improve predictions of facility level impacts to storms, allowing for better emergency preparation and response.

Develop and fund a -driven retrofit program to strengthen critical facilities against storm impacts, using improved facility-level storm impact predictions to guide project selection and prioritization. Integrate these predictions into State capital planning and permitting processes to ensure that resilience upgrades are strategically aligned with risk. This approach will reduce cascading infrastructure failures and enhance community-wide continuity during major storm events.

Extend beyond coastal areas and flood hazards to provide resources for inland areas and additional risks such as wind, drought, and wildfire. Embed this climate hazard information into permitting systems for structures and infrastructure in the State, such that all projects are treated equitably using current standards.

Category:

Infrastructure	Natural Systems	Community Resilience	**Emergency Preparedness**

Asset Type:

All Critical Infrastructure	Drinking Water	Wastewater	Dams	Stormwater
Ports	Electric Grid	Fuel Supply	Roads, Bridges, & Culverts	Public Transportation
Beaches & Barriers	Coastal Wetlands	Forests	Water Resources	
Evacuation Routes & Emergency Shelters	**Building Design & Construction**	**Emergency Services**	Community Health & Resilience	Financing Climate Resilience Projects

Responsibility:
RIEMA, RIDEM, RI Div. of Statewide Planning

Timeframe:

Short-Term (1-2 years)	**Medium-Term (2-5 years)**	**Long-Term (Ongoing)**

Driver:

State	**Gap Analysis**	Community
Partner	Municipal	

Metrics for Success:

- A -driven retrofit program to strengthen critical facilities against storm impacts is developed.

Implementation Need(s):
Funding, Collection & Information Systems, Rules & Regulations

Potential Funding Source:
FEMA Emergency Management Performance Grant (EMPG), RIDEM Climate Resilience Fund, RIIB Municipal Resilience Program (MRP) Action Grant

Funding Need:

N/A	$	$$	$$$	**$$$$**

Establishing a retrofit program will require significant investment. The funding required for this initiative will require further cost estimation.

Evacuation Routes & Emergency Shelters

Action 16.01

Evacuation Route Mapping & Planning: Conduct a statewide reassessment of evacuation routes and associated signage. Build off the RIEMA Safety Starts Now campaign to implement a public outreach initiative to inform citizens about evacuation routes and shelter locations through homeowner associations, nonprofit organizations, and State and local governments will help citizens become more resilient to the impacts of a changing climate. Integrate emergency service providers as essential stakeholders in planning efforts. This campaign will ensure that the challenges faced during emergencies are addressed in evacuation routes. It will also emphasize coordinated public information efforts, as well as community outreach and education, to build awareness, strengthen local partnerships, and enhance overall emergency response and recovery.

Revise evacuation routes and update signage every five years based on coastal, riverine, and stormwater flooding projections to ensure safety and accessibility. Ensure that revised evacuation routes are publicly accessible and available online. Prioritize and protect fuel supply and resilient charging station availability along evacuation routes, to ensure that evacuation efforts are not stalled due to stranded vehicles.

Category:

Infrastructure	Natural Systems	Community Resilience	**Emergency Preparedness**

Asset Type:

All Critical Infrastructure	Drinking Water	Wastewater	Dams	Stormwater
Ports	Electric Grid	Fuel Supply	Roads, Bridges, & Culverts	Public Transportation
Beaches & Barriers	Coastal Wetlands	Forests	Water Resources	
Evacuation Routes & Emergency Shelters	Building Design & Construction	Emergency Services	Community Health & Resilience	Financing Climate Resilience Projects

Responsibility:
RIEMA, RIDOT, RI Div. of Statewide Planning

Timeframe:

Short-Term (1-2 years)	Medium-Term (2-5 years)	**Long-Term (Ongoing)**

Driver:

State	Gap Analysis	Community
Partner	Municipal	

Metrics for Success:

- Statewide reassessment of evacuation routes and associated signage is conducted.
- Findings from the statewide reassessment are incorporated into evacuation route and shelter assignments.
- A public outreach campaign on the locations of evacuation shelters and location routes is conducted.

Implementation Need(s):
Collection & Information Systems, Education, Engagement, & Awareness, Emergency Preparedness & Response Authorities

Potential Funding Source:
USDOT Promoting Resilient Operations for Transformative, Efficient, and Cost-saving Transportation Program (PROTECT) Grant Program, FEMA Emergency Management Performance Grant (EMPG), RIDEM Climate Resilience Fund (CRF), RIIB Municipal Resilience Program(MRP), RIDSP Resilience Technical Assistance Program, Resilient Rhody Infrastructure Fund (RRIF)

Funding Need:

N/A	$	$$	**$$$**	$$$$

*Estimate is based on a single implementation cycle.

Action 16.02

Evacuation Route Maintenance: Develop an asset management program to evaluate the existing conditions and appropriateness of named evacuation routes, including bridges critical to maintaining connectivity for costal communities during emergencies.

Establish a coordinated, systematic process and funding mechanism to maintain access to evacuation routes during storms and to promptly repair roads, bridges, and culverts in flood-affected neighborhoods. Ensure that post-storm recovery efforts are equitably distributed. Coordinate with neighboring states when evacuation routes lead across State lines.

Category:

- **Infrastructure**
- Natural Systems
- Community Resilience
- Emergency Preparedness

Asset Type:

- All Critical Infrastructure
- Drinking Water
- Wastewater
- Dams
- Stormwater
- Ports
- Electric Grid
- Fuel Supply
- **Roads, Bridges, & Culverts**
- Public Transportation
- Beaches & Barriers
- Coastal Wetlands
- Forests
- Water Resources
- **Evacuation Routes & Emergency Shelters**
- Building Design & Construction
- Emergency Services
- Community Health & Resilience
- Financing Climate Resilience Projects

Responsibility:
RIEMA, RIDOT, RIDEM

Timeframe:

- **Short-Term (1-2 years)**
- Medium-Term (2-5 years)
- **Long-Term (Ongoing)**

Driver:

- State
- Gap Analysis
- **Community**
- Partner
- Municipal

Metrics for Success:

- A State Assessment Management Plan for evacuation routes is completed.
- A coordinated process and funding mechanism for evacuation route maintenance is established.

Implementation Need(s):
Emergency Preparedness & Response Authorities, Funding

Potential Funding Source:
RIIB - Municipal Roads & Bridges Revolving Loan Fund (MRBRF), Municipal Resilience Program (MRP), Municipal Infrastructure Grant Program (MIGP)
RIDEM Ocean State Climate Adaptation and Resilience (OSCAR) Fund

Funding Need:

- N/A
- $
- $$
- **$$$**
- $$$$

*Estimate is based on a single implementation cycle.

Emergency Services

Action 17.01

Emergency Response Guidance: Develop coordinated preparedness and resilience guidelines and best practices for emergency services. Such guidelines may include preparedness and resilience trainings and exercises, self-assessments of emergency response departments, and suggested changes to develop stronger, more resilient response capacity during natural or man-made disasters.

Create standard response procedures for critical facilities and services. For example, fire, ambulance, police department, tree crew, and utilities personnel cannot respond to emergencies when winds exceed 60 mph.

Incorporate local emergency service providers, community organizations, Health Equity Zone (HEZ) collaboratives, and Tribal Nations and native communities, as essential stakeholders in municipal and statewide resilience & emergency planning efforts. This will ensure the challenges facing emergency services and communities during disaster events are addressed in preparedness and recovery plans. Continue to update Recovery Support Functions and host Recovery Town Halls with local communities and provide continued funding to support these efforts.

Category:

Infrastructure	Natural Systems	Community Resilience	**Emergency Preparedness**

Asset Type:

All Critical Infrastructure	Drinking Water	Wastewater	Dams	Stormwater
Ports	Electric Grid	Fuel Supply	Roads, Bridges, & Culverts	Public Transportation
Beaches & Barriers	Coastal Wetlands	Forests	Water Resources	
Evacuation Routes & Emergency Shelters	Building Design & Construction	**Emergency Services**	Community Health & Resilience	Financing Climate Resilience Projects

Responsibility:
RIEMA

Timeframe:

Short-Term (1-2 years)	Medium-Term (2-5 years)	Long-Term (Ongoing)

Driver:

State	Gap Analysis	**Community**
Partner	Municipal	

Metrics for Success:

- Coordinated emergency preparedness and resilience guidelines are developed for emergency services.
- Standardized response procedures are developed for critical facilities and services.
- Engagement is included in all emergency planning efforts.

Implementation Need(s):
Emergency Preparedness & Response Authorities, Technical Assistance & Capacity Building, Intergovernmental Coordination

Potential Funding Source:
FEMA Emergency Management Performance Grant (EMPG)

Funding Need:

N/A	$	**$$**	$$$	$$$$

Action 17.02

Emergency Response Support: Provide state-level support to municipal emergency services to enhance disaster preparedness and resilience through a broader, more inclusive approach. This includes trainings that strengthen continuity in emergency operations planning, with added emphasis on wildfire danger and response, grants to organizations supporting emergency shelters, healthcare facilities, and vulnerable housing, and recovery funding. In particular, establish a State grant program to support municipalities and communities in addressing damages from non-federally declared disasters.

Concurrently, continue to hold National Weather Service trainings for the Emergency Management Directors, annual State Emergency Operations Center trainings, annual HURREVAC trainings, quarterly WebEOC trainings for Emergency Management Directors and Emergency Support Functions. Expand municipal training and use of NEST (Network for Environmental Sensing and Technology), RI-CHAMP (Coastal Hazards Analysis Modeling and Prediction) and similar tools so that municipal emergency services can be briefed on forecasted impacts to critical infrastructure and roads in real time as a storm approaches.

Category:

Infrastructure	Natural Systems	Community Resilience	**Emergency Preparedness**

Asset Type:

All Critical Infrastructure	Drinking Water	Wastewater	Dams	Stormwater
Ports	Electric Grid	Fuel Supply	Roads, Bridges, & Culverts	Public Transportation
Beaches & Barriers	Coastal Wetlands	Forests	Water Resources	
Evacuation Routes & Emergency Shelters	Building Design & Construction	**Emergency Services**	Community Health & Resilience	Financing Climate Resilience Projects

Responsibility:
RIEMA, RI Div. of Statewide Planning

Timeframe:

Short-Term (1-2 years)	**Medium-Term (2-5 years)**	**Long-Term (Ongoing)**

Driver:

State	Gap Analysis	Community
Partner	Municipal	

Metrics for Success:

- Additional State grant program is established to support municipalities and communities after non-federally declared disasters.

Implementation Need(s):
Funding, Education, Engagement, & Awareness, Technical Assistance & Capacity Building, Emergency Preparedness & Response Authorities

Potential Funding Source:
FEMA Emergency Management Performance Grant (EMPG)

Funding Need:

N/A	$	$$	$$$	**$$$$**

Establishing a program to address damages from non-federally declared disasters will require significant investment. The funding required for this initiative will require further cost estimation.

Action 17.03

Emergency Response Outreach: Create a centralized, multilingual platform for emergency preparedness materials for residents, such as the evacuation plan and locations of evacuation routes and shelters.

To inform this work, continue to update and fund the State Shelter Plan. In addition, share information on transportation during hazard events, discussing the importance of staying off the road. Ensure the information is accessible in multiple languages.

Category:

Infrastructure	Natural Systems	Community Resilience	**Emergency Preparedness**

Asset Type:

All Critical Infrastructure	Drinking Water	Wastewater	Dams	Stormwater
Ports	Electric Grid	Fuel Supply	Roads, Bridges, & Culverts	Public Transportation
Beaches & Barriers	Coastal Wetlands	Forests	Water Resources	
Evacuation Routes & Emergency Shelters	Building Design & Construction	**Emergency Services**	Community Health & Resilience	Financing Climate Resilience Projects

Responsibility:
RIEMA, RI Div. of Statewide Planning, EOHHS

Timeframe:

Short-Term (1-2 years)	Medium-Term (2-5 years)	Long-Term (Ongoing)

Driver:

State	Gap Analysis	**Community**
Partner	Municipal	

Metrics for Success:

- A centralized platform for emergency preparedness materials is established.
- The State Shelter Plan is updated and funded.

Implementation Need(s):
Education, Engagement, & Awareness, Emergency Preparedness & Response Authorities

Potential Funding Source:
FEMA Emergency Management Performance Grant (EMPG), RI Department of Transportation Capital Improvement Program (CIP)

Funding Need:

N/A	**$**	$$	$$$	$$$$

Action 17.04

Post-Disaster Restoration: Encourage all governmental entities involved in disaster recovery to draft a singular set of appropriate restoration guidance, with vulnerable populations in mind, that are implemented by all entities. Develop consistent restoration & rebuild guidance and clear communication regarding permitting needs across State agencies. Build off the Public Assistance Program and Policy Guide (PAPPG).

Category:

Infrastructure	Natural Systems	**Community Resilience**	**Emergency Preparedness**

Asset Type:

All Critical Infrastructure	Drinking Water	Wastewater	Dams	Stormwater
Ports	Electric Grid	Fuel Supply	Roads, Bridges, & Culverts	Public Transportation
Beaches & Barriers	Coastal Wetlands	Forests	Water Resources	
Evacuation Routes & Emergency Shelters	Building Design & Construction	Emergency Services	**Community Health & Resilience**	Financing Climate Resilience Projects

Responsibility:
RIEMA, CRMC, RIDEM

Timeframe:

Short-Term (1-2 years)	Medium-Term (2-5 years)	**Long-Term (Ongoing)**

Driver:

State	**Gap Analysis**	Community
Partner	Municipal	

Metrics for Success:

- A singular set of restoration protocols is established and implemented by all governmental entities involved in disaster recovery.
- A streamline permitting tool is developed.

Implementation Need(s):
Rules & Regulations, Emergency Preparedness & Response Authorities

Potential Funding Source:
FEMA Emergency Management Performance Grant (EMPG)

Funding Need:

N/A	**$**	$$	$$$	$$$$

Community Health & Resilience

Action 18.01

Resilience Technical Assistance: Establish support to help local governments—especially small, rural, and under-resourced communities—access climate resilience funding, with a focus on health, equity, and infrastructure needs. Through the State's Regional Resilience Coordinators, provide technical assistance to support municipalities in grant writing, capital planning, and shared services agreements, while clarifying agency roles and actively engaging community-based organizations (CBOs). Ensure resilience planning includes mental health and well-being, and evaluate resilience priorities being deprioritized at the federal level to provide targeted State support, particularly for environmental justice communities.

Category:

Infrastructure	Natural Systems	**Community Resilience**	Emergency Preparedness

Asset Type:

All Critical Infrastructure	Drinking Water	Wastewater	Dams	Stormwater
Ports	Electric Grid	Fuel Supply	Roads, Bridges, & Culverts	Public Transportation
Beaches & Barriers	Coastal Wetlands	Forests	Water Resources	
Evacuation Routes & Emergency Shelters	Building Design & Construction	Emergency Services	**Community Health & Resilience**	Financing Climate Resilience Projects

Responsibility:
EOHHS, RIDEM, CRMC

Timeframe:

Short-Term (1-2 years)	Medium-Term (2-5 years)	**Long-Term (Ongoing)**

Driver:

State	**Gap Analysis**	**Community**
Partner	Municipal	

Metrics for Success:

- Resilience technical assistance programs are expanded with a focus on small, rural, and under-resourced communities.

Implementation Need(s):
Funding, Technical Assistance & Capacity Building

Potential Funding Source:
USDA Rural Development Technical Assistance
HUD Community Development Block Grant (CDBG), RIIB - Clean Water State Revolving Fund (CWSRF) or Drinking Water State Revolving Fund (DWSRF) - Set Asides, RIIB Community Project Assistance Fund (CPAF), NSF EPSCoR

Funding Need:

N/A	$	**$$**	$$$	$$$$

*Estimate is based on a single implementation cycle.

Action 18.02

Model Ordinances: Develop model municipal ordinances to ensure climate resilience goals are met, ensuring that development does not occur in floodplains, highly erosive areas, and other climate vulnerable locations. Make model ordinances accessible to municipalities through a web library of these resources. Support implementation of resilience ordinances locally, including grant funding for municipalities needing legal assistance to implement. Build off the existing model floodplain ordinance that gets adopted by each municipality affected by a FEMA map update.

Category:

Infrastructure	Natural Systems	**Community Resilience**	Emergency Preparedness

Asset Type:

All Critical Infrastructure	Drinking Water	Wastewater	Dams	Stormwater
Ports	Electric Grid	Fuel Supply	Roads, Bridges, & Culverts	Public Transportation
Beaches & Barriers	Coastal Wetlands	Forests	Water Resources	
Evacuation Routes & Emergency Shelters	Building Design & Construction	Emergency Services	**Community Health & Resilience**	Financing Climate Resilience Projects

Responsibility:
RI Div. of Statewide Planning, RI League of Cities and Towns, RI Dep. of Administration, RIEMA

Timeframe:

Short-Term (1-2 years)	Medium-Term (2-5 years)	**Long-Term (Ongoing)**

Driver:

State	Gap Analysis	Community
Partner	Municipal	

Metrics for Success:

- Model municipal ordinances for climate resilience goals are developed.

Implementation Need(s):
Land Use Policy, Technical Assistance & Capacity Building

Potential Funding Source:
NOAA Coastal Zone Management (CZM) Program/Grants

Funding Need:

N/A	$	**$$**	$$$	$$$$

*Estimate is based on a single implementation cycle.

Action 18.03

Resilience Hubs: Develop a Resilience Hubs Program that provides technical support to create new Hubs, implement backup power systems, deploy mobile health units, and carry out necessary retrofits for shelters, community centers, and other critical infrastructure.

Category:

Infrastructure	Natural Systems	**Community Resilience**	Emergency Preparedness

Asset Type:

All Critical Infrastructure	Drinking Water	Wastewater	Dams	Stormwater
Ports	Electric Grid	Fuel Supply	Roads, Bridges, & Culverts	Public Transportation
Beaches & Barriers	Coastal Wetlands	Forests	Water Resources	
Evacuation Routes & Emergency Shelters	Building Design & Construction	Emergency Services	**Community Health & Resilience**	Financing Climate Resilience Projects

Responsibility:
DPUC, PUC, OER, Utilities

Timeframe:

Short-Term (1-2 years)	**Medium-Term (2-5 years)**	Long-Term (Ongoing)

Driver:

State	Gap Analysis	**Community**
Partner	Municipal	

Metrics for Success:

- A Resilience Hubs Program is established.

Implementation Need(s):
Funding, Technical Assistance & Capacity Building

Potential Funding Source:
US DOE State Energy Program (SEP), RIIB - Efficient Buildings Fund (EBF), Municipal Resilience Program (MRP), Municipal Infrastructure Grant Program (MIGP)

Funding Need:

N/A	$	$$	**$$$**	$$$$

Action 18.04

School Resilience: Increase funding and technical support to support appropriate resilience upgrades in schools, such as flood resilience measures (elevation, floodproofing, relocation of structures, green stormwater infrastructure, etc.) and heat resilience measures (urban tree planting, removal of impervious surfaces, etc.).

Encourage construction of new school facilities in locations that are not vulnerable to future climate risks, and assess relocation options for existing structures, ensuring long-term safety and continuity of education services. Ensure State funding dedicated to school upgrades, construction, and relocation are equitably implemented, with consideration of flood and heat vulnerabilities.

Category:

Infrastructure	Natural Systems	**Community Resilience**	Emergency Preparedness

Asset Type:

All Critical Infrastructure	Drinking Water	Wastewater	Dams	Stormwater
Ports	Electric Grid	Fuel Supply	Roads, Bridges, & Culverts	Public Transportation
Beaches & Barriers	Coastal Wetlands	Forests	Water Resources	
Evacuation Routes & Emergency Shelters	Building Design & Construction	Emergency Services	**Community Health & Resilience**	Financing Climate Resilience Projects

Responsibility:
RIDE, RIDOH, RIIB

Timeframe:

Short-Term (1-2 years)	**Medium-Term (2-5 years)**	Long-Term (Ongoing)

Driver:

State	Gap Analysis	**Community**
Partner	Municipal	

Metrics for Success:

- Funding for technical assistance programs for school resilience projects increases.
- New school facilities are not constructed in locations vulnerable to present or future risks.

Implementation Need(s):
Funding, Education, Engagement, & Awareness, Direct Government Investment & Procurement, Technical Assistance & Capacity Building

Potential Funding Source:
HUD Community Development Block Grant (CDBG), USDA Community Facilities Direct Loan & Grant Program

Funding Need:

N/A	$	$$	**$$$**	$$$$

*Not inclusive of physical installation. The funding required for these projects will require project-level cost estimation.

Action 18.05

School Curriculum: Continue to embed environmental literacy and climate resiliency into K – 12 school curriculum. Require at least one climate-related course for graduation from state colleges/universities.

Continue to support Nonprofit Governmental Organizations (NGOs), Community Based Organizations (CBOs), and other organizations that provide hands-on experiences, classroom visits, and professional development for educators to cultivate climate informed, engaged citizens. Specifically, integrate into family and senior programs and other informal learning spaces.

Build upon Energy, Climate Change, and Environmental Justice curriculum developed with the National Energy Education Department, and continue to provide resources to the Rhode Island Science Teachers Association.

Category:

Infrastructure	Natural Systems	**Community Resilience**	Emergency Preparedness

Asset Type:

All Critical Infrastructure	Drinking Water	Wastewater	Dams	Stormwater
Ports	Electric Grid	Fuel Supply	Roads, Bridges, & Culverts	Public Transportation
Beaches & Barriers	Coastal Wetlands	Forests	Water Resources	
Evacuation Routes & Emergency Shelters	Building Design & Construction	Emergency Services	**Community Health & Resilience**	Financing Climate Resilience Projects

Responsibility:
RIDE w/ RIDOH Support

Timeframe:

Short-Term (1-2 years)	Medium-Term (2-5 years)	**Long-Term (Ongoing)**

Driver:

State	**Gap Analysis**	Community
Partner	Municipal	

Metrics for Success:

- Environmental literacy and climate resiliency continues to be integrated into school curriculum.
- The number of educators accessing Energy, Climate Change, and Environmental Justice curriculum increases.

Implementation Need(s):
Education, Engagement, & Awareness

Potential Funding Source:
National Estuary Program (Narragansett Bay Estuary), NOAA Environmental Literacy Program

Funding Need:

N/A	**$**	$$	$$$	$$$$

Action 18.06

Health Impacts & Metrics: Evaluate the health impacts of state-identified climate change risks and integrate mental health and trauma-informed services into resilience planning. Align this work with statewide climate mitigation and adaptation goals by establishing health metrics that reflect both physical and mental well-being.

Develop a set of recommendations for how the State could tie its & vulnerability assessment findings with the person-centered impacts of climate change on assets & establish FTE for an analyst to continue to conduct this work.

Category:

Infrastructure	Natural Systems	**Community Resilience**	Emergency Preparedness

Asset Type:

All Critical Infrastructure	Drinking Water	Wastewater	Dams	Stormwater
Ports	Electric Grid	Fuel Supply	Roads, Bridges, & Culverts	Public Transportation
Beaches & Barriers	Coastal Wetlands	Forests	Water Resources	
Evacuation Routes & Emergency Shelters	Building Design & Construction	Emergency Services	**Community Health & Resilience**	Financing Climate Resilience Projects

Responsibility:
EOHHS, DOH

Timeframe:

Short-Term (1-2 years)	**Medium-Term (2-5 years)**	Long-Term (Ongoing)

Driver:

State	**Gap Analysis**	Community
Partner	Municipal	

Metrics for Success:

- Mental health and trauma-informed services are integrated into resilience planning efforts.
- Recommendations to incorporate person-centered impacts of climate change into climate , vulnerability assessments, and funding & financing selection criteria are established.

Implementation Need(s):
Collection & Information Systems

Potential Funding Source:
CDC Climate-Ready States and Cities Initiative (CRSCI)
RI Department of Health (RIDOH) - Current budget allocation, NSF EPSCoR

Funding Need:

N/A	$	**$$**	$$$	$$$$

Action 18.07

Housing & Business Resilience: Develop a centralized, multilingual platform to educate current and prospective homeowners, renters, and business owners about property-specific climate risks, resilience strategies, and zoning-based insurance options. Include coastal risk disclosure materials for real estate agents and tools to address financial barriers to flood-resilient housing, particularly for vulnerable populations. Ensure the platform supports equitable access to waterfronts and empowers communities by closing insurance market gaps. Develop practical, scenario-based guidance such as step-by-step information on how to protect health and safety during common events like basement flooding to further support residents and business owners.

In addition, strengthen statewide requirements regarding disclosure of climate risk information, including through real estate disclosures and homebuyer education programs. Continue to support updates to the Coastal Hazard Analysis tool and incorporate this tool into statewide risk awareness efforts.

Complete a statewide vulnerability assessment of residential and commercial properties. Ensure that statewide funding for the planning and development of future affordable housing incorporates resilient land use strategies and does not further development in flood vulnerable locations.

Category:

Infrastructure	Natural Systems	**Community Resilience**	Emergency Preparedness

Asset Type:

All Critical Infrastructure	Drinking Water	Wastewater	Dams	Stormwater
Ports	Electric Grid	Fuel Supply	Roads, Bridges, & Culverts	Public Transportation
Beaches & Barriers	Coastal Wetlands	Forests	Water Resources	
Evacuation Routes & Emergency Shelters	Building Design & Construction	Emergency Services	**Community Health & Resilience**	Financing Climate Resilience Projects

Responsibility:
RIDEM, RI Div. Statewide Planning, CRMC, RIEMA, RI Housing

Timeframe:

Short-Term (1-2 years)	Medium-Term (2-5 years)	**Long-Term (Ongoing)**

Driver:

State	Gap Analysis	**Community**
Partner	Municipal	

Metrics for Success:

- A centralized, multilingual housing-focused platform is developed.
- A statewide vulnerability assessment is conducted for residential and commercial properties.

Implementation Need(s):
Collection & Information Systems, Education, Engagement, & Awareness

Potential Funding Source:
HUD Pathways to Removing Obstacles to Housing (PRO Housing) Grant Program, FEMA Flood Mitigation Assistance Grant Program

Funding Need:

N/A	$	$$	**$$$**	$$$$

Action 18.08

Low Income Home Assistance: Expand the Rhode Island Low Income Home Energy Assistance Program (LIHEAP) to ensure equitable access to essential services and resources, including dehumidifiers, mold testing kits, cooling equipment, remediation, and technical assistance for weatherization and home retrofits. The expansion should also create a centralized system for interpreting reports and collecting resident feedback during emergency events. As a part of this expansion, refund the RI Cool it Off Program and LIHEAP Summer Cooling Program. Develop strategies and identify funding resources to support community organizations and residents for their time and expertise.

Category:

Infrastructure	Natural Systems	**Community Resilience**	Emergency Preparedness

Asset Type:

All Critical Infrastructure	Drinking Water	Wastewater	Dams	Stormwater
Ports	Electric Grid	Fuel Supply	Roads, Bridges, & Culverts	Public Transportation
Beaches & Barriers	Coastal Wetlands	Forests	Water Resources	
Evacuation Routes & Emergency Shelters	Building Design & Construction	Emergency Services	**Community Health & Resilience**	Financing Climate Resilience Projects

Responsibility:
DHS, RIDOH

Timeframe:

Short-Term (1-2 years)	Medium-Term (2-5 years)	**Long-Term (Ongoing)**

Driver:

State	Gap Analysis	**Community**
Partner	Municipal	

Metrics for Success:

- The Rhode Island Low Income Home Assistance Program (LIHEAP) is expanded.
- A centralized LIHEAP platform is developed.
- RI Cool if Off Program and LIHEAP Summer Cooling Program are funded.

Implementation Need(s):
Technical Assistance & Capacity Building, Funding

Potential Funding Source:
US DHS Low Income Home Energy Assistance Program (LIHEAP), HUD Community Development Block Grant (CDBG) Program, Regional Greenhouse Gas Initiative (RGGI)

Funding Need:

N/A	$	$$	$$$	**$$$$**

Action 18.09

Community Resilience Planning: Continue to develop technical assistance and statewide support for bottom-up, community-led groups and Health Equity Zone (HEZ) community members, and Green Justice Zone (GJZ) curriculum stewards to carry out planning and action to make their communities more climate resilient, including coordinated guidance on identifying and securing funding. Engage community groups at the very beginning of any State planning process.

Continue to develop Community Assessments for Climate Resilience & Implementation as a partnership between the Executive Office of Health and Human Services and the Health Equity Zones as a part of this process.

Category:

Infrastructure	Natural Systems	**Community Resilience**	Emergency Preparedness

Asset Type:

All Critical Infrastructure	Drinking Water	Wastewater	Dams	Stormwater
Ports	Electric Grid	Fuel Supply	Roads, Bridges, & Culverts	Public Transportation
Beaches & Barriers	Coastal Wetlands	Forests	Water Resources	
Evacuation Routes & Emergency Shelters	Building Design & Construction	Emergency Services	**Community Health & Resilience**	Financing Climate Resilience Projects

Responsibility:
RIDOH, EOHHS, RIDEM

Timeframe:

Short-Term (1-2 years)	Medium-Term (2-5 years)	**Long-Term (Ongoing)**

Driver:

State	**Gap Analysis**	**Community**
Partner	Municipal	

Metrics for Success:

- The number of climate resilience initiatives led by community-led groups increases.
- The number of completed Community Assessments for Climate Resilience & Implementation increases.

Implementation Need(s):
Funding, Technical Assistance & Capacity Building

Potential Funding Source:
CDC Climate-Ready States and Cities Initiative (CRSCI), RI Department of Health (RIDOH)

Funding Need:

N/A	$	**$$**	$$$	$$$$

*Estimate is based on a single implementation cycle.

Action 18.10

Resilience Workforce Development: Develop additional climate resilience training opportunities through the Real Jobs RI Platform, Career and Technical Education (CTE), and municipal job boards. Provide State funding for the growth of these programs to further include climate resilience. Invest in post-secondary workforce development, focusing on trades.

Category:

- Infrastructure
- Natural Systems
- **Community Resilience**
- Emergency Preparedness

Asset Type:

- All Critical Infrastructure
- Drinking Water
- Wastewater
- Dams
- Stormwater
- Ports
- Electric Grid
- Fuel Supply
- Roads, Bridges, & Culverts
- Public Transportation
- Beaches & Barriers
- Coastal Wetlands
- Forests
- Water Resources
- Evacuation Routes & Emergency Shelters
- Building Design & Construction
- Emergency Services
- **Community Health & Resilience**
- Financing Climate Resilience Projects

Responsibility:
Dept. of Labor and Training

Timeframe:

- Short-Term (1-2 years)
- **Medium-Term (2-5 years)**
- Long-Term (Ongoing)

Driver:

- **State**
- Gap Analysis
- Community
- Partner
- Municipal

Metrics for Success:

- Climate resilience training opportunities increase.

Implementation Need(s):
Education, Engagement, & Awareness, Direct Government Investment & Procurement

Potential Funding Source:
USDA Rural Development Training Programs

Funding Need:

- N/A
- $
- **$$**
- $$$
- $$$$

Financing Climate Resilience Projects

Action 19.01

Resilience Funding: Develop incentives to support the statewide adoption of climate resilience standards and establish a consistent funding stream to assist municipalities in developing resilience ordinances. Strengthen State grant assistance for climate adaptation, including restoration, elevation, and buyout initiatives, to better leverage federal funding and assistance programs. Create new funding programs to specifically to support voluntary buyouts; local vulnerability studies, hydrologic analyses, and watershed assessments, to inform best placement of adaptation solutions; emergency relief for non-federally declared disasters; maintenance of installed resilience solutions; and for other key needs established throughout the State resilience actions. Establish annual funding support for these funds through State budget line items.

Utilize the annual EC4 budget to advance resilience priorities, and create a regularly updated, publicly accessible list of federal, State, and local climate resilience funding opportunities to increase awareness and access. Utilize federal and State tools to continually assess cost-benefit of proposed resilience projects.

Continue to establish dedicated green bond funding and a State budget line item to advance the priority actions identified in this Plan. Ensure that annually, both grant and financing options remain available.

Category:

- **Infrastructure**
- **Natural Systems**
- **Community Resilience**
- **Emergency Preparedness**

Asset Type:

- All Critical Infrastructure
- Drinking Water
- Wastewater
- Dams
- Stormwater
- Ports
- Electric Grid
- Fuel Supply
- Roads, Bridges, & Culverts
- Public Transportation
- Beaches & Barriers
- Coastal Wetlands
- Forests
- Water Resources
- Evacuation Routes & Emergency Shelters
- Building Design & Construction
- Emergency Services
- Community Health & Resilience
- **Financing Climate Resilience Projects**

Responsibility:
RIIB, RIDEM, RIEMA, State Building Code Commission, RI League of Cities and Towns, RI Div. of Statewide Planning

Driver:

- **State**
- Gap Analysis
- Community
- Partner
- **Municipal**

Timeframe:

- **Short-Term (1-2 years)**
- Medium-Term (2-5 years)
- **Long-Term (Ongoing)**

Metrics for Success:

- Incentives are established to support statewide adoption of climate resilience standards.
- A State budget line item to advance the priority actions identified in this Plan is established.

Implementation Need(s):
Funding, Community Incentives

Potential Funding Source:
Bond/Legislative Request

Funding Need:

- N/A
- $
- $$
- $$$
- **$$$$**

*Resilience funding will require significant investment. The funding required for the initiatives outlined in Action 19.01 will require further cost estimation.

Action 19.02

Resilience Web Resources: Update the State's climate change website to include a hub of State resilience actions, municipal resilience actions, State agency resources available, and annual resilience funding programs from federal, State, and local sources. Maintain updates to this page on no less than an annual basis.

Category:

- **Infrastructure**
- **Natural Systems**
- **Community Resilience**
- **Emergency Preparedness**

Asset Type:

- All Critical Infrastructure
- Drinking Water
- Wastewater
- Dams
- Stormwater
- Ports
- Electric Grid
- Fuel Supply
- Roads, Bridges, & Culverts
- Public Transportation
- Beaches & Barriers
- Coastal Wetlands
- Forests
- Water Resources
- Evacuation Routes & Emergency Shelters
- Building Design & Construction
- Emergency Services
- Community Health & Resilience
- **Financing Climate Resilience Projects**

Responsibility:
RIDEM

Timeframe:

- **Short-Term (1-2 years)**
- Medium-Term (2-5 years)
- **Long-Term (Ongoing)**

Driver:

- **State**
- Gap Analysis
- Community
- Partner
- Municipal

Metrics for Success:

- The State's climate change website is updated to include State and municipal resilience actions and information about funding programs.

Implementation Need(s):
Education, Engagement, & Awareness, Intergovernmental Coordination

Potential Funding Source:
N/A

Funding Need:

- N/A
- **$**
- $$
- $$$
- $$$$

*Annual need

Action 19.03

Resilience Loans: Fund and launch the recently established *Resilient Rhody Infrastructure Fund*, which will serve as the State's resilience revolving loan fund. Model this fund after statewide models provided by the Clean Water and Drinking Water State Revolving Funds, utilizing State agency partnership with RIDEM for project criteria development and project technical review. Draw upon successful resilience RLF models from other States to determine loan sizes, terms, project eligibility, and principal forgiveness ratios. Ensure that both large scale (greater than $1M) and small scale (less than $10k) loan options are explored, the latter being accomplished through loans supporting the creation of municipal RLFs to property owners. Voluntary buyouts should be strongly supported as an eligible project category. Following the lead of other states, ensure that grant programs are still offered alongside loan options for all phases of project implementation (planning, design, and construction).

Category:

- **Infrastructure**
- Natural Systems
- **Community Resilience**
- Emergency Preparedness

Asset Type:

- All Critical Infrastructure
- Drinking Water
- Wastewater
- Dams
- Stormwater
- Ports
- Electric Grid
- Fuel Supply
- Roads, Bridges, & Culverts
- Public Transportation
- Beaches & Barriers
- Coastal Wetlands
- Forests
- Water Resources
- Evacuation Routes & Emergency Shelters
- Building Design & Construction
- Emergency Services
- Community Health & Resilience
- **Financing Climate Resilience Projects**

Responsibility:
RIIB, RIDEM

Timeframe:

- **Short-Term (1-2 years)**
- Medium-Term (2-5 years)
- **Long-Term (Ongoing)**

Driver:

- **State**
- Gap Analysis
- Community
- Partner
- Municipal

Metrics for Success:

- The *Resilient Rhody* Infrastructure Fund is initiated.

Implementation Need(s):
Funding

Potential Funding Source:
Bond/Legislative Request, *Resilient Rhody* Infrastructure Fund

Funding Need:

- N/A
- $
- $$
- $$$
- **$$$$**

Resilient Rhody Infrastructure Fund will require significant investment. The funding required will require further cost estimation.

Action 19.04

State Resilience Grants: Continue to support and establish ongoing State funding for climate resilience adaptation on the ground through the Municipal Resilience Program (MRP) Action Grants, Climate Resilience Fund (CRF), and Ocean State Climate Adaptation and Resilience (OSCAR) Program, and enhance the stability and predictability of these grants by creating dedicated State budget line items. Ensure that grant program criteria continually reflects State resilience actions and priorities, that projects funded support long term, sustainable approaches to site and regional resilience, and that proposed & funded projects reflect community buy in through having been established in local resilience plans. Continue efforts to streamline application to these programs, building upon existing efforts to merge MRP Action Grant and Climate Resilience Fund application processes through strong inter-agency collaboration.

Continue to expand the geographical reach and diversify the project types supported by these programs, as well as by the Coastal and Estuarine Habitat Restoration Trust Fund (CEHRTF), to further support planning & vulnerability assessments, capacity growth, equipment, as well as flood vulnerable land acquisition measures.

Category:

- **Infrastructure**
- **Natural Systems**
- **Community Resilience**
- **Emergency Preparedness**

Asset Type:

- **All Critical Infrastructure**
- Drinking Water
- Wastewater
- Dams
- Stormwater
- Ports
- Electric Grid
- Fuel Supply
- Roads, Bridges, & Culverts
- Public Transportation
- Beaches & Barriers
- Coastal Wetlands
- Forests
- Water Resources
- Evacuation Routes & Emergency Shelters
- Building Design & Construction
- Emergency Services
- Community Health & Resilience
- **Financing Climate Resilience Projects**

Responsibility:
RIDEM, RIIB, CRMC

Timeframe:

- **Short-Term (1-2 years)**
- Medium-Term (2-5 years)
- **Long-Term (Ongoing)**

Driver:

- **State**
- Gap Analysis
- Community
- Partner
- **Municipal**

Metrics for Success:

- The number of municipalities that access State resilience funding increases.
- Application process and prioritization criteria are revised for improved efficiency and to improve efficiency, to reflect state resilience actions, and to reflect any new State resilience standards.

Implementation Need(s):
Funding

Potential Funding Source:
Coastal and Estuarine Habitat Restoration Program and Trust Fund (CEHRTF), RIDEM Climate Resilience Fund, RIDEM Ocean State Climate Adaptation and Resilience (OSCAR) Fund, RIIB Municipal Resilience Program (MRP) Action Grant, Bond/Legislative Request

Funding Need:

- N/A
- $
- $$
- $$$
- **$$$$**

Continued State funding will require significant investment. The funding required will require further cost estimation.

Action 19.05

Insurance: Continue to track the impacts of climate change on insurance markets in Rhode Island. In particular, develop strategies to address market shifts, rising costs, and sharing challenges.

Ensure needed State Building Code updates as outlined in Action 15.02 are achieved to mitigate rising insurance rates. Introduce Fortified Wind in Rhode Island, with regulatory support, insurance rebates, and funding for implementation.

Explore the creation of a public catastrophe model for Rhode Island, as well as ways in which property owners and municipalities can share resilience adaptation improvements with insurers.

Further, explore State utilization of parametric insurance or insurer credit program which would provide payout under particular storm scenarios or funding to implement resilience solutions, respectively.

Category:

Infrastructure	Natural Systems	**Community Resilience**	**Emergency Preparedness**

Asset Type:

All Critical Infrastructure	Drinking Water	Wastewater	Dams	Stormwater
Ports	Electric Grid	Fuel Supply	Roads, Bridges, & Culverts	Public Transportation
Beaches & Barriers	Coastal Wetlands	Forests	Water Resources	
Evacuation Routes & Emergency Shelters	**Building Design & Construction**	Emergency Services	Community Health & Resilience	**Financing Climate Resilience Projects**

Responsibility:
DBR

Timeframe:

Short-Term (1-2 years)	**Medium-Term (2-5 years)**	**Long-Term (Ongoing)**

Driver:

State	Gap Analysis	**Community**
Partner	Municipal	

Implementation Need(s):
Public-Private Partnership Frameworks, Rules & Regulations

Metrics for Success:

- Strategies developed to address market shifts, rising costs, and sharing challenges.
- State Building Code is updated to include resilience considerations.
- Fortified Wind funding program established to assist property owners in upgrading structures.
- Efforts to explore creating a public catastrophe model and utilizing parametric insurance or insurer credit program is initiated.

Potential Funding Source:
Bond/Legislative Request

Funding Need:

N/A	$	**$$**	$$$	$$$$

Cross-Sector Coordination

Action 20.01

Regional and Cross-Sector Resilience: Encourage multi-municipal, cross-governmental, and cross-sector collaboration across statewide resilience initiatives and grant programs. Utilize Regional Resilience Coordinators in abutting states to navigate and advance this work. In doing so, identify policy, regulatory, and/or economic barriers for implementing resilience projects that span multiple private properties, span both public and private properties, or span jurisdictional (municipal or state) boundaries.

Category:

- **Infrastructure**
- Natural Systems
- **Community Resilience**
- Emergency Preparedness

Asset Type:

- **All Critical Infrastructure**
- Drinking Water
- Wastewater
- Dams
- Stormwater
- Ports
- Electric Grid
- Fuel Supply
- Roads, Bridges, & Culverts
- Public Transportation
- Beaches & Barriers
- Coastal Wetlands
- Forests
- Water Resources
- Evacuation Routes & Emergency Shelters
- **Building Design & Construction**
- Emergency Services
- **Community Health & Resilience**
- **Financing Climate Resilience Projects**

Responsibility:
RIDEM, RI. Div of Statewide Planning

Timeframe:

- Short-Term (1-2 years)
- Medium-Term (2-5 years)
- **Long-Term (Ongoing)**

Driver:

- State
- **Gap Analysis**
- Community
- Partner
- Municipal

Metrics for Success:

- Funding for cross- regional and sector resilience projects is established.
- Barriers are identified for implementing cross-regional and sector resilience projects.
- The number of cross-regional and sector resilience projects implemented increases.

Implementation Need(s):
Public-Private Partnership Frameworks, Intergovernmental Coordination

Potential Funding Source:
N/A

Funding Need:

- **N/A**
- $
- $$
- $$$
- $$$$

Action 20.02

Business Resilience: Develop a state-funded climate resilience grant program for businesses, guided by the findings of Ready Set Rhody, to support private-sector adaptation and resilience efforts. Continue to support and fund the Small Business Resiliency project, which provides vulnerability assessments for small businesses as well as Risk Reduction Guides across eight business sectors. Continue to fund RI Commerce's Main Street Program and Site Readiness Program, which can support local business districts to improve their resilience. Support Rhode Island start-ups and small businesses providing and developing resilience solutions to develop through funding & technical assistance.

Category:

Infrastructure	Natural Systems	**Community Resilience**	Emergency Preparedness

Asset Type:

All Critical Infrastructure	Drinking Water	Wastewater	Dams	Stormwater
Ports	Electric Grid	Fuel Supply	Roads, Bridges, & Culverts	Public Transportation
Beaches & Barriers	Coastal Wetlands	Forests	Water Resources	
Evacuation Routes & Emergency Shelters	Building Design & Construction	Emergency Services	**Community Health & Resilience**	**Financing Climate Resilience Projects**

Responsibility:
Commerce, RI Div. of Statewide Planning, RIIB

Timeframe:

Short-Term (1-2 years)	**Medium-Term (2-5 years)**	**Long-Term (Ongoing)**

Driver:

State	Gap Analysis	Community
Partner	Municipal	

Metrics for Success:

- State-funded climate resilience grant program for businesses is established.
- Funding for the Small Business Resiliency program is continued.
- Funding for the RI Commerce's Main Street Program and Site Readiness Program is continued.

Implementation Need(s):
Funding, Direct Government Investment & Procurement, Technical Assistance & Capacity Building, Public-Private Partnership Frameworks

Potential Funding Source:
Legislative request

Funding Need:

N/A	$	$$	$$$	**$$$$**

Establishing State funding for businesses will require significant investment. The funding required will require further cost estimation.

Action 20.03

Agriculture: Encourage the protection and sustained productivity of Rhode Island's agricultural lands and facilities by supporting farmers and food system operators in adopting climate-smart agricultural practices and infrastructure investments to build resilient agricultural landscapes and local food supply chains in response to climate change. Include consideration of agricultural facilities and supply chain functions, including but not limited to barns, greenhouses, storage, processing, aggregation, cold storage, on-farm water and energy systems, and local distribution infrastructure. Ensure that agricultural asset types are included in future State resilience plans and vulnerability assessments. Continue to update Relish Rhody.

Best management practices may include, but are not limited to, cover cropping, crop diversification/rotation, reduced tillage, and agroforestry, which help safeguard soil health, water quality, biodiversity, and farmer livelihoods. Support the Agricultural Lands Preservation Commission, RIDEM, and other relevant entities in securing conservation easements on agricultural lands to prevent conversion to non-agricultural uses, promote long term stewardship, and preserve the resilience benefits these lands provide.

Create a program to support climate-smart food production in community and home gardens, including guidance on easily replicable methods for individuals with limited time and experience to start growing their own food.

Category:

Infrastructure	**Natural Systems**	**Community Resilience**	Emergency Preparedness

Asset Type:

All Critical Infrastructure	Drinking Water	Wastewater	Dams	Stormwater
Ports	Electric Grid	Fuel Supply	Roads, Bridges, & Culverts	Public Transportation
Beaches & Barriers	Coastal Wetlands	Forests	Water Resources	
Evacuation Routes & Emergency Shelters	Building Design & Construction	Emergency Services	**Community Health & Resilience**	Financing Climate Resilience Projects

Responsibility:
RIDEM

Timeframe:

Short-Term (1-2 years)	Medium-Term (2-5 years)	**Long-Term (Ongoing)**

Driver:

State	Gap Analysis	Community
Partner	Municipal	

Implementation Need(s):
Community Incentives, Intergovernmental Coordination, Funding and Technical Assistance, Capacity Building, Land-Use Policy Alignment, Public-Private Partnership Frameworks, Education, Engagement, & Awareness, Data Collection & Information Systems

Potential Funding Source:
USDA Natural Resources Conservation Service (NRCS) Incentives and Climate-Smart Agricultural Mitigation Activities, RI Green Bond, Regional Greenhouse Gas Initiative (RGGI), USDA Specialty Crop Block Grants, USDA Transition to Organic Partnership Program, USDA Sustainable Agriculture Research and Extension Grants, USDA Rural Development awards, Municipal Resilience Program (MRP) Action Grant, Bond/Legislative Request

Metrics for Success:

- Guidance document developed for farmers on climate-smart agricultural practices.
- Number of secured easements for agricultural lands increases.
- Development of a State Soil Health Plan & increased adoption of Soil Health Plans by landowners.
- Participation increase in soil conservation programs and implementation of climate-smart farming practices
- Increase in the number of agricultural facilities retrofitted or supported for climate resilience.
- Increase in consideration of agricultural resilience into state and local planning processes.

N/A	$	$$	**$$$**	$$$$

*Estimate is based on a single implementation cycle.

Chapter 3
Statewide Climate Vulnerability Assessment

Statewide Climate Vulnerability Assessment

This climate risk screening was conducted to enable multi-hazard comparison of risk across a range of infrastructural, economic, environmental, and societal asset types.

This assessment follows a standardized approach to assessing climate risk across 21 asset types (ranging from Coastal Wetlands to Public Libraries to Evacuation Routes, and more) across five climate hazards, as applicable.

Where possible, this assessment takes in asset condition data and other relevant details that inform asset vulnerability, but it is understood to be inherently higher level. This assessment process was carried out with consultation from the Resilience EC4 Subgroup, RI Resilience Partner Group, Municipal Resilience Stakeholders, and Community Resilience Stakeholders, to ensure it aligned to their priority climate risks. For further information on the community process, refer to Chapter 1: Community Engagement Summary Report.

The purpose of this assessment is to understand the climate-related risks most material to each asset type, how those risks may change over time under multiple climate change scenarios, and the relative risk distribution for assets within a given asset type across the State. The outputs of this risk assessment informed Chapter 5: Climate Adaptation & Resilience Solutions, in which aspects of asset criticality were embedded to prioritize high-impact climate change adaptation solutions.

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Rhode Island Sunset © Narragansett Bay National Estuarine Research Reserve (NBNERR)

How to Read This Document

1. **Vulnerability Assessment Introduction:** Provides a high-level overview of the vulnerability assessment process, defining the metrics assessed.
2. **Asset-Hazard Pairs:** Defines the process for selecting the assessed assets, hazards, climate scenarios, and consequences.
3. **Risk Assessment Methodology:** Walks through the process for identifying risk ratings for each asset.
4. **Summary Outputs:** Presents summary results by asset type, including coastal and riverine flooding maps.
5. **Disclaimer and Limitations:** Summarizes the context of this document and defines steps on how it should be utilized.

Appendices

Appendix A. Previous Rhode Island Reports and Data: Provides a table summarizing past Rhode Island studies and data that inform this assessment.

Appendix B. Asset Buffer Approach: Provides a table summarizing the data sources used for each asset location and their buffer size and methodology.

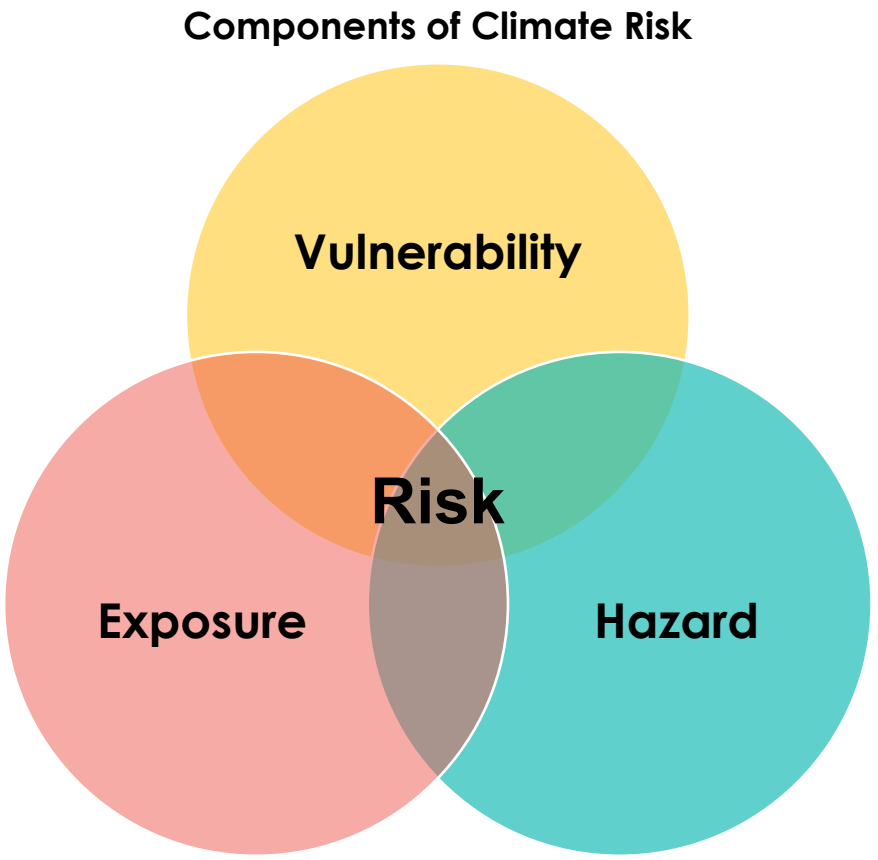
Appendix C. Asset Risk Assessment Results: Provides detailed risk assessment results for each asset.

1. Vulnerability Assessment Introduction

Vulnerability Assessment Process

In this study we conducted a Climate Vulnerability Assessment to determine which assets across Rhode Island have the greatest relative climate risk to be considered for Chapter 5: Climate Adaptation & Resilience Solutions.

Climate risk is here defined as the combination of climate **hazards**, asset **exposure**, and asset **vulnerability** – reflecting for each asset the possibility of climate exposure and the potential negative consequences that exposure could create.

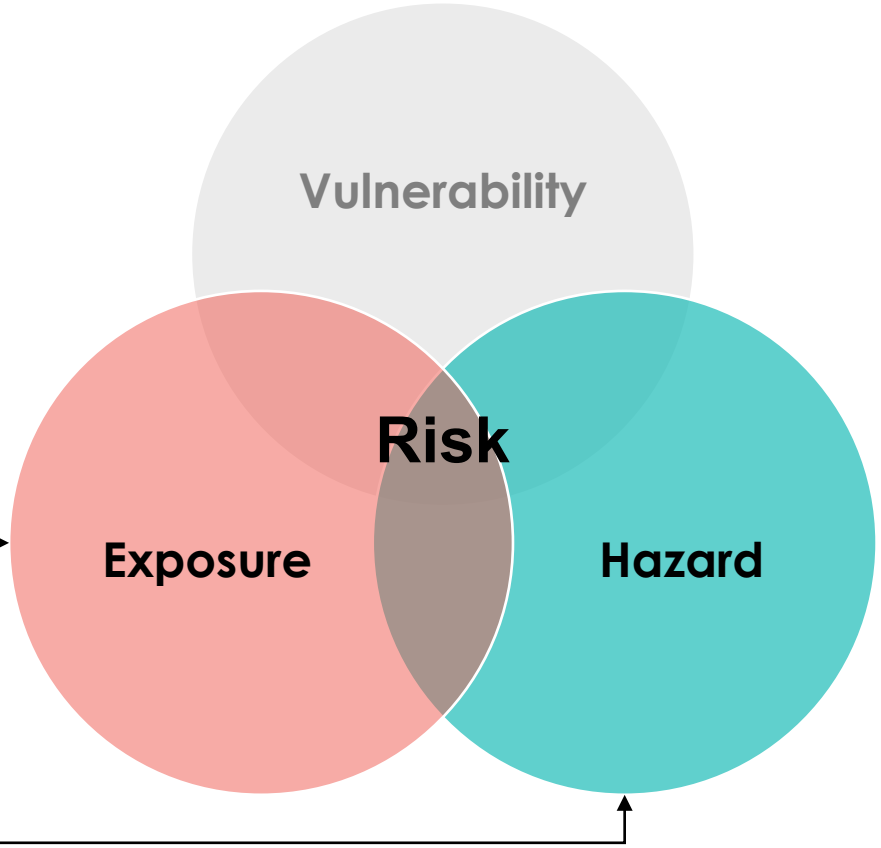


Screening Level Exposure Assessment Process

This task builds off the previously conducted *Screening Level Exposure Assessment*.

In the Exposure Assessment, asset type *vulnerability* data had not yet been embedded. As such, the outputs were a measure of hazard and exposure, which creates the potential for risk, but is not yet a direct measure of risk.

Components of Climate Risk



Exposure
How likely is a hazard event to occur and what is the intensity?

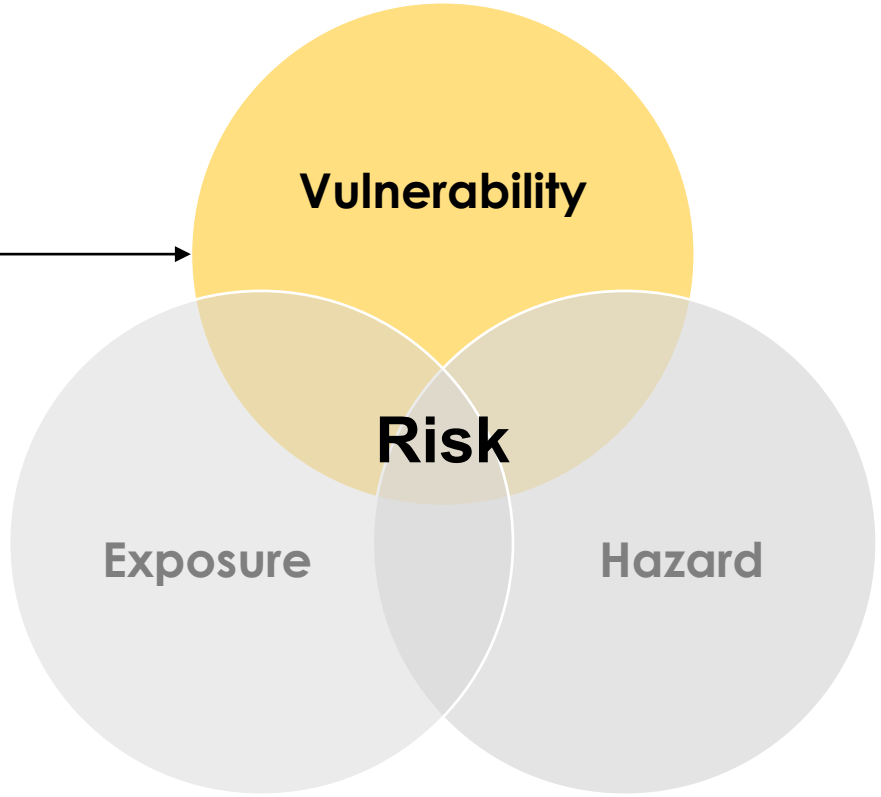
Hazard
Occurrence of climate-related events

Vulnerability Component

As part of the *Statewide Climate Vulnerability Assessment*, available asset data was reviewed to determine which characteristics may make an asset more or less vulnerable to the hazards it is exposed to, and to assign that vulnerability rating to each individual asset within an asset type.

These vulnerability assignments then permit the combination of hazard, exposure, and vulnerability to produce a risk rating for that asset, allowing for comparison of asset risk levels across the State.

Components of Climate Risk

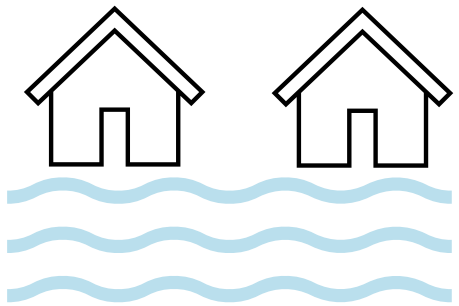


Vulnerability
How susceptible to damage are the exposed assets and what are the consequences of that damage?

Exposure vs. Vulnerability

Exposure

High Exposure Rating High Exposure Rating

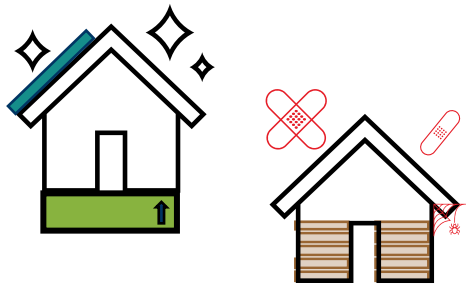


Two assets share the same probability of experiencing a Nor'easter, resulting in a High exposure rating.

Exposure reflects the *likelihood* and *extent* to which an asset may experience a hazard.

Vulnerability

Low Vulnerability Rating High Vulnerability Rating

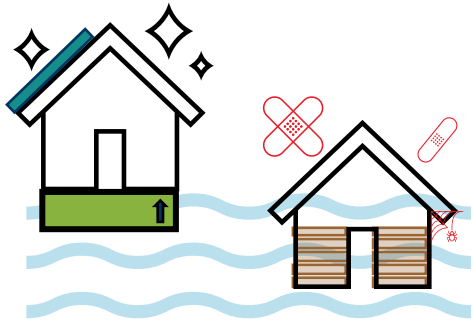


One asset is newer, elevated, and constructed with resilient materials. It also has backup power. The other is older, in poor condition, and built with less flood-resistant materials.

These characteristics determine how *susceptible* each asset is to experience hazard *consequences*.

Risk

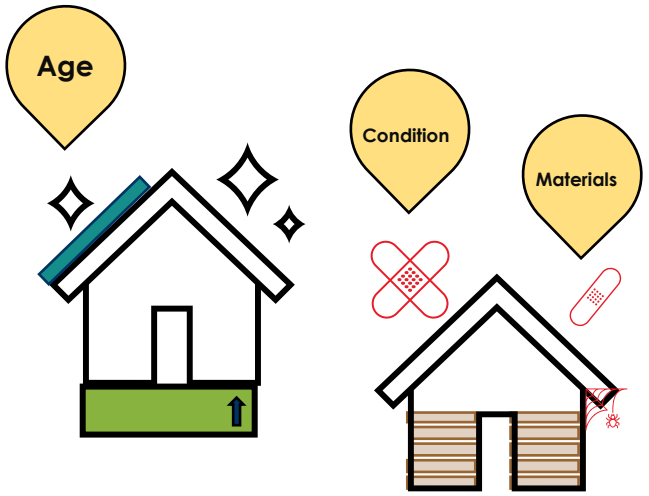
Medium Risk Rating Very-High Risk Rating



Although both assets are exposed to the same hazard, **the one with lower vulnerability is expected to experience fewer consequences; resulting in reduced overall risk.**

This report aims to communicate how available asset data for each included asset type can inform its relative vulnerability to assessed hazards.

Vulnerability Assessment Methodology



Now that we've assessed the exposure of each asset type to each relevant hazard, this Vulnerability Assessment Methodology:

1. *Identifies the specific characteristics of different asset type(s)* that influence how susceptible exposed assets are to experiencing consequences such as damage, disruption, or impacts to health and wellness;

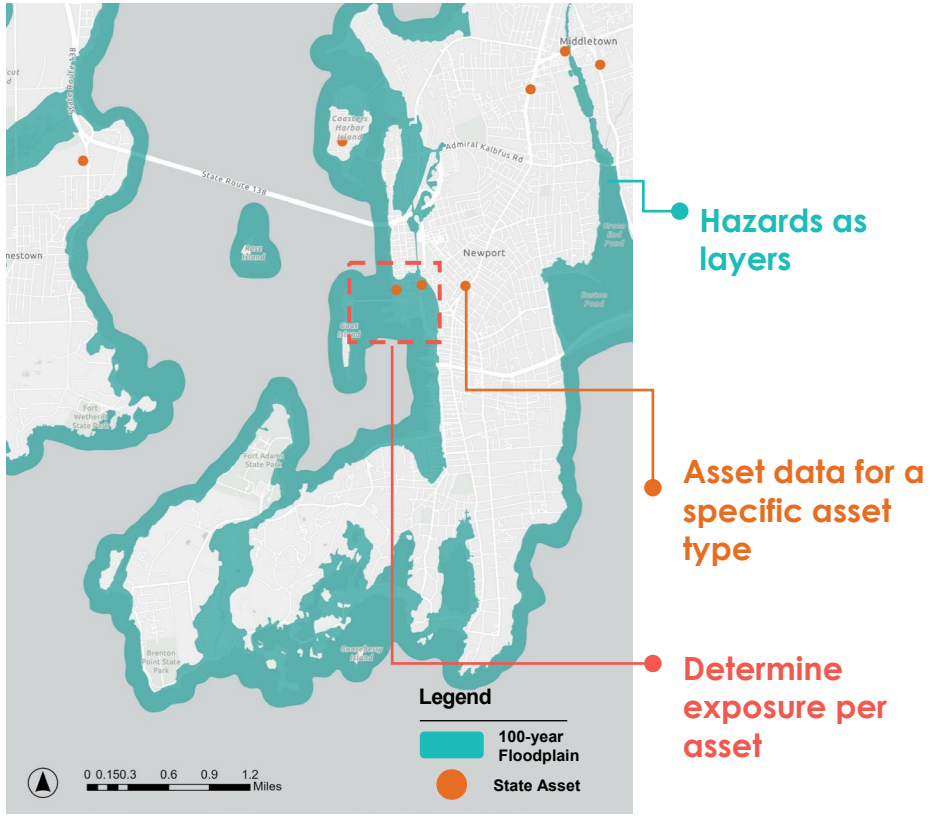
2. *Proposes the approaches* we will use to *translate those characteristics into corresponding vulnerabilities* to pair with hazard exposure to determine resultant risk.

Vulnerability Assessment Process

1. Exposure: **Review hazard exposure** previously identified to determine what hazards a given asset is exposed to.

2.Asset Vulnerability: **Determine asset type vulnerability characteristics** based on engineering judgment / literature review / previous studies and identify available asset data that can inform whether assets are more or less vulnerable to exposed hazards.

3. Risk: **Combine exposure and vulnerability** to determine qualitative risk ratings for each asset



Example GIS-based Exposure Assessment

2. Asset-Hazard Pairs

Hazards Assessed

Overview

In the Screening Level Exposure Assessment, five relevant climate hazards were identified, derived from the six manifestations of climate change outlined in *Resilient Rhody (2018)*. The manifestations were established by the EC4 Group based on observed shifts in Rhode Island's climate patterns.

Hazard	Description	Relevant Manifestations
Coastal Flooding	Flooding resulting from coastal waters. This is inclusive of both coastal storm surge events, which cause temporary flooding, and chronic sea level rise, which could lead to permanent inundation.	
Stormwater Flooding	Flooding resulting from extreme rainfall, often as a result of an extreme storm event overwhelming drainage systems.	
Riverine Flooding	Flooding resulting from overtopping of streams and rivers, often after extreme rainfall events and may be worsened by rising sea levels.	
Extreme Heat	Increasing temperatures and heat wave events, which may be temporary, and chronic increases in average temperatures.	
Extreme Wind	Damaging winds, often caused by storm events.	

Rhode Island's Six Manifestations of Climate Change

Sea Level Rise | Warming Air Temperatures | Warming Water Temperatures | Storm Frequency and Intensity | Changing Biodiversity | Precipitation and Inland Flooding

Hazards Assessed

Overview

The five climate hazards were assessed over present and future climate conditions. The future climate conditions include the time horizons 2035, 2050, 2100. Each time horizon was assessed under an Intermediate emissions scenario, a scenario where mitigation efforts are low, and a Very High Emissions scenario, a scenario where there is no progress made in mitigation efforts. Statewide geospatial hazard data was collected to assess these scenarios.

5 Hazards


Coastal Flooding


Stormwater Flooding


Riverine Flooding


Extreme Heat


Extreme Wind

4 Time Horizons

- Current: Present Conditions
- Future: 2035, 2050, 2100

2 Climate Scenarios

- SSP2-4.5: Intermediate emissions scenario
- SSP5-8.5: Very High emissions scenario

Hazards Assessed

Data Sources

Hazards may have multiple outputs that are assessed in the exposure assessment. The outputs of each hazard were assessed for the identified time horizons and climate scenarios. The future time horizons for erosion and riverine flooding were not assessed due to the unavailability of future-looking data.

The statewide geospatial data and their outputs are highlighted in the table on the right.

Hazard	Outputs	Data Sources	Resolution	Present	2035		2050		2100	
					SSP2 -4.5	SSP5 -8.5	SSP2 -4.5	SSP5 -8.5	SSP2 -4.5	SSP5 -8.5
Coastal Flooding	**Hurricane** Depth (ft)	STORMTOOLS:*100-yr with SLR scenarios**	Asset	■			■	■	■	■
		STORMTOOLS: *500-yr floodplain**	Asset	■						
		STORMTOOLS: *50-yr with SLR scenarios**	Asset		■	■				
	Nor'easter Depth (ft)	STORMTOOLS: *10-yr with SLR scenarios**	Asset	■	■	■	■	■	■	■
	Sea Level Rise Depth (ft)	STORMTOOLS: *MHHW with SLR scenarios**	Asset	■	■	■	■	■	■	■
	Erosion (yes/no)	FEMA: *Zone VE*	Asset	■						
Stormwater Flooding	**Rainfall** Depth (ft)	NOAA, NRCC, IPCC AR6: *24-hr 100-year storm*	County	■	■	■	■	■	■	■
Riverine Flooding	**Inundation** (yes/no)	FEMA: *100-yr floodplain*	Asset	■						
	Inundation (yes/no)	FEMA: *500-yr floodplain*	Asset	■						
Extreme Heat	**Heat Index** (°F)	NASA Earth Exchange GDDP: Heat Index	County	■	■	■	■	■	■	■
	Number of Extreme Heat Days (days)	NOAA: *Annual Number of Days above 90 °F and 95°F*	County	■	■	■	■	■	■	■
Extreme Wind	**Design Wind Speeds** (mph)	ASCE7 Hazard Tool and IPCC AR 5: *Design Wind Speeds*	County	■	■	■	■	■	■	■

*The NOAA 2022 Sea Level Report was utilized to evaluate the High SLR scenario and connect STORMTOOLS SLR scenarios to future time horizons. See next page for more information.

■ **Outputs Assessed** ■ **Outputs Not Assessed**

Hazards Assessed

Coastal Flooding Data Sources

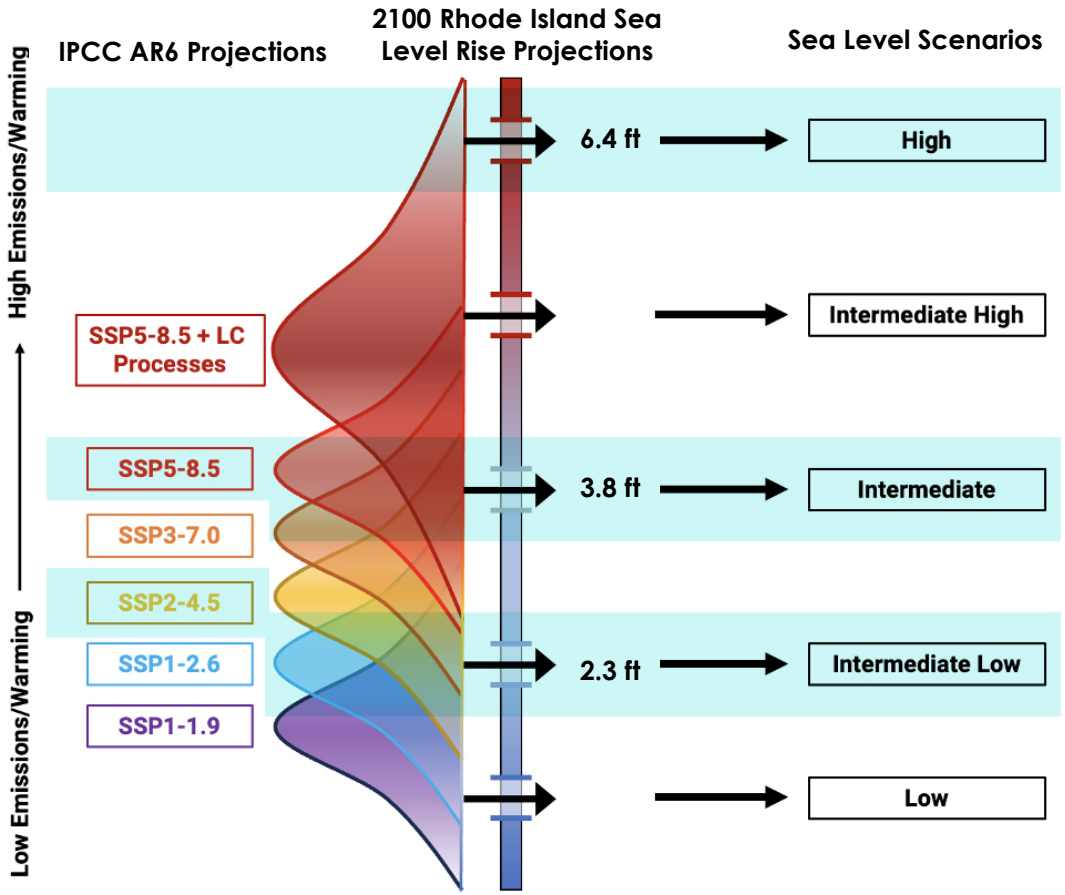
NOAA's 2022 Sea Level Rise technical report connects sea level rise (SLR) scenarios to representative equivalent climate change scenarios. The Intermediate-Low and Intermediate SLR scenarios, aligned with the SSP2-4.5 and SSP5-8.5 emission scenarios, were evaluated for coastal flooding. The High SLR scenario was also evaluated because the scenario is used by RI Coastal Resources Management Council (CRMC) to inform coastal policies and planning efforts. NOAA's SLR scenarios connect COASTAL STORMTOOLS SLR projections to future time horizons.

NOAA's report produces RI-specific estimates of SLR (at Providence and Newport) at each considered time horizon and SLR scenario. These were conservatively rounded up to the nearest available model from Coastal STORMTOOLS (0', 1', 2', 3', 5', and 7'). For example, SLR is estimated to be 7 ft in 2100 under a High SLR scenario and 3 ft under an Intermediate-Low SLR scenario or SSP2-4.5 emission scenario.

Coastal STORMTOOLS SLR Model: 0' 1' 2' 3' 5' 7'

SLR Scenario	Present		2030		2050		2100	
	Reported	*Rounded*	*Reported*	*Rounded*	*Reported*	*Rounded*	*Reported*	*Rounded*
Intermediate – Low	0'	0'	0.6'	1'	1.1'	2'	2.3'	3'
Intermediate	0'	0'	0.6'	1'	1.2'	2'	3.8'	5'
High	0'	0'	0.6'	1'	1.5'	2'	6.4'	7'

Rhode Island Sea Level Rise Projections
(source: NOAA 2022 Sea Level Rise Technical Report)



Alignment between Climate Change Scenarios and Sea Level Rise Scenarios
(source: US Interagency Task Force on Sea Level Change and NOAA 2022 Sea Level Rise Technical Report)

Assets Assessed

Overview

Climate hazard exposure and vulnerability was assessed for priority asset types as determined in *Resilient Rhody 2018*. Approximately over 130,000 assets were assessed statewide across 4 asset groups and 21 asset types.

The assessment covers the assets identified in the table to the right. However, the asset type Historic Resources and the asset Blackstone River Valley National Park, were not included in the Vulnerability Assessment.

Additional assets were not included in the assessment due to limited geospatial data availability, including culverts, hardened shorelines outside of Narragansett, residential electrical lines, and wells and septic systems. Assets not owned by the State (e.g. above ground storage tanks) were also not included in the assessment.

4 Groups	**21 Asset Types**
Critical Infrastructure and Facilities	Drinking Water Systems, Wastewater Treatment Facilities, Dams, Seawalls and Tidal Gates, Stormwater Infrastructure, Ports, Electric Grid, Fuel Supply, Roads, Bridges, and Culverts, Historic Resources and Public Transportation.
Natural Systems	Coastal Wetlands, Beaches and Barriers, Forests, and Water Resources.
Community Resilience Structures	Public Housing, Municipal Buildings, Schools, and Food Markets.
Emergency Preparedness Structures	Evacuation routes, emergency shelters, and Emergency Services.

Asset Assessed

Data Sources

6 Data Sources

Asset geospatial data was gathered from local Rhode Island data sources or was clipped from national data sources. The selected data was reviewed by project stakeholders throughout this task. For a list matching the asset types to data sources, see Appendix B: Asset Buffer Approach.

Rhode Island Data Sources:

- RI Department of Transportation (RIDOT) Stormwater Program
- RI Department of Emergency Management Agency (RIEMA)
- Rhode Island Geographic Information System (RIGIS)
- University of Rhode Island Environmental Data Center (URI EDC)

National Data Sources:

- Esri
- The United States Wind Turbine Database (USGS)

Assets Assessed

Buffer Approach

The geospatial data consisted of lines, points, and polygons. Most polygons did not need a buffer. However, for line, point, and larger polygon data, buffers were applied to determine the appropriate assessment area. Buffer creation followed one of the following approaches:

- **Single Parameter:** If the sizes of the asset were relatively consistent across the State, a single buffer was assigned based on the average asset size.
- **Custom Buffer:** When asset sizes varied significantly, especially with larger outliers, individual research was conducted to assign custom buffer sizes. Assets of similar size were then grouped and assigned a single buffer parameter.
- **Data-Driven Buffer:** When asset size indicators were present in the data source, buffer sizes were scaled in proportion to those values.
- **Grid-Based:** For assets that spanned most of the state, typically natural systems, a hexagonal grid was used to segment the asset for more manageable analysis.

See Appendix B: Asset Buffer Approach for a complete list of the buffer methodologies.



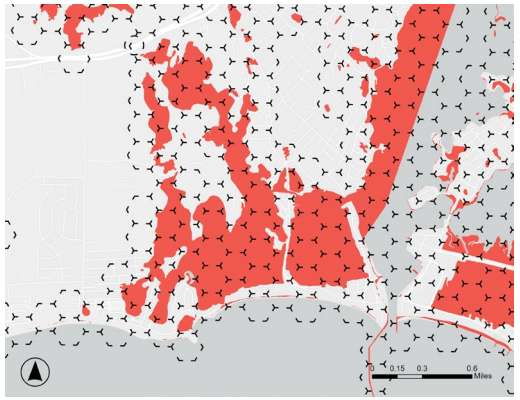
Example Single Parameter Buffer
Bus Route



Example Custom Buffer
Wastewater Treatment Facilities



Example Data-Driven Buffer
Hospital: Based on Number of Beds



Example Grid-Based Buffer
Coastal Wetlands

Buffer **Asset**

Asset-Hazard Pairs: Identification

To determine which combinations of asset type and hazard pairs to take forward into the vulnerability assessment, an initial screening was done to evaluate which asset-hazard pairs had the potential for highest consequence.

Asset-hazard pairs with the highest consequence were identified as a primary consequence. These combinations were subsequently screened against stakeholder priorities through public engagement, with community-emphasized pairs being highlighted. **All primary and community pairs were assessed in the vulnerability assessment.**

Asset		Hazard				
Asset Type	Asset Category	Coastal Flooding	Stormwater Flooding	Riverine Flooding	Extreme Heat	Extreme Wind
Critical Infrastructure and Facilities	Dams	Secondary	Primary	Community	Secondary	Secondary
	Drinking Water Systems	Primary	Primary	Primary	Community	Secondary
	Electrical Grid	Primary	Primary	Primary	Primary	Community
	Fuel Supply	Primary	Primary	Primary	Secondary	Secondary
	Ports	Community	Primary	Secondary	Secondary	Secondary
	Public Transportation	Primary	Primary	Primary	Community	Primary
	Roads, Bridges, and Culverts	Community	Community	Primary	Secondary	Secondary
	Seawalls and Tidal Gates	Primary	Secondary	Secondary	Secondary	Secondary
	Stormwater Infrastructure	Primary	Community	Secondary	Secondary	Secondary
	Wastewater Treatment Facilities	Primary	Community	Community	Secondary	Secondary
Natural Systems	Beaches and Barriers	Community	Secondary	Secondary	Secondary	Secondary
	Coastal Wetlands	Community	Secondary	Secondary	Secondary	Secondary
	Forests	Secondary	Secondary	Secondary	Primary	Community
	Water Resources	Primary	Primary	Secondary	Primary	Secondary
Community Resilience Structures	Public Housing	Community	Primary	Primary	Community	Primary
	Municipal Buildings	Primary	Primary	Primary	Primary	Primary
	Schools	Primary	Primary	Primary	Community	Primary
	Food Markets	Primary	Primary	Primary	Primary	Primary
Emergency Preparedness Structures	Emergency Services	Primary	Community	Primary	Primary	Primary
	Evacuation Routes &Emergency Shelters	Primary	Primary	Community	Primary	Primary

Primary | Community | Secondary

Asset-Hazard Pairs: Primary Consequence

A primary consequence is identified for each assessed asset-hazard pair. Three consequences were assessed:

- **Health and Wellness:** Negative human health outcomes that are not attached to physical damage of other assets but pose a direct risk to life safety of asset occupants.
- **Damage:** Physical damage experienced by an asset resulting in financial loss and/or inability to function as required.
- **Disruption:** Disruption of critical functionality resulting from hazard demand on infrastructure systems exceeding their capacity or leading to deterioration of natural systems.

The consequences were determined by previous Rhode Island studies, literature reviews, and subject matter expert judgment.

*These asset categories include multiple assets within each group, each with varying consequences. For the purposes of this summary table, a single representative primary consequence has been assigned per category. For detailed, asset-specific consequences, please refer to Appendix C: Asset Risk Assessment Results.

Health / Wellness | Damage | Disruption | Not Assessed

Asset		Hazard				
Asset Type	Asset Category	Coastal Flooding	Stormwater Flooding	Riverine Flooding	Extreme Heat	Extreme Wind
Critical Infrastructure and Facilities	Dams		Damage	Damage		
	Drinking Water Systems	Health / Wellness	Health / Wellness	Health / Wellness	Health / Wellness	
	Electrical Grid*	Damage	Damage	Damage	Disruption	Damage
	Fuel Supply	Damage	Damage	Damage		
	Ports	Disruption	Damage			
	Public Transportation*	Disruption	Disruption	Disruption	Health / Wellness	Damage
	Roads, Bridges, and Culverts	Disruption	Disruption	Disruption		
	Seawalls and Tidal Gates	Damage				
	Stormwater Infrastructure*	Damage	Damage			
	Wastewater Treatment Facilities	Damage	Damage	Damage		
Natural Systems	Beaches and Barriers	Damage				
	Coastal Wetlands	Damage				
	Forests				Damage	Damage
	Water Resources*	Disruption	Health / Wellness		Health / Wellness	
Community Resilience Structures	Public Housing	Damage	Damage	Damage	Health / Wellness	Damage
	Municipal Buildings	Damage	Damage	Damage	Health / Wellness	Damage
	Schools	Damage	Damage	Damage	Health / Wellness	Damage
	Food Markets	Damage	Damage	Damage	Health / Wellness	Damage
Emergency Preparedness Structures	Emergency Services	Damage	Damage	Damage	Health / Wellness	Damage
	Evacuation Routes and Emeregency Shelters*	Disruption	Disruption	Disruption	Damage	Health / Wellness

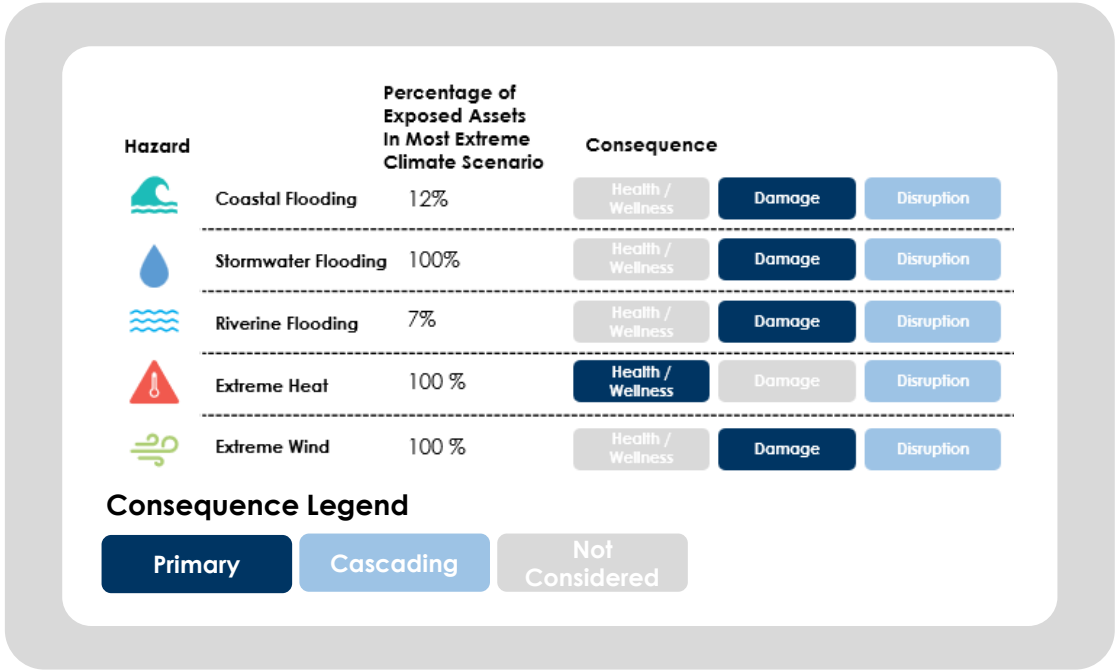
Asset-Hazard Pairs: Consequence Assignment

While each pair is evaluated based on one consequence, we acknowledge that consequences are often interconnected. For example, coastal flooding may lead to damage of infrastructure and can result in downtime of the asset.

To reflect this complexity, each asset-specific slide highlights:

- The **primary consequence** assessed for the associated hazard in dark blue.
- **Cascading consequences**, or those that may occur as secondary effects, in light blue.
- **Consequences not considered** for that asset type are marked in grey. To concentrate the assessment, only two consequences were highlighted.

Example Asset-Hazard-Consequence Summary: Public Libraries



Asset Vulnerability Determination

Asset data was then reviewed for each included asset type. This was done to determine which characteristics may make a given asset more or less vulnerable to exposed hazards.

For example, road quality may influence how well a given road handles floodwater exposure.

Each asset type has its own vulnerability logic, reflecting available data and primary metrics relevant to the consequence being evaluated. Where relevant characteristic data was not available, external data, such as an overlay of geospatial data, was used to supplement, or assets within that category were assumed to be equally vulnerable.

A full list of asset vulnerability sources and assignment logic is provided in *Appendix C. Asset Risk Assessment Results.*

Example Vulnerability Determination Using Asset Characteristic Data
Roads and Coastal Flooding

Vulnerability Rating	Vulnerability Methodology
High Rating	Poor, fair, or no information on pavement condition
Low Rating	Excellent or good pavement condition

Data Sources: Rhode Island Department of Transportation Resilience Improvement Plan (RIDOT), 2024.

Example Vulnerability Determination Using External Geospatial Data
Forests and Extreme Heat

Vulnerability Rating	Vulnerability Methodology
High Rating	More than 25% of forest block has low terrestrial resilience
Low Rating	Other

Data Sources: The Nature Conservancy (TNC) Resilient Land Mapping Tool

3. Risk Assessment Methodology

Risk Rating Methods

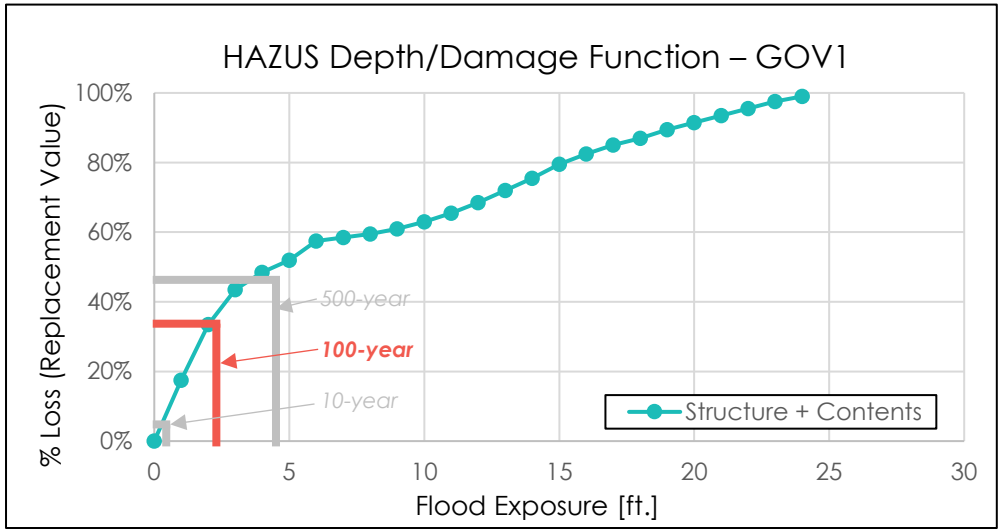
Once asset-hazard exposure and vulnerability data is determined, risk ratings are produced via one of two methods:

Fragility Curve: quantitative evaluation of consequence based on hazard exposure. This method leverages flood and wind fragility curves produced by Hazus for building assets to determine direct estimates of consequence level based on coastal flood depths and extreme wind speeds.

Risk Matrix: combination of hazard rating and vulnerability rating via a matrix to produce a resultant risk rating. This method utilizes determined vulnerability characteristics with qualitative hazard exposure ratings to determine a representative risk rating.

A full list of rating method per asset – hazard pair is provided in *Appendix C: Asset Risk Assessment Results.*

Example Fragility Curve – Coastal Flooding and Public Libraries



Example Risk Matrix

Risk Matrix		Hazard			
		None	Low	**Medium**	High
Vuln.	Low	Negligible	Low	Medium	High
	High	Negligible	Medium	**High**	Very High

Example Risk Assessment Process – Fragility Curve

Public Library – Coastal Flooding

Example Assessment

A library asset was determined to have the following coastal flood exposure in the Current climate scenario:

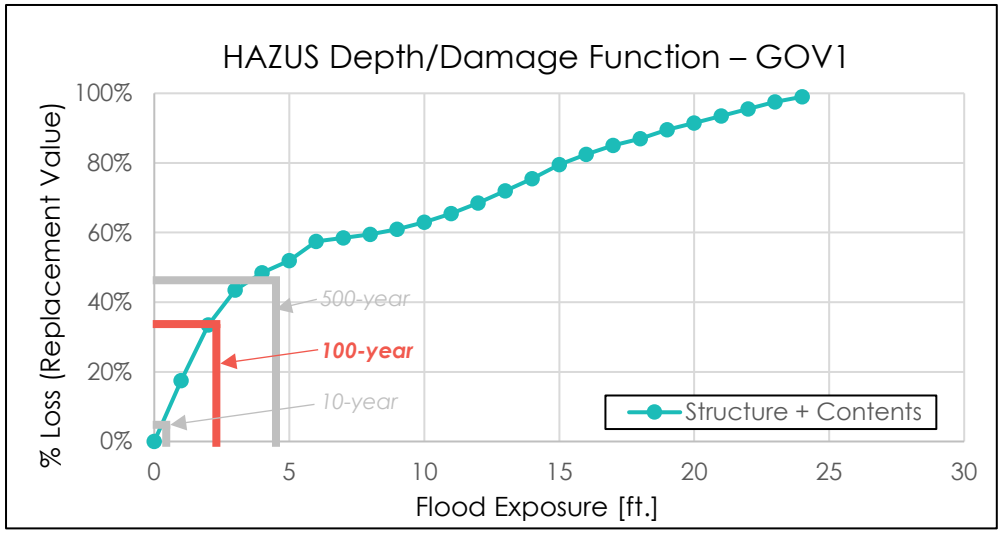
Hazard Exposure – Coastal – Current

Evaluation	Nor'Easter (10-year)	Hurricane (100-year)	Major Event (500-year)
Depth [ft]	0.3'	2.2'	4.3'
Damage [%]	5%	36%	50%

The flood depth resulting from the 100-year storm event is evaluated against a fragility curve for library assets. This evaluation shows that the 100-year event produces damage greater than 30% of the total replacement cost – resulting in a **High** risk rating for the Current climate scenario.

This exercise is repeated for each climate scenario and time horizon assessed.

Hazus Depth/Damage Function – Average Government Services (GOV1)



Coastal Flood Risk – Assessment Logic

Coastal Risk Rating	Description
None	No flood exposure in any return period event
Low	100-year event leads to <10% damage
Medium	100-year event leads to between 10 - 30% damage
High	100-year event leads to greater than 30% damage

Example Risk Assessment Process – Risk Matrix

Forest Block – Extreme Heat

Example Assessment

A forest block asset was determined to have a Medium extreme heat hazard rating in 2050 based on its county's extreme heat hazard exposure.

Hazard Exposure – Extreme Heat – 2050 SSP5-8.5

Evaluation	Hot Days (> 90 F)	Hot Days (> 95 F)
Annual Total	10.1	1.2
Rating	Medium	n/a

The forest block was evaluated as having more than 25% of its area comprised of low terrestrial resilience, resulting in a High vulnerability rating.

High vulnerability and Medium hazard result in a High risk rating for this forest block in 2050.

This exercise is repeated for each climate scenario and time horizon assessed.

Example Risk Matrix Application

Risk Matrix		Hazard			
		None	Low	**Medium**	High
Vuln.	Low	Negligible	Low	Medium	High
	High	Negligible	Medium	**High**	Very High

Risk Assessment Output

The output of conducting the assessment for each asset against its asset-hazard pairs is a risk rating for each hazard under each climate scenario.

Assets will then be designated as "High Risk" or not based on their risk ratings under emissions scenario SSP5-8.5* at each time horizon.

The example asset shown to the right would be a "High Risk" asset in 2050 and 2100.

A summary of asset type results by hazard is provided in *Appendix C: Asset Risk Assessment Results.*

* For Coastal, the High Sea Level Rise scenario is used

Example Risk Assessment Output – Individual Asset

Hazard	Current	2035		2050		2100	
		SSP2-4.5	SSP5-8.5	SSP2-4.5	SSP5-8.5	SSP2-4.5	SSP5-8.5
Coastal	Low	Low	Low	Medium	High	High	High
Riverine	Medium	*Not assessed - Current taken as representative*					
Stormwater	Low	Low	Low	Low	Low	Low	Low
Extreme Heat	Medium	Medium	Medium	Medium	High	High	High
Extreme Wind	Low	Low	Low	Medium	Medium	High	High

Risk Assessment Output

A scoring system was developed to combine risks across hazards for an asset. An asset's score is based on its risk level across each included hazard, considering the severity and immediacy of the risk level.

This was not how assets were prioritized to inform the Chapter 5: Climate Adaptation & Resilience Solutions but provides an initial sense of which asset types are exposed to high risk from multiple hazards.

A score is produced based on the table below for each hazard, and then the hazard scores are averaged to produce the total asset score. For each asset type, assets scoring the highest are designated as the highest risk.

Example Risk Assessment Output – Individual Asset

Hazard	Current	2035		2050		2100	
		SSP2-4.5	SSP5-8.5	SSP2-4.5	SSP5-8.5	SSP2-4.5	SSP5-8.5
Coastal	Low	Low	Low	Medium	High	High	High
Riverine	Medium	*Not assessed - Current taken as representative*					
Stormwater	Low	Low	Low	Low	Low	Low	Low
Extreme Heat	Medium	Medium	Medium	Medium	High	High	High
Extreme Wind	Low	Low	Low	Medium	Medium	High	High

Asset Scoring Rubric

Score	Qualifying Risk
4	High or Very High in the Current scenario
3	High or Very High by 2050
2	High or Very High by 2100
1	Non-negligible
0	Negligible across all scenarios

Example Evaluation

Hazard	Score
Coastal	3
Riverine	1
Stormwater	1
Extreme Heat	3
Extreme Wind	2

$$\frac{3 + 1 + 1 + 3 + 2 = 10}{5 \text{ hazards}} = 2$$

4. Summary Outputs

Summary Results

Overview

This section provides a high-level summary of the risk assessment results for each asset group.

1. **Critical Infrastructure and Facilities**
2. **Natural Systems**
3. **Community Resilience Structures**
4. **Emergency Preparedness Structures**

Each asset group section includes an overview of the types and number of assets. This asset count corresponds to the number of geospatial data buffers generated, which were created based on geospatial points, lines, and polygons. For details on the buffer creation methodology and data sources, refer to *Appendix B: Asset Buffer Approach*.

Each asset group section presents summary tables showing the number of High and Very-High risk assets across individual climate scenarios, as well as a consolidated summary across all scenarios. These highlighted at-risk assets are intended to illustrate the distribution of at-risk assets across asset types. *Climate Resilience Solutions* builds from the asset-level results summarized in this report.

Each asset group section also has coastal flooding maps and riverine flooding risk maps, if assessed, showing a geographic representation of risk across the State. Maps for stormwater flooding, extreme heat, and extreme wind are not included, as the climate data was at the county level rather than the asset level. As a result, maps were not created because they do not effectively illustrate the distribution of asset-level across the State.

For detailed asset-level results and methodologies, refer to *Appendix C: Asset Risk Assessment Results.*

Key Takeaways by Asset Type

All key takeaways reflect the most extreme assessed scenario, which is SSP5-8.5 in 2100 for coastal flooding, stormwater flooding, extreme heat, and extreme wind, and present day for riverine flooding.

Critical Infrastructure and Facilities

Flood hazards pose the greatest risk to Critical Infrastructure and Facilities

Over **7,300** high or very high-risk assets (not including roads)

- 100% of assets at high or very high risk to stormwater flooding
- 12% of assets at high or very high risk to coastal flooding
- 1 in 10 (10%) assets at high or very high risk to riverine flooding

Natural Systems

Heat, stormwater flooding, and coastal flooding pose the greatest risk to Natural Systems

Over **1,250** high or very high-risk assets

- 100% of assets at high or very high risk to stormwater flooding
- 100% of assets at high or very high risk to extreme heat
- 57% of assets at high or very high risk to coastal flooding

Community Resilience Structures

Stormwater flooding and heat pose the greatest risk to Community Resilience Structures

Over **1,200** high or very high-risk assets

- 100% of assets at high or very high risk to stormwater flooding
- 100% of assets at high or very high risk to extreme heat
- 41% of assets at high or very high risk to extreme wind

Emergency Preparedness Structures

Stormwater flooding and heat pose the greatest risk to Emergency Preparedness Structures

Over **230** high or very high-risk assets (not including evac routes)

- 100% of assets at high or very high risk to extreme heat and stormwater flooding (not counting evacuation routes)
- 17% of assets at high or very high risk to coastal flooding and 15% of assets to riverine flooding

Results – Critical Infrastructure and Facilities

Critical Infrastructure and Facilities

10 Asset Types

Asset type refers to the assets we are analysing as outlined in *Resilient Rhody 2018*.

21 Assets

Assets refer to the specific dataset that was used for each asset type. Many asset types have multiple assets.

Asset Type	Assets	Number of Assets
Dams	Dams	668
Drinking Water Systems	Public Water Supply Reservoirs	49
	Community Wellhead Protection Areas	62
Electric Grid	Electrical Transmission Lines	1,770 half-mile segments
	Power Plants (fossil fuel)	15
	Wind Turbines	30
	Solar Systems (and farms)	173
Fuel Supply	Underground Storage Tanks	317
Ports	Ports and Commercial Areas	1,568
Public Transportation	RIPTA Bus Stops	3,588
	RIPTA Bus Routes	5,079 half-mile segments
	MBTA Commuter Rail Stations	4
	MBTA Commuter Rail Line	51
Roads, Bridges, and Culverts	Roads	84,669 half-mile segments
	Bridges	1,179
Seawalls and Tidal Gates	Hardened Shorelines in Narragansett Bay	1,098
Stormwater Infrastructure	Sewer Overflows	93
	Sewered Areas	21
	Stormwater Treatment Units (STU)	2,476
	Stormwater Control Plan (SCP) Watersheds	297
Wastewater Treatment Facilities	Wastewater Treatment Facilities	19

Results

The number of Very-High and High-Risk assets in each asset category are listed for each climate hazard.

Results reflect the most severe climate scenario assessed for the relevant hazard.

Asset-hazard pairs not assessed are noted with a dash.

Number of Very-High and High-Risk assets under the most extreme scenario relevant to that hazard.

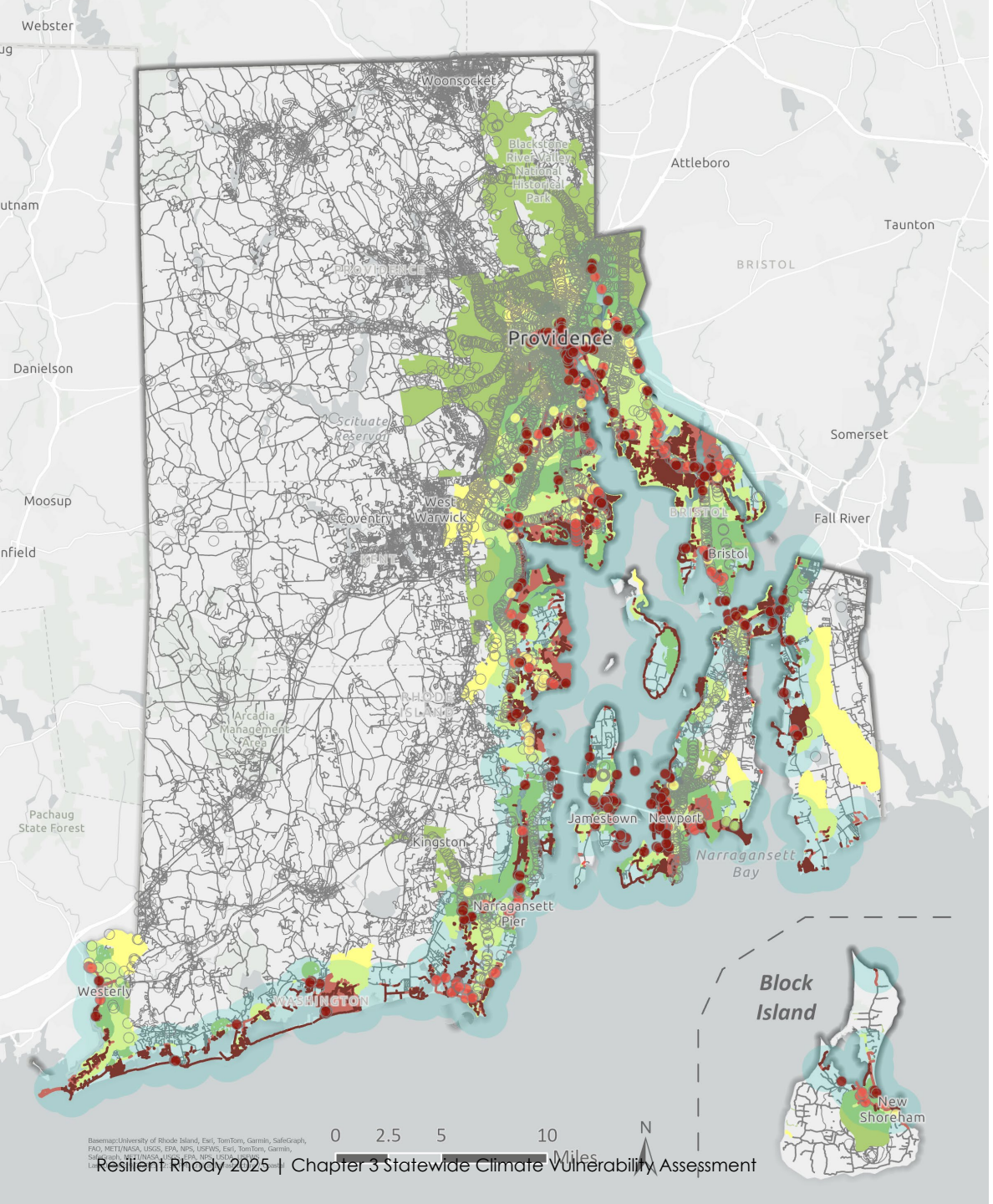
Asset Type	Assets	Number of Assets	Coastal Flooding	Stormwater Flooding	Riverine Flooding	Extreme Heat	Extreme Wind
Dams	Dams	668	-	**668**/668	**391**/668	-	-
Drinking Water Systems	Public Water Supply Reservoirs	49	**4**/49	**49**/49	**29**/49	**49**/49	-
	Community Wellhead Protection Areas	62	**0**/62	**62**/62	**46**/62	**62**/62	-
Electric Grid	Electrical Transmission Lines	1,770 ½ mile segments	-	-	-	-	**1770**/1770
	Power Plants (fossil fuel)	15	**2**/15	**15**/15	**3**/15	**15**/15	**0**/15
	Wind Turbines	30	**6**/30	**30**/30	**2**/30	-	**0**/30
	Solar Systems (and farms)	173	**3**/173	**173**/173	**4**/173	-	**0**/173
Fuel Supply	Underground Storage Tanks	317	**29**/317	**317**/317	**39**/317	-	-
Ports	Ports and Commercial Areas	1,568	**813**/1568	**1567**/1568	-	**0**/1568	-
Public Transportation	RIPTA Bus Stops	3,588	**230**/3588	**3588**/3588	**127**/3588	**3588**/3588	-
	RIPTA Bus Routes	5,079 ½ mile segments	**642**/5079	**5079**/5079	**636**/5079	-	-
	MBTA Commuter Rail Stations	4	**1**/4	**4**/4	**2**/4	**4**/4	**0**/4
	MBTA Commuter Rail Line	51	**10**/51	**51**/51	**26**/51	-	-
Roads, Bridges, and Culverts	Roads	84,669 ½ mile segments	**9476**/84669	**84699**/84669	**8065**/84669	-	
	Bridges	1,179	**368**/1179	**1179**/1179	**578**/1179	-	-
Seawalls and Tidal Gates	Hardened Shorelines in Narragansett Bay	1,098	**70**/1098	-	-	-	-
Stormwater Infrastructure	Sewer Overflows	93	**36**/93	**93**/93	-	-	-
	Sewered Areas	21	**0**/21	**21**/21	-	-	-
	Stormwater Treatment Units (STU)	2,476	**314**/2476	**2476**/2476	-	-	-
	Stormwater Control Plan (SCP) Watershed	297	**24**/297	**297**/297	-	-	-
Wastewater Treatment Facilities	Wastewater Treatment Facilities	19	**13**/19	**19**/19	**5**/19	-	-

Note: Results are taken for the most extreme scenario, which is SSP5-8.5 in 2100 for coastal flooding, stormwater flooding, extreme heat, and extreme wind, and present day for riverine flooding.

Results – Summary Outputs

The risk outputs from all assessed climate scenarios were summarized by counting the number of highest-scoring assets in each asset type. This number illustrates the distribution of high-risk assets across each asset type. Assets containing a single high-scoring asset are highlighted in blue.

Asset Type	Assets	Number of Assets	Number of Highest Scoring Assets
Dams	Dams	668	**215**/668
Drinking Water Systems	Public Water Supply Reservoirs	49	**1 – Gardiner Pond**
	Community Wellhead Protection Areas	62	**2**/62
Electric Grid	Electrical Transmission Lines	1,770 half-mile segments	**376**/1,770 half-mile segments
	Power Plants (fossil fuel)	15	**4**/15
	Wind Turbines	30	**1 – Green Providence Wind II**
	Solar Systems (and farms)	173	**1 – Smithfield, Rhode Island**
Fuel Supply	Underground Storage Tanks	317	**122**/317
Ports	Ports and Commercial Areas	1,568	**167**/1,568
Public Transportation	RIPTA Bus Stops	3,588	**2**/2,588
	RIPTA Bus Routes	5,079 half-mile segments	**42**/5,079 half-mile segments
	MBTA Commuter Rail Stations	4	**1 – Wickford Junction**
	MBTA Commuter Rail Line	51	**7**/51
Roads, Bridges, and Culverts	Roads	84,669 half-mile segments	**172**/84,669 half-mile segments
	Bridges	1,179	**32**/1,179
Seawalls and Tidal Gates	Hardened Shorelines in Narragansett Bay	1,098	**70**/1,098
Stormwater Infrastructure	Sewer Overflows	93	**11**/93
	Sewered Areas	21	**5**/21
	Stormwater Treatment Units (STU)	2,476	**32**/2,476
	Stormwater Control Plan (SCP) Watershed	297	**6**/297
Wastewater Treatment Facilities	Wastewater Treatment Facilities	19	**1 - Warwick**



Coastal Flooding

Coastal Flooding Risk for Critical Infrastructure and Facilities

The adjacent map demonstrates clusters of high and very high risk ratings across assessed Critical Infrastructure and Facilities. These concentrated areas of coastal flooding risk are highlighted.

Critical Infrastructure and Facilities

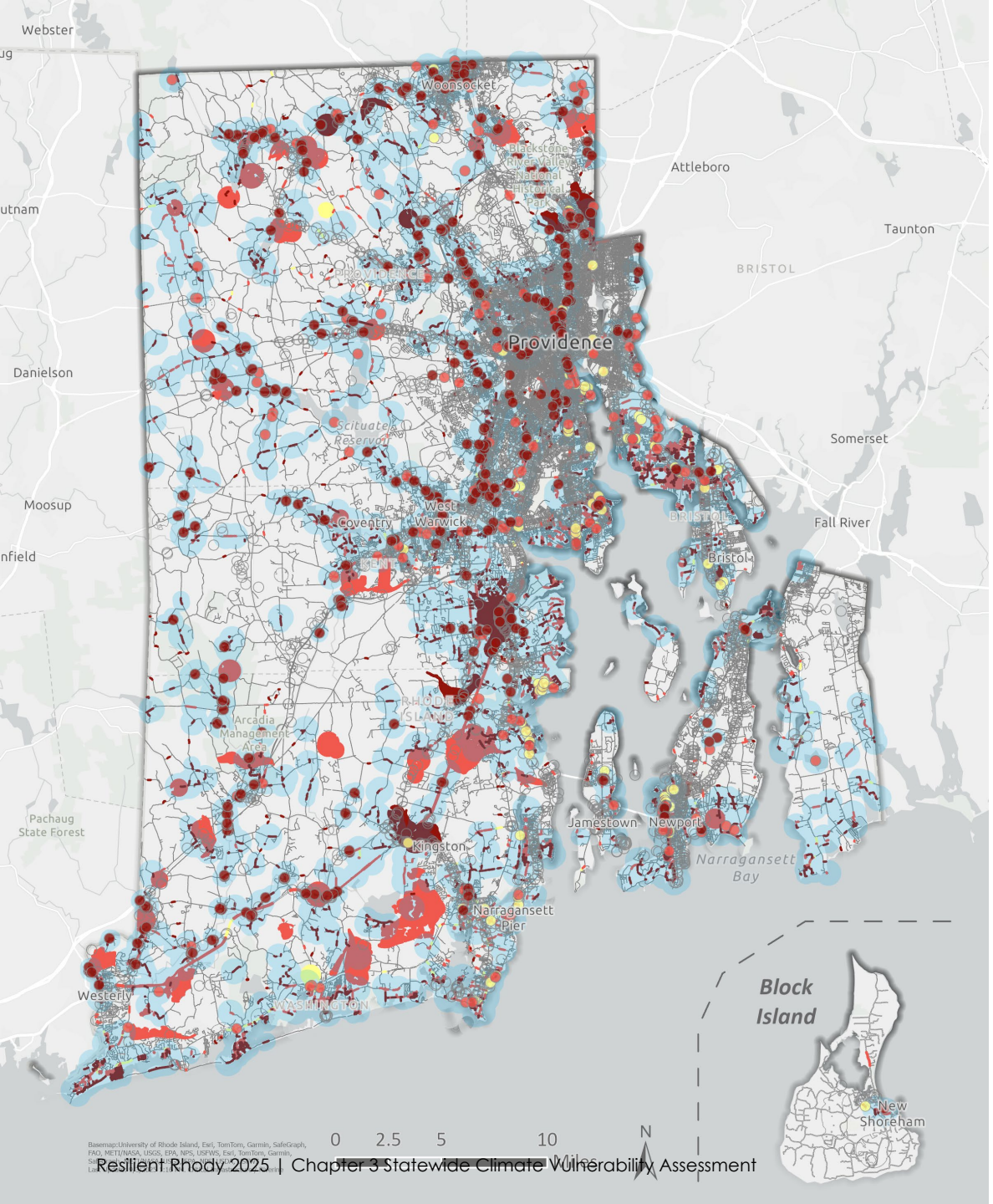
Asset	Risk Results (High or Very High Rating, 2100, High SLR*)
Drinking Water Systems	**4** / 111 **drinking water systems**
Electric Grid	**11** / 218 **electric grid assets**
Fuel Supply	**29** / 317 **underground storage tanks**
Ports	**813** / 1568 **ports**
Public Transportation	**883** / 8722 **public transportation assets**
Roads, Bridges, and Culverts	**9844** / 85848 **roads and bridges**
Seawalls and Tidal Gates	**70** / 1098 **hardened shorelines**
Stormwater Infrastructure	**374** / 2887 **stormwater infrastructure**
Wastewater Treatment Facilities	**13** / 19 **wastewater treatment facilities**

Coastal Risk Rating

Hotspot

- **Low Rating**
- **Medium Rating**
- **High Rating**
- **Very High Rating**

*University of Rhode Island's (URI) Coastal STORMTOOLS data was used to map coastal flooding through the State. For more detail on the various coastal flooding scenarios assessed for each asset, refer to *Appendix C: Asset Risk Assessment Results*. Additionally, the climate risk geospatial data will be made publicly available on the Rhode Island Geographic Information System (RIGIS) website.



Riverine Flooding

Riverine Flooding Risk for Critical Infrastructure and Facilities

The adjacent map demonstrates clusters of high and very high risk ratings across assessed Critical Infrastructure and Facilities. These concentrated areas of riverine risk are highlighted.

Critical Infrastructure and Facilities

Asset	Risk Results (High or Very High Rating, Present*)
Dams	**391** / 669 **dams**
Drinking Water Systems	**75** / 111 **drinking water systems**
Electric Grid	**9** / 218 **electric grid assets**
Fuel Supply	**39** / 317 **underground storage tanks**
Public Transportation	**791** / 8722 **public transportation assets**
Roads, Bridges, and Culverts	**8643** / 85848 **roads and bridges**
Wastewater Treatment Facilities	**5** / 19 **wastewater treatment facilities**

Riverine Risk Rating

Hotspot

- **Low Rating**
- **Medium Rating**
- **High Rating**
- **Very High Rating**

*FEMA FIRM data was used to map riverine flooding throughout the State. For more detail on the various riverine flooding scenarios assessed for each asset, refer to *Appendix C: Asset Risk Assessment Results*. Additionally, the climate risk geospatial data will be made publicly available on the Rhode Island Geographic Information System (RIGIS) website.

Results – Natural Systems

Assets Assessed

Natural Systems

4 Asset Types

Asset type refers to the assets we are analysing as outlined in *Resilient Rhody 2018*.

7 Assets

Assets refer to the specific dataset that was used for each asset type. Many asset types have multiple assets.

Asset Type	Assets	Number of Assets
Beaches and Barriers	Coastal Barriers	134
Coastal Wetlands	Coastal Wetlands	9,966
Forests	Forest Blocks	353
	Conservation Lands	1,032
Water Resources	Rivers and Streams	1,972
	Streams	6,816
	Lakes and Ponds	3,160

Results

The number of Very-High and High-Risk assets in each asset category are listed for each climate hazard. Results come from the most severe climate scenario. Scenarios not assessed are noted with a dash.

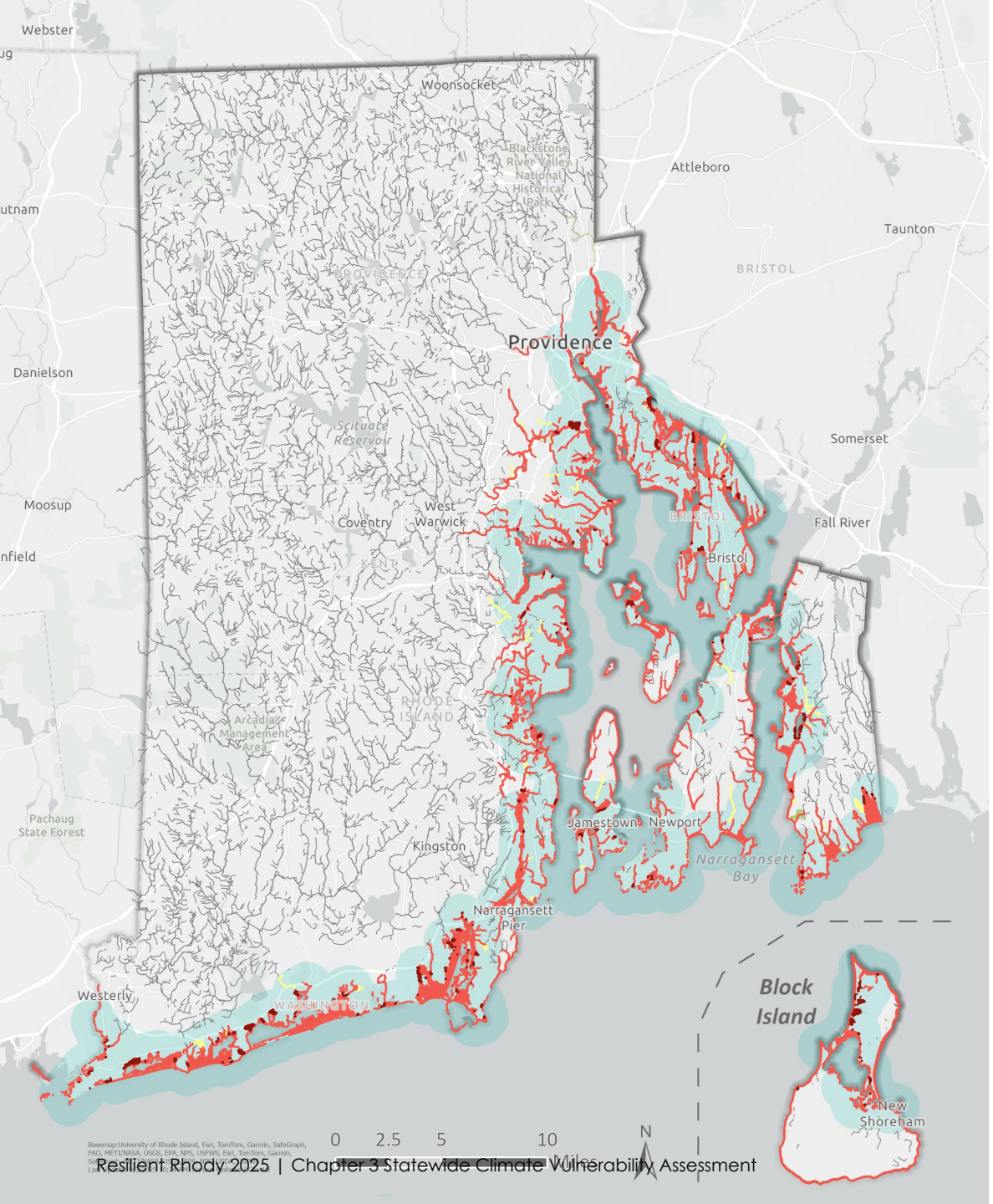
Number of Very-High and High-Risk Assets under the most Extreme Climate Scenario

Asset Type	Assets	Number of Assets	Coastal Flooding	Stormwater FLooding	Riverine Flooding	Extreme Heat	Extreme Wind
Beaches and Barriers	Coastal Barriers	134	**37**/134	-	-	-	-
Coastal Wetlands	Coastal Wetlands	9,966	**9821**/ 9966	-	-	-	-
Forests	Forest Blocks	353	-	-	-	**353**/353	**81**/353
	Conservation Lands	1,032	-	-	-	**1032**/ 1032	**412**/1032
Water Resources	Rivers and Streams	1,972	**275**/ 1972	**1971**/ 1972	-	**1971**/ 1972	-
	Streams	6,816	**629**/ 6816	-	-	**6815**/ 6816	-
	Lakes and Ponds	3,160	-	**3160**/3160	-	**3160**/ 3160	-

Results – Summary Outputs

The risk outputs from all assessed climate scenarios were summarized by counting the number of highest-scoring assets in each asset type. This number illustrates the distribution of high-risk assets across each asset type.

Asset Type	Assets	Number of Assets	Highest Scoring Assets
Beaches and Barriers	Coastal Barriers	134	**37**/134
Coastal Wetlands	Coastal Wetlands	9,966	**60**/9,966
Forests	Forest Blocks	353	**28**/353
	Conservation Lands	1,032	**217**/1,032
Water Resources	Rivers and Streams	1,972	**120**/1,972
	Streams	6,816	**228**/6,816
	Lakes and Ponds	3,160	**123**/3,160



Coastal Flooding

Coastal Flooding Risk for Natural Systems

The adjacent map demonstrates clusters of high and very high risk ratings across assessed Natural Systems. These concentrated areas of coastal flooding risk are highlighted.

Natural Systems

Asset	Risk Results (High or Very High Rating, 2100, High SLR*)
Beaches and Barriers	**37**/134 **beaches and barriers**
Coastal Wetlands	**9,821**/9,966 **coastal wetlands**
Water Resources	**904**/8,788 **rivers, streams, lakes and ponds.**

Coastal Risk Rating

Hotspot

- **Low Rating**
- **Medium Rating**
- **High Rating**
- **Very High Rating**

*University of Rhode Island's (URI) Coastal STORMTOOLS data was used to map coastal flooding through the State. For more detail on the various coastal flooding scenarios assessed for each asset, refer to *Appendix C: Asset Risk Assessment Results*. Additionally, the climate risk geospatial data will be made publicly available on the Rhode Island Geographic Information System (RIGIS) website.

Results – Community Resilience Structures

Assets Assessed

Community Resilience Structures

4 Asset Types

Asset type refers to the assets we are analysing as outlined in *Resilient Rhody 2018*.

6 Assets

Assets refer to the specific dataset that was used for each asset type. Many asset types have multiple assets.

Asset Type	Assets	Number of Assets
Housing	Public Housing	799
Municipal Buildings	City and Town Halls	39
	Public Libraries	71
Schools	K-12 Schools	552
	Colleges and Universities	16
Food Markets	Food Markets	470

Results

The number of Very-High and High-Risk assets in each asset category are listed for each climate hazard. Results come from the most severe climate scenario. Scenarios not assessed are noted with a dash.

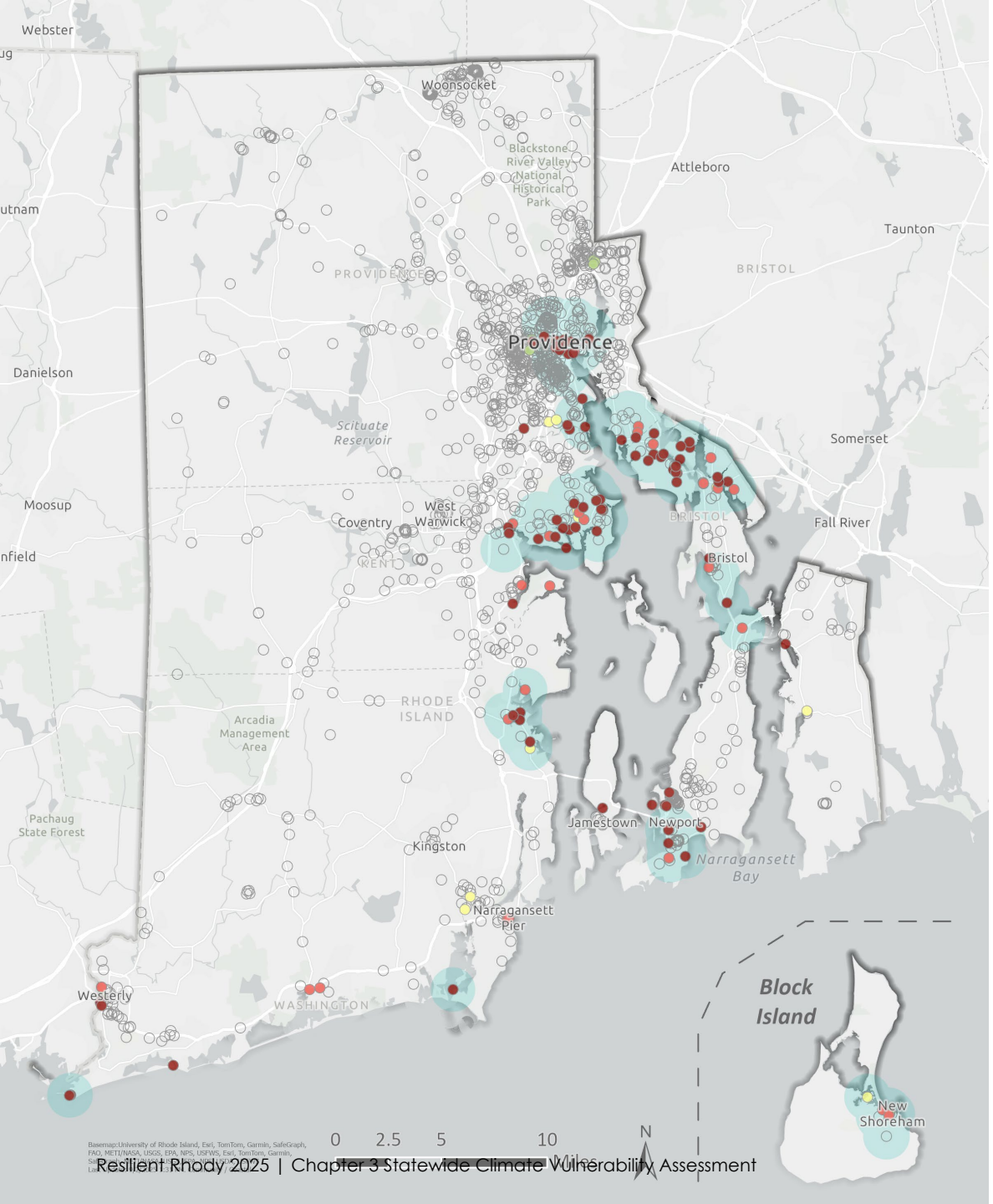
Number of Very-High and High-Risk Assets under the most Extreme Climate Scenario

Asset Type	Assets	Number of Assets	Coastal Flooding	Stormwater Flooding	Riverine Flooding	Extreme Heat	Extreme Wind
Public Housing	Public Housing	799	**26**/799	**799**/799	**21**/799	**799**/799	**799**/799
Municipal Buildings	City and Town Halls	39	**3**/39	**39**/39	**2**/39	**39**/39	**0**/39
	Public Libraries	71	**6**/71	**71**/71	**3**/71	**71**/71	**0**/71
Schools	K-12 Schools	552	**46**/552	**552**/552	**59**/552	**552**/552	**0**/552
	Colleges and Universities	16	**8**/16	**16**/16	**2**/16	**16**/16	**0**/16
Food Markets	Food Markets	470	**41**/470	**470**/470	**41**/470	**470**/470	**0**/470

Results – Summary Outputs

The risk outputs from all assessed climate scenarios were summarized by counting the number of highest-scoring assets in each asset type. This number illustrates the distribution of high-risk assets across each asset type. Assets containing a single high-scoring asset are highlighted in blue.

Asset Type	Assets	Number of Assets	Highest Scoring Assets
Housing	Public Housing	799	**3**/799
Municipal Buildings	City and Town Halls	39	**1 – North Kingstown Town Hall**
	Public Libraries	71	**1 – Maury Loontjens Memorial Library**
Schools	K-12 Schools	552	**13**/552
	Colleges and Universities	16	**5**/16
Food Markets	Food Markets	470	**7**/470



Coastal Flooding

Coastal Flooding Risk for Community Resilience Structures

The adjacent map demonstrates clusters of high and very high risk ratings across assessed Community Resilience Structures. These concentrated areas of coastal flooding risk are highlighted.

Community Resilience Structures

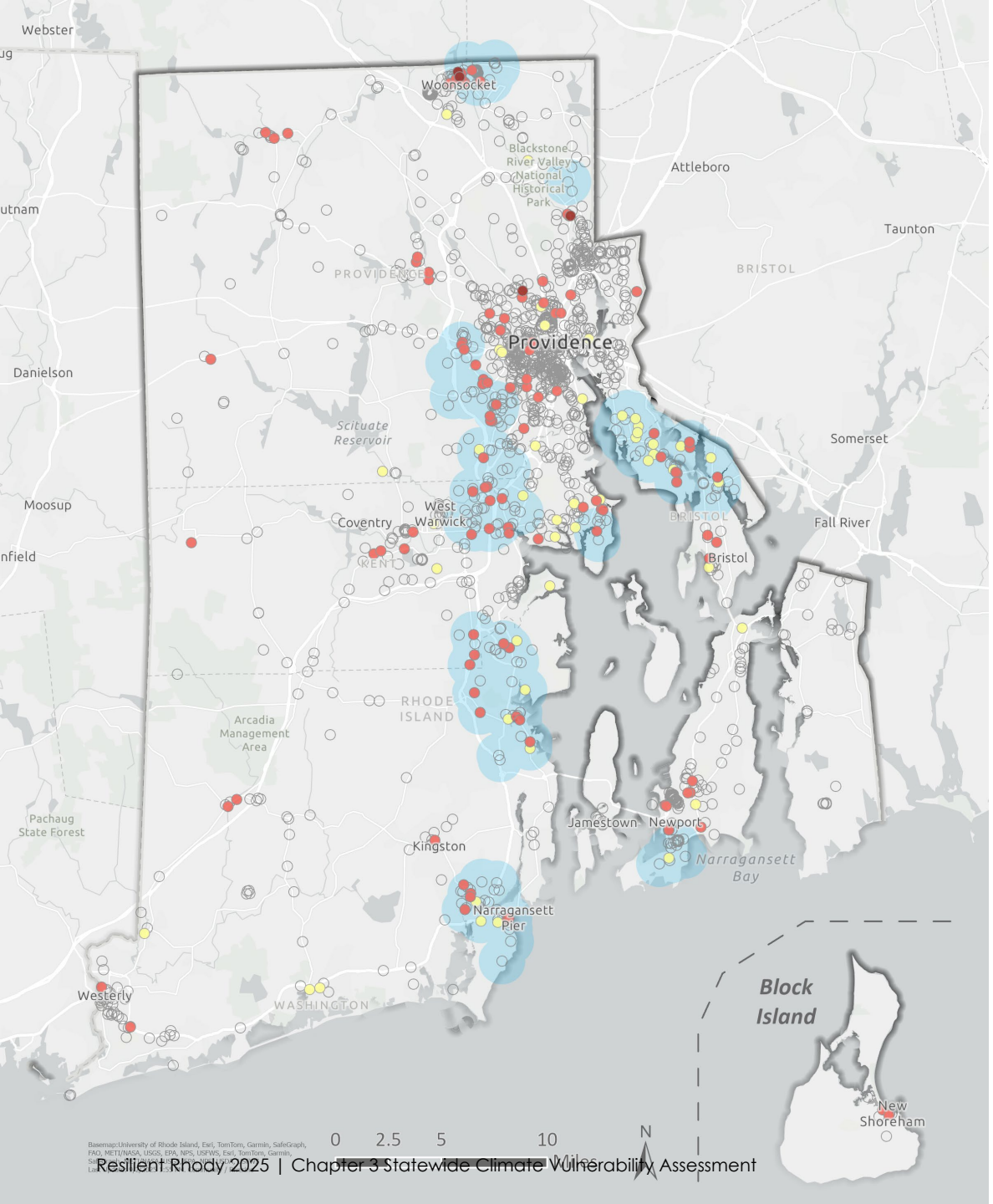
Asset Type	**Risk Results** (High or Very High Rating, 2100, High SLR*)
Public Housing	**26**/ 799 **housing assets**
Municipal Buildings (Libraries and Town Halls)	**9** / 110 **buildings**
Schools (K-12 Schools and Colleges and Universities)	**54** / 568 **schools**
Food Markets	**41**/ 470 **food markets**

Coastal Risk Rating

Hotspot

- **Low Rating**
- **Medium Rating**
- **High Rating**
- **Very High Rating**

*University of Rhode Island's (URI) Coastal STORMTOOLS data was used to map coastal flooding through the State. For more detail on the various coastal flooding scenarios assessed for each asset, refer to *Appendix C: Asset Risk Assessment Results*. Additionally, the climate risk geospatial data will be made publicly available on the Rhode Island Geographic Information System (RIGIS) website.



Riverine Flooding

Riverine Flooding Risk for Community Resilience Structures

The adjacent map demonstrates clusters of high and very high risk ratings across assessed Community Resilience Structures. These concentrated areas of riverine flooding risk are highlighted.

Community Resilience Structures

Asset Type	Risk Results (High or Very High Rating, Present*)
Public Housing	**21** / 799 **housing assets**
Municipal Buildings (Libraries and Town Halls)	**5** / 110 **buildings**
Schools (K-12 Schools and Colleges and Universities)	**61** / 568 **schools**
Food Markets	**41** / 470 **service providers**

Riverine Risk Rating

Hotspot

- **Low Rating**
- **Medium Rating**
- **High Rating**
- **Very High Rating**

*FEMA FIRM data was used to map riverine flooding throughout the State. For more detail on the various riverine flooding scenarios assessed for each asset, refer to *Appendix C: Asset Risk Assessment Results*. Additionally, the climate risk geospatial data will be made publicly available on the Rhode Island Geographic Information System (RIGIS) website.

Results – Emergency Preparedness Structures

Assets Assessed

Emergency Preparedness Structures

2 **Asset Types**

Asset type refers to the assets we are analysing as outlined in *Resilient Rhody 2018.*

5 **Assets**

Assets refer to the specific dataset that was used for each asset type. Many asset types have multiple assets.

Asset Type	Assets	Number of Assets
Emergency Services	Hospitals	17
	Fire Stations	173
	Police Facilities	68
Evacuation Routes and Emergency Shelters	Evacuation Routes	4,065 half-mile segments
	Emergency Shelters	192

Results

The number of Very-High and High-Risk assets in each asset category are listed for each climate hazard. Results come from the most severe climate scenario. Scenarios not assessed are noted with a dash.

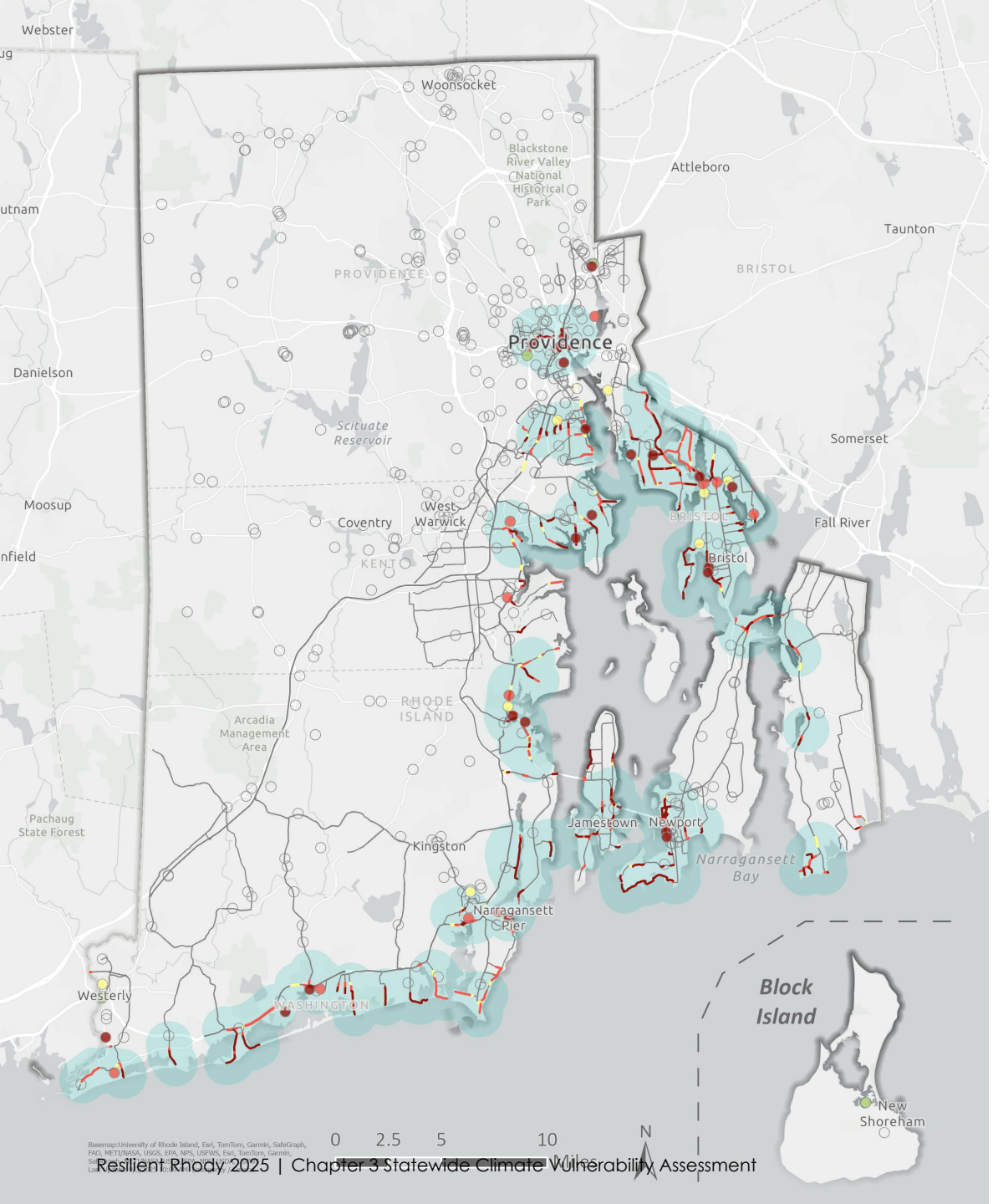
Number of Very-High and High-Risk Assets under the most Extreme Climate Scenario

Asset Type	Assets	Number of Assets	Coastal Flooding	Stormwater Flooding	Riverine Flooding	Extreme Heat	Extreme Wind
Emergency Services	Hospitals	17	**3**/17	**17**/17	**3**/17	**17**/17	**0**/17
	Fire Stations	173	**15**/173	**173**/173	**15**/173	**173**/173	**0**/173
	Police Facilities	68	**6**/68	**68**/68	**9**/68	**68**/68	**0**/68
Emergency Shelters and Routes	Evacuation Routes	4,065 half-mile segments	**728**/4065	**4065**/4065	**612**/4065	-	-
	Emergency Shelters	192	**14**/192	**192**/192	**23**/192	**192**/192	**0**/192

Results – Summary Outputs

The risk outputs from all assessed climate scenarios were summarized by counting the number of highest-scoring assets in each asset type. This number illustrates the distribution of high-risk assets across each asset type. Assets containing a single high-scoring asset are highlighted in blue.

Asset Type	Assets	Number of Assets	Highest Scoring Assets
Emergency Services	Hospitals	17	**1 – South County Health**
	Fire Stations	173	**1 – Atwells Fire Station**
	Police Facilities	68	**1 – Newport Substation**
Evacuation Routes and Emergency Shelters	Evacuation Routes	4,065 half-mile segments	**8**/4,065 half-mile segments
	Emergency Shelters	192	**1 – Hugh Cole School**



Coastal Flooding

Coastal Flooding Risk for Emergency Preparedness Structures

The adjacent map demonstrates clusters of high and very high risk ratings across assessed Emergency Preparedness Structures. These concentrated areas of coastal flooding risk are highlighted.

Emergency Preparedness Structures

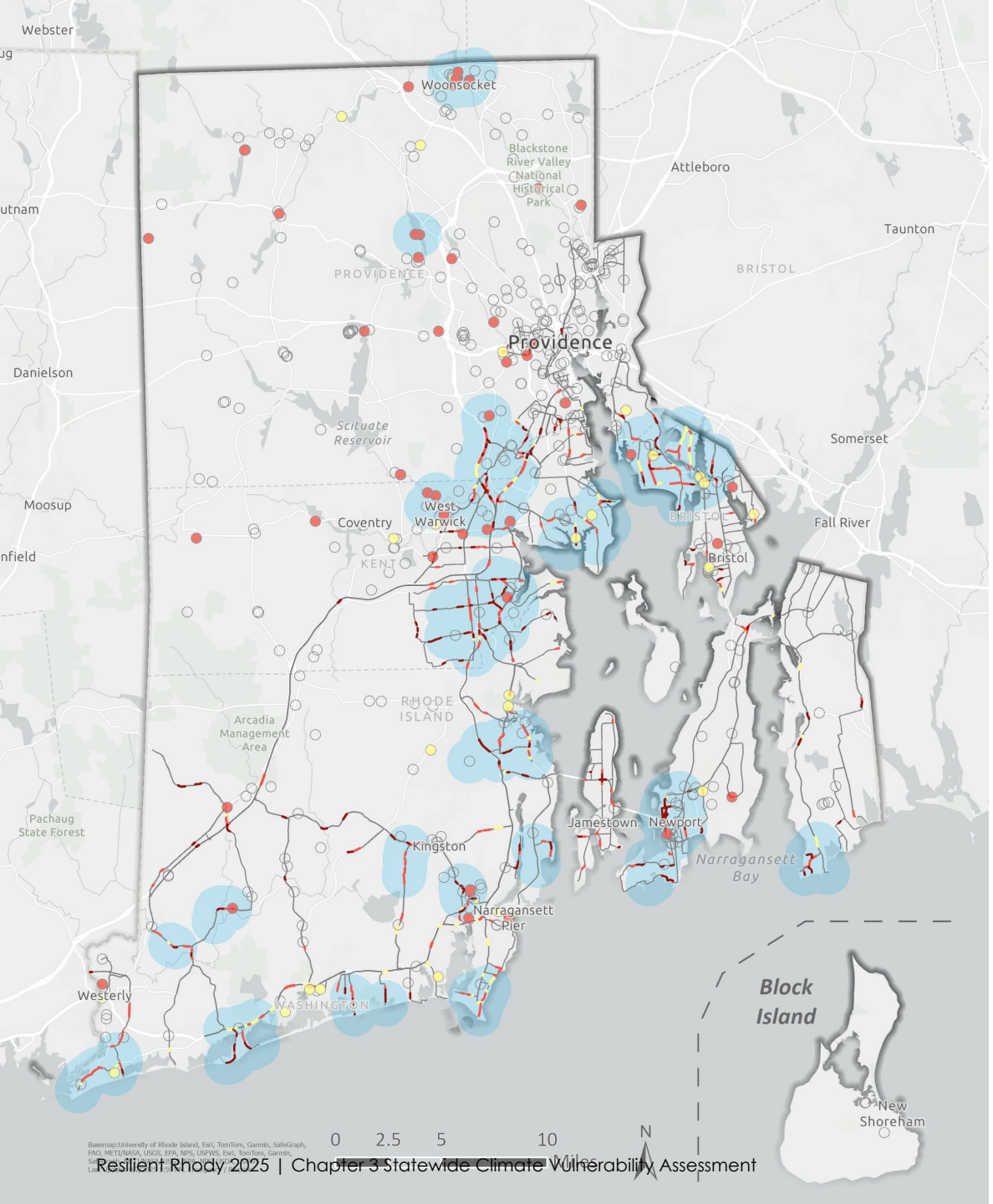
Asset	Risk Results (High or Very High Rating, 2100, High SLR*)
Hospitals	**3**/17 **hospitals**
Fire Stations	**15**/173 **fire stations**
Police Facilities	**6**/68 **police facilities**
Evacuation Routes	**18% of half-mile evacuation route segments**
Emergency Shelters	**14**/192 **emergency shelters**

Coastal Risk Rating

Hotspot

- **Low Rating**
- **Medium Rating**
- **High Rating**
- **Very High Rating**

*University of Rhode Island's (URI) Coastal STORMTOOLS data was used to map coastal flooding through the State. For more detail on the various coastal flooding scenarios assessed for each asset, refer to *Appendix C: Asset Risk Assessment Results*. Additionally, the climate risk geospatial data will be made publicly available on the Rhode Island Geographic Information System (RIGIS) website.



Riverine Flooding

Riverine Flooding Risk for Emergency Preparedness Structures

The adjacent map demonstrates clusters of high and very high risk ratings across assessed Emergency Preparedness Structures. These concentrated areas of riverine risk exposure are highlighted.

Emergency Preparedness Structures

Asset	Risk Results (High or Very High Rating, Present*)
Hospitals	**3**/17 **hospitals**
Fire Stations	**15**/173 **fire stations**
Police Facilities	**9**/68 **police facilities**
Evacuation Routes	**15% of half- mile evacuation route segments**
Emergency Shelters	**23**/192 **emergency shelters**

Riverine Risk Rating

Hotspot

- **Low Rating**
- **Medium Rating**
- **High Rating**
- **Very High Rating**

*FEMA FIRM data was used to map riverine flooding throughout the State. For more detail on the various riverine flooding scenarios assessed for each asset, refer to *Appendix C: Asset Risk Assessment Results*. Additionally, the climate risk geospatial data will be made publicly available on the Rhode Island Geographic Information System (RIGIS) website.

5. Disclaimer and Limitations

Disclaimer

This assessment is intended to provide a high-level risk screening across a wide variety of asset types and potential consequences. Not every potentially damaging natural hazard is considered, nor is every potentially damaging asset-hazard interaction considered. The analysed hazards and asset-hazard pairs were selected based on perceived relevance and in coordination with relevant stakeholders, based on engagement with RIDEM, the Resilience EC4 Subgroup, the RI Resilience Partner Group, Municipal Resilience Stakeholders, and Community Resilience Stakeholders. Every effort was made to capture the most important asset-hazard pairs.

Any recipient utilizing this content acknowledges that Rhode Island's current and future natural hazard risk exposure is dependent on many factors beyond Arup's control, including uncertainties around existing project sites and their construction details, natural hazards, and climate change. Arup emphasizes that the forward-looking projections, forecasts, or estimates are based upon interpretations or assessments of available information at the time of this assessment.

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Limitations

- Inherent uncertainties exist for all hazard data, but especially for future hazard data
- Asset data was collected during *Task 2.3: Develop State Asset Inventory*, in which a state asset inventory was developed based on publicly available datasets and supplemented by existing inventories provided by members of the Resilience EC4 Subgroup. Supplemental data requests were made in order to resolve data gaps. Where data gaps remain, the assessment is limited in its ability to differentiate low and high vulnerability assets.
- There is a lack of existing, available research quantitatively linking hazard intensity to expected consequences for many of the asset-hazard pairs included in this study. As such, vulnerability models utilizing the risk matrix framework are intended to approximate expected climate risks.
- No direct state-wide stormwater flood modelling was identified for use in the assessment. Extreme rainfall projections are therefore used as a proxy representation, though local topographical details will determine exact stormwater flood conditions.
- The climate risk assessment outputs are understood to be a high-level screening based on the scale and nature of a state-wide climate risk assessment covering 40 asset groups, assessed for five climate hazards across seven combinations of time horizon and climate change scenario. More detailed modelling of specific natural hazard events with site- and asset-specific characteristics would be necessary to model direct climate risk with more precision and fidelity.
- Many combinations of asset group and climate hazard have had detailed site-specific analysis conducted by relevant asset owners or state agencies. Where possible, this assessment takes in asset condition data and other relevant details that inform asset vulnerability, but it is understood to be inherently higher level for the purposes of comparison across asset types. Detailed assessments should be further consulted, where available, for a deeper understanding of individual assets.

Appendix A. Previous Rhode Island Reports and Data

Previous Rhode Island Reports

Critical Infrastructure and Facilities

Appendix A provides a list of previous Rhode Island reports that support the research of assets and climate across the State. In addition, to the research listed in the two tables, other State reports include

- *Resilient Rhody: An Actionable Vision for Addressing the Impacts of Climate Change in Rhode Island* – 2018
- *Resilient Rhody: Three Year Impact Report* – 2021
- *Resilient Rhody: State of Resilience Report* – 2024
- *State of Rhode Island Hazard Mitigation Plan* - February 2024

Asset Category	Rhode Island Report
Drinking Water Systems	• Water Quality 2035: Rhode Island Water Quality Management Plan, Rhode Island Department of Administration, Division of Planning, October 2016 • Safe Water RI: Ensuring Safe Water for Rhode Island's Future, July 2013 • Rhode Island Water 2030, Rhode Island Department of Administration, Division of Planning, 2012
Electrical Grid	• Resilient Microgrids for Rhode Island Critical Services, Rhode Island Office of Energy Resources, 2017 • Rhode Island State Energy Plan, Rhode Island Department of Administration, Division of Planning, 2015
Ports	• Stakeholder vulnerability and resilience strategy assessment of maritime infrastructure: Pilot project for Providence, RI, Becker et al., May 2017
Public Transportation	• RIDOT Resilience Improvement Plan, Rhode Island Department of Transportation, 2024 • Rhode Island Coordinated Public Transit Human Services Transportation Plan, Rhode Island Public Transit Authority (RIPTA), March 2023 • Vulnerability of Municipal Transportation Assets to Sea Level Rise and Storm Surge, Rhode Island Department of Administration, Division of Planning, September 2016
Roads, Bridges, and Culverts	• RIDOT Road-Stream Crossing Design Manual, Rhode Island Department of Transportation, 2022 • Transit Forward 2040: Rhode Island Transit Master Plan, Rhode Island Department of Administration, Division of Planning, December 2020 • Rhode Island Transportation Plan, Rhode Island Department of Administration, Division of Planning, 2020
Stormwater Infrastructure	• Stakeholder Vulnerability and Resilience Strategy Assessment of Maritime Infrastructure: Pilot project for Providence, RI, Becker et al., May 2017
Wastewater Treatment Facilities	• Implications of Climate Change for RI Wastewater Collection & Treatment Infrastructure, Rhode Island Department of Environmental Management, March 2017
Multiple Assets	• Report Card for Rhode Island's Infrastructure, American Society of Civil Engineers (ASCE), 2020

Previous Rhode Island Reports

Natural Systems, Climate Resilience Structures, and Emergency Preparedness Structures

Asset Category	Rhode Island Report
Coastal Wetlands	• Coastal and Estuarine Land Conservation Plan, RI Coastal Resources Management Council (CRMC) & RI Department of Environmental Management (RIDEM), 2025 &2010 • Comprehensive Conservation & Management Plan (2010, 2025), Narragansett Bay Estuary Program, 2025 &2010 • Narragansett Bay Estuary Program Science Updates, Narragansett Bay Estuary Program, 2025 & 2010
Forests	• Rhode Island 2020 Forest Action Plan, Rhode Island Department of Environmental Management, Division of Forest Environment, June 2020 • The Value of Rhode Island Forests, Rhode Island Department of Environmental Management, August 2019
Water Resources	• Non-Point Source (NPS) Management Plan, Rhode Island Department of Environmental Management, 2024 • Southeast New England Program Strategic Plan, SNEP Network, 2021 • Water Quality 2035: Rhode Island Water Quality Management Plan, Rhode Island Department of Administration, Division of Planning, October 2016 • Rhode Island Water 2030, Rhode Island Department of Administration, Division of Planning, 2012 • Rhode Island Freshwater Wetland Monitoring and Assessment Plan, Rhode Island Department of Environmental Management, 2006
Public Housing	• Coastal Property Guide, Rhode Island Coastal Resources Management Council (CRMC), 2014
Emergency Services	• Rhode Island First Responder Network Authority (FirstNet) and AT&T, Rhode Island Emergency Management Agency, 2017
Evacuation Routes & Emergency Shelters	• Rhode Island Evacuation Plan, Rhode Island Emergency Management Agency, 2013

Previous Data Sources

Federal and State

Data	Data Source
RI Coastal Resources Management Council (CRMC)	• Shoreline Change Maps, https://www.crmc.ri.gov/maps/maps_shorechange.html
National Oceanic and Atmospheric Administration (NOAA)	• Coastal Flood Exposure Mapper, https://www.coast.noaa.gov/floodexposure/#-10575352,4439107,5z • NOAA National Storm Surge Maps, https://www.nhc.noaa.gov/nationalsurge/ • NOAA Sea Level Rise Viewer, https://coast.noaa.gov/slr/#/layer/slr/6.5/-7940533.226979762/5121539.8831784185/13.000/satellite/none/0.8/2050/interHigh/noAccretion/NOS_Minor

Appendix B. Asset Buffer Approach

Assets Assessed

Buffer Approach

The geospatial data consisted of lines, points, and polygons. Most polygons did not need a buffer. However, for line, point, and larger polygon data, buffers were applied to determine the appropriate assessment area. Buffer creation followed one of the following approaches:

- **Single Parameter:** If the sizes of the asset were relatively consistent across the State, a single buffer was assigned based on the average asset size.
- **Custom Buffer:** When asset sizes varied significantly, especially with larger outliers, individual research was conducted to assign custom buffer sizes. Assets of similar size were then grouped and assigned a single buffer parameter.
- **Data-Driven Buffer:** When asset size indicators were present in the data source, buffer sizes were scaled in proportion to those values.
- **Grid-Based:** For assets that spanned most of the state, typically natural systems, a hexagonal grid was used to segment the asset for more manageable analysis.



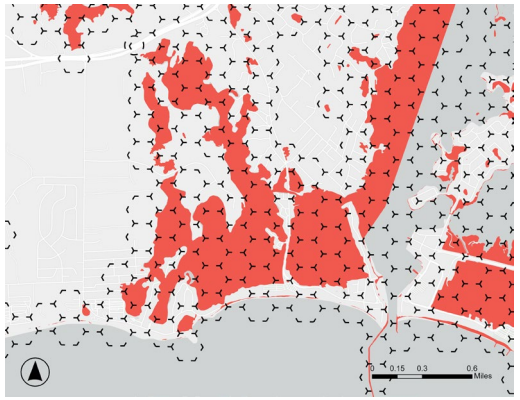
Example Single Parameter Buffer
Bus Route



Example Custom Buffer
Wastewater Treatment Facilities



Example Data-Driven Buffer
Hospital: Based on Number of Beds



Example Grid-Based Buffer
Coastal Wetlands

Buffer **Asset**

Assets Assessed

Buffer Approach: Critical Infrastructure and Facilities

Asset Type	Assets	Data Source	Geometry	Buffer Methodology	Buffer Size
Dams	Dams	URI EDC and RIGIS	Point	Custom Buffer	75 to 1,700 ft
Drinking Water Systems	Public Water Supply Reservoirs	URI EDC and RIGIS	Polygon	-	-
	Community Wellhead Protection Areas	URI EDC and RIGIS	Polygon	-	-
Electric Grid	Electrical Transmission Lines	URI EDC and RIGIS	Line	Single parameter	150 ft
	Power Plants (fossil fuel)	Esri	Point	Data-driven Buffer	Based on Capacity
	Wind Turbines	USGS	Point	Data-driven Buffer	Based on Capacity
	Solar Systems (and farms)	URI EDC and RIGIS	Polygon	-	-
Fuel Supply	Underground Storage Tanks	URI EDC and RIGIS	Point	Data-driven Buffer	Based on Tank Size
Ports	Ports and Commercial Areas	URI EDC and RIGIS	Polygon	-	-
Public Transportation	RIPTA Bus Stops	URI EDC and RIGIS	Point	Single parameter	30 ft
	RIPTA Bus Routes	URI EDC and RIGIS	Line	Single parameter	60 ft
	MBTA Commuter Rail Stations	Mass GIS	Line	Single parameter	150 ft
	MBTA Commuter Rail Line	Mass GIS	Line	Single parameter	150 ft
Roads, Bridges, and Culverts	Roads	RIDOT	Line	Data-driven Buffer	Based on the Number of Lanes
	Bridges	RIDOT	Point	Custom Buffer	400 to 12,000 ft
Seawalls and Tidal Gates	Hardened Shorelines in Narragansett Bay	URI EDC and RIGIS	Polyline	Single parameter	20 ft
Stormwater Infrastructure	Sewer Overflows	URI EDC and RIGIS	Point	Single parameter	0 ft
	Sewered Areas	URI EDC and RIGIS	Polygon	Grid based	500 ft hexagon
	Stormwater Treatment Units (STU)	RIDOT Stormwater Program	Polygon	-	-
	Stormwater Control Plan (SCP) Watershed	RIDOT Stormwater Program	Polygon	Grid based	500 ft hexagon
Wastewater Treatment Facilities	Wastewater Treatment Facilities	URI EDC and RIGIS	Point	Custom Buffer	500 to 1,700 ft

Assets Assessed

Buffer Approach: Natural Systems

Asset Type	Assets	Data Source	Geometry	Buffer Methodology	Buffer Size
Beaches and Barriers	Coastal Barriers	URI EDC and RIGIS	Polygon	-	-
Coastal Wetlands	Coastal Wetlands	URI EDC and RIGIS	Polygon	Grid based	500 ft hexagon, 250 ft from the coast
Forests	Forest Blocks	URI EDC and RIGIS	Polygon	Grid based	500 ft hexagon
	Conservation Lands	URI EDC and RIGIS	Polygon	Grid based	500 ft hexagon
Water Resources	Streams and Rivers	URI EDC and RIGIS	Line	-	-
	Streams	Project Team Existing Data	Line	-	-
	Lakes and Ponds	URI EDC and RIGIS	Polygon	Grid based	500 ft hexagon

Assets Assessed

Buffer Approach: Community & Emergency Preparedness Structures

Asset Type	Assets	Data Source	Geometry	Buffer Methodology	Buffer Size
Housing	Public Housing	HUD	Point	Data-driven Buffer	Based on Total Occupancy
Municipal Buildings	City and Town Halls	URI EDC and RIGIS	Point	Single parameter	150 ft
	Public Libraries	URI EDC and RIGIS	Point	Data-driven Buffer	Based on the Square Footage of the Library
Schools	K-12 Schools	URI EDC and RIGIS	Point	Data-driven Buffer	Based on the Square Footage of the School
	Colleges and Universities	Project Team Existing Data	Point	Custom Buffer	1,500 to 4,500 ft
Emergency Services	Hospitals	URI EDC and RIGIS	Point	Data-driven Buffer	Based on the Number of Beds
	Fire Stations	Project Team Existing Data	Point	Single parameter	150 ft
	Police Facilities	Project Team Existing Data	Point	Single parameter	150 ft
	Food Markets	URI EDC and RIGIS	Point	Data-driven Buffer	Based on the Number of Cash Registers
Evacuation Routes and Emergency Shelters	Evacuation Routes	RIEMA	Line	Data-driven Buffer	Based on the Number of Lanes
	Emergency Shelters	RIEMA	Point	Single parameter	300 ft

Appendix C. Asset Risk Assessment Results

How to Read the Asset Risk Assessment Results

Appendix C

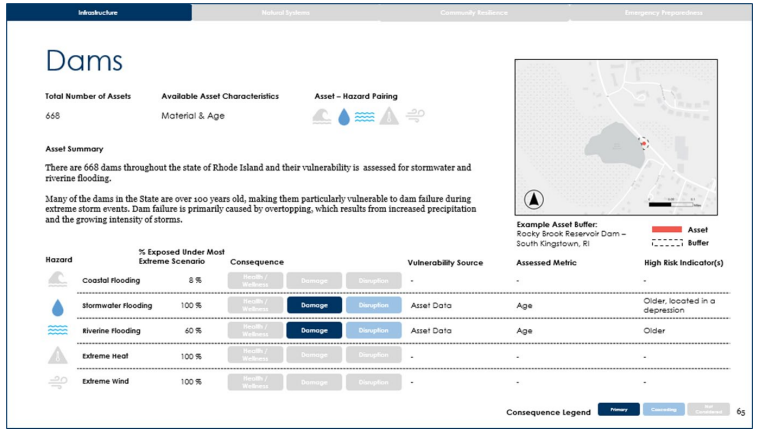
This section provides an asset-level summary for the risk assessment results for each asset group.

1. Critical Infrastructure and Facilities
2. Natural Systems
3. Community Resilience Structures
4. Emergency Preparedness Structures

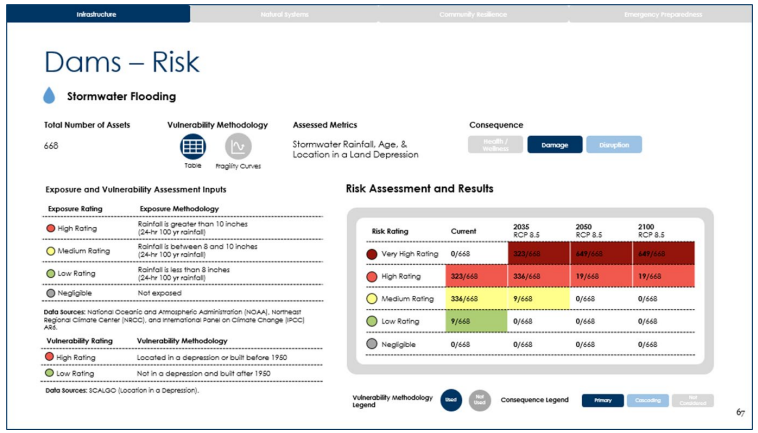
Each asset section includes a **summary page** that introduces the asset, including a summary table of the assessed scenarios and their associated consequences. Additionally, the summary page provides example buffer maps.

Each asset section also has various **risk results** pages that give an in-depth overview of the exposure and vulnerability methodology, including risk assessment results. There is one risk results page for each Asset-Hazard pair assessed.

Example Asset Summary Page



Example Risk Results Page

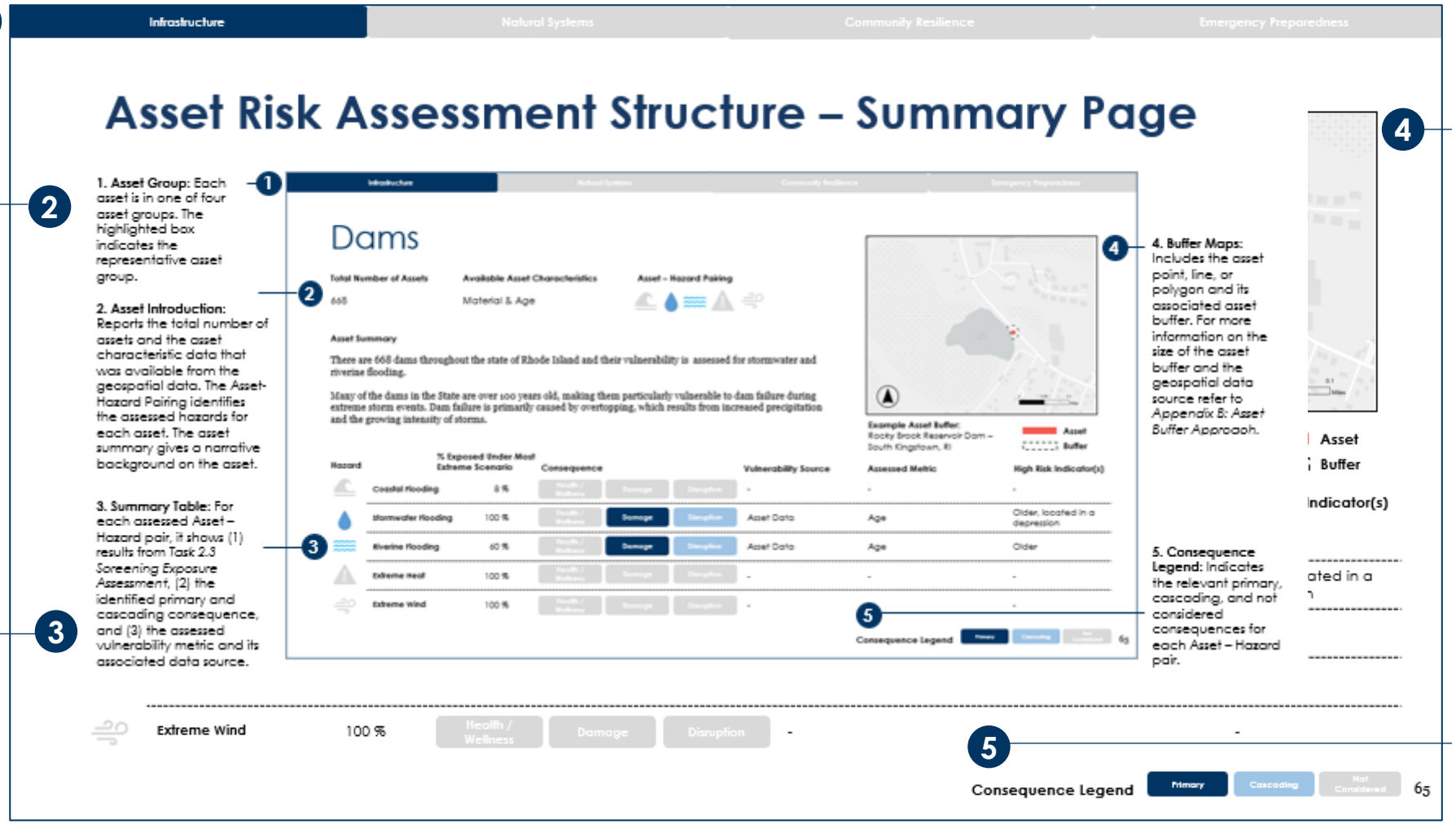


Asset Risk Assessment Structure – Summary Page

1. Asset Group: Each asset is in one of four asset groups. The highlighted box indicates the representative asset group.

2. Asset Introduction: Reports the total number of assets and the asset characteristic data that was available from the geospatial data. The Asset-Hazard Pairing identifies the assessed hazards for each asset. The asset summary gives a narrative background on the asset.

3. Summary Table: For each assessed Asset – Hazard pair, it shows (1) results from *Task 2.3 Screening Exposure Assessment*, (2) the identified primary and cascading consequence, and (3) the assessed vulnerability metric and its associated data source.



4. Buffer Maps: Includes the asset point, line, or polygon and its associated asset buffer. For more information on the size of the asset buffer and the geospatial data source refer to *Appendix B: Asset Buffer Approach.*

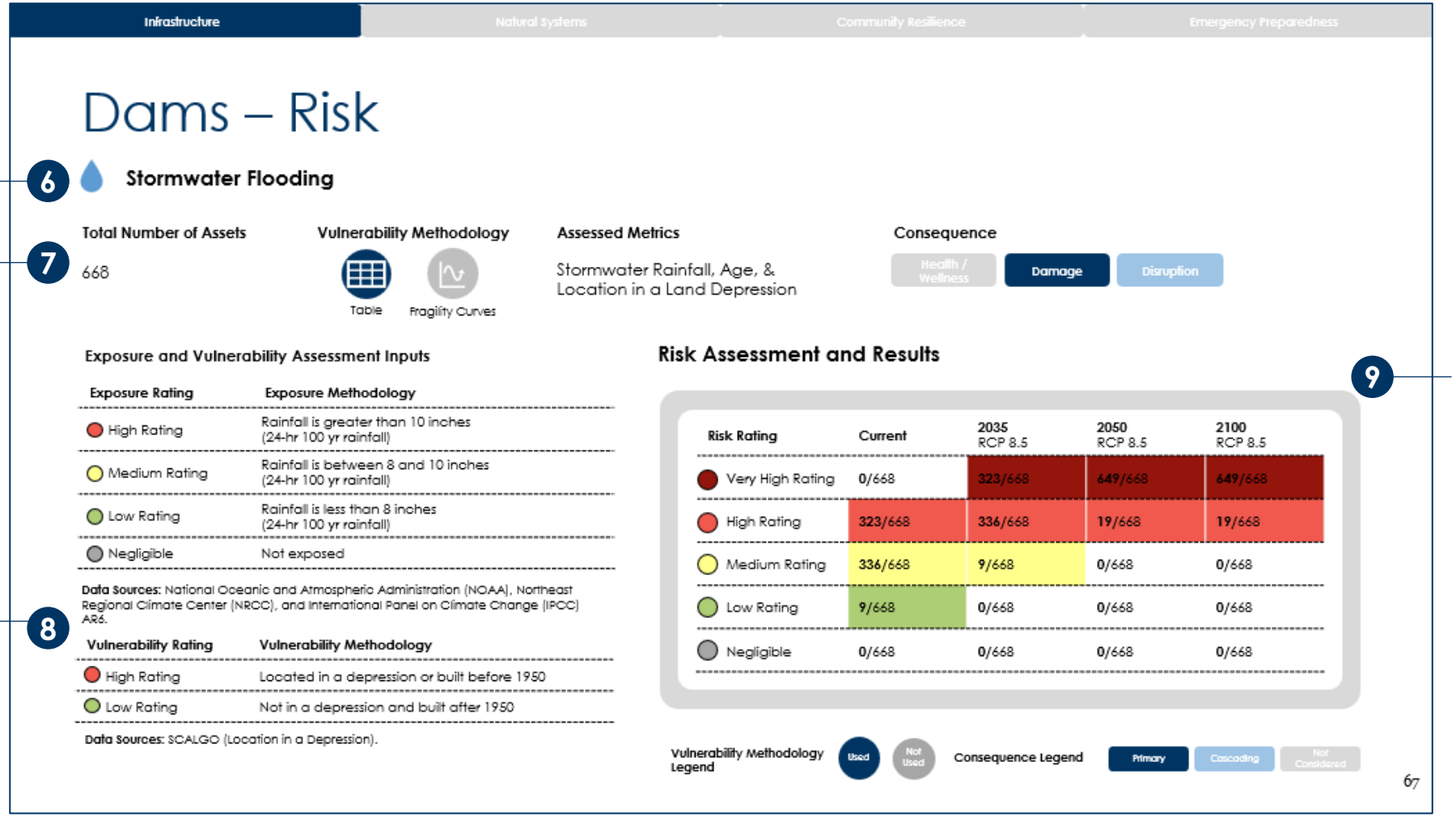
5. Consequence Legend: Indicates the relevant primary, cascading, and not considered consequences for each Asset – Hazard pair.

Asset Risk Assessment Structure – Risk Results

6. Climate Hazard: Vulnerability Introduction: Identifies the assed climate hazard. There will be one page of results for each assessed hazard.

7. Vulnerability Introduction: Includes number of assets, the vulnerability methodology used (table vs. fragility curve), the metrics that were used in the vulnerability assessment, and restates the identified consequences.

8. Exposure and Vulnerability Assessment Inputs: Summary of the exposure and vulnerability inputs and their associated methodologies. Includes data sources used in the assessment.



Infrastructure | Natural Systems | Community Resilience | Emergency Preparedness

Dams – Risk

6 **Stormwater Flooding**

7

Total Number of Assets	Vulnerability Methodology	Assessed Metrics	Consequence
668	Table, Fragility Curves	Stormwater Rainfall, Age, & Location in a Land Depression	Health / Wellness, **Damage**, Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Rainfall is greater than 10 inches (24-hr 100 yr rainfall)
Medium Rating	Rainfall is between 8 and 10 inches (24-hr 100 yr rainfall)
Low Rating	Rainfall is less than 8 inches (24-hr 100 yr rainfall)
Negligible	Not exposed

Data Sources: National Oceanic and Atmospheric Administration (NOAA), Northeast Regional Climate Center (NRCC), and International Panel on Climate Change (IPCC) AR6.

8

Vulnerability Rating	Vulnerability Methodology
High Rating	Located in a depression or built before 1950
Low Rating	Not in a depression and built after 1950

Data Sources: SCALGO (Location in a Depression).

Risk Assessment and Results

9

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	0/668	323/668	649/668	649/668
High Rating	323/668	336/668	19/668	19/668
Medium Rating	336/668	9/668	0/668	0/668
Low Rating	9/668	0/668	0/668	0/668
Negligible	0/668	0/668	0/668	0/668

Vulnerability Methodology Legend: Used, Not Used

Consequence Legend: Primary, Cascading, Not Considered

67

9. Risk Assessment Results: Reports the summary risk results for each assessed climate hazard and time horizon.

C.1. Critical Infrastructure and Facilities

Asset Results

Critical Infrastructure and Facilities

1. Dams
2. Drinking Water Systems
3. Electric Grid
4. Fuel Supply
5. Ports
6. Public Transportation
7. Roads, Bridges and Culverts
8. Seawalls and Tidal Gates
9. Stormwater Infrastructure
10. Wastewater Treatment Facilities

Dams

Dams

Total Number of Assets

668

Available Asset Characteristics

Material & Age

Asset – Hazard Pairing



Asset Summary

There are 668 dams throughout the state of Rhode Island and their vulnerability is assessed for stormwater and riverine flooding.

Many of the dams in the State are over 100 years old, making them particularly vulnerable to dam failure during extreme storm events. Dam failure is primarily caused by overtopping, which results from increased precipitation and the growing intensity of storms.



Example Asset Buffer:
Rocky Brook Reservoir Dam – South Kingstown, RI

Asset
Buffer

Hazard	% Exposed Under Most Extreme Scenario	Consequence			Vulnerability Source	Assessed Metric	High Risk Indicator(s)
Coastal Flooding	8 %	Health / Wellness	Damage	Disruption	-	-	-
Stormwater Flooding	100 %	Health / Wellness	**Damage**	Disruption	Asset Data	Age	Older, located in a depression
Riverine Flooding	60 %	Health / Wellness	**Damage**	Disruption	Asset Data	Age	Older
Extreme Heat	100 %	Health / Wellness	Damage	Disruption	-	-	-
Extreme Wind	100 %	Health / Wellness	Damage	Disruption	-	-	-

Consequence Legend Primary | Cascading | Not Considered

Dams – Risk

Stormwater Flooding

Total Number of Assets

668

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Stormwater Rainfall, Age, & Location in a Land Depression

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Rainfall is greater than 10 inches (24-hr 100 yr rainfall)
Medium Rating	Rainfall is between 8 and 10 inches (24-hr 100 yr rainfall)
Low Rating	Rainfall is less than 8 inches (24-hr 100 yr rainfall)
Negligible	Not exposed

Data Sources: National Oceanic and Atmospheric Administration (NOAA), Northeast Regional Climate Center (NRCC), and International Panel on Climate Change (IPCC) AR6.

Vulnerability Rating	Vulnerability Methodology
High Rating	Located in a depression or built before 1950
Low Rating	Not in a depression and built after 1950

Data Sources: SCALGO (Location in a Depression).

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/668	**323**/668	**649**/668	**649**/668
High Rating	**323**/668	**336**/668	**19**/668	**19**/668
Medium Rating	**336**/668	**9**/668	**0**/668	**0**/668
Low Rating	**9**/668	**0**/668	**0**/668	**0**/668
Negligible	**0**/668	**0**/668	**0**/668	**0**/668

Vulnerability Methodology Legend: **Used** | Not Used

Consequence Legend: **Primary** | Cascading | Not Considered

Dams - Risk

Riverine Flooding

Total Number of Assets

668

Vulnerability Methodology

Table

Fragility Curves

Assessed Metrics

Riverine Flood Exposure and Age

Consequence

Health / Wellness | **Damage** | **Disruption**

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Asset is in both the 100-year and 500-year floodplain
Medium Rating	Asset is in the 500-year but not the 100-year floodplain
Low Rating	Asset is not in the 100-year or 500-year floodplain
Negligible	Not exposed

Data Sources: FEMA FIRM.

Vulnerability Rating	Vulnerability Methodology
High Rating	Dam built prior to 1950
Low Rating	Dam built 1950 or after

Data Sources: URI Environmental Data Center and RIGIS (Age).

*Results are presented only for the current, because only present-day data on riverine flooding was available.

Risk Assessment and Results

Risk Rating	Current*
Very High Rating	**328**/668
High Rating	**63**/668
Medium Rating	**7**/668
Low Rating	**0**/668
Negligible	**270**/668

Vulnerability Methodology Legend: Used | Not Used

Consequence Legend: Primary | Cascading | Not Considered

Drinking Water Systems

1. Public Water Reservoirs
2. Wellhead Protection Areas

Public Water Reservoirs

Total Number of Assets

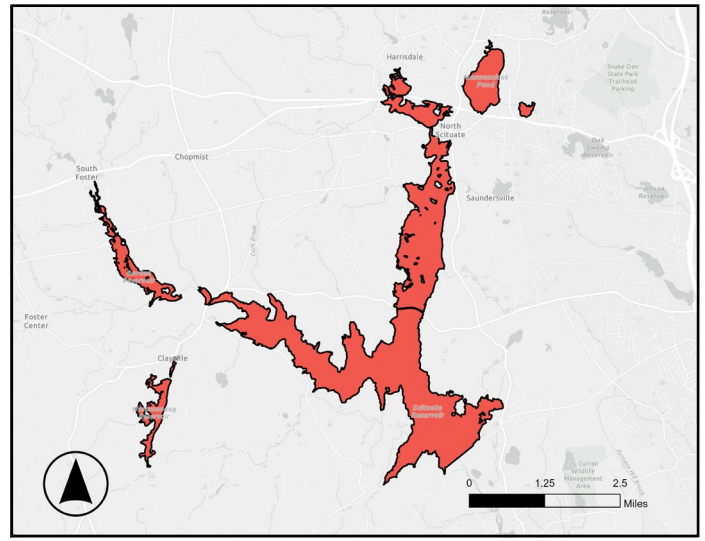
49

Available Asset Characteristics

Area and Proximity to Algal Blooms and Superfund Sites

Asset – Hazard Pairing





Example Asset Buffer:
Public Water Reservoirs

Asset
Buffer

Asset Summary

There are 49 public water reservoirs throughout the state of Rhode Island and their vulnerability are assessed for coastal flooding, stormwater flooding, riverine flooding, and extreme heat.

Climate hazards are a threat to drinking water quality due to contamination of public water reservoirs. Coastal flooding can cause saltwater intrusion, while all flooding increases contamination risks. Extreme heat can reduce the quality and availability of water.

Hazard	% Exposed Under Most Extreme Scenario	Consequence			Vulnerability Source	Assessed Metric	High Risk Indicator(s)
Coastal Flooding	22 %	**Health / Wellness**	Damage	**Disruption**	Asset Data	Area	Large % of Asset Exposed
Stormwater Flooding	100 %	**Health / Wellness**	Damage	**Disruption**	RIDEM; EPA	Proximity to Contamination Sites	Close Proximity
Riverine Flooding	61 %	**Health / Wellness**	Damage	**Disruption**	RIDEM; EPA	Proximity to Contamination Sites	Close Proximity
Extreme Heat	100 %	**Health / Wellness**	Damage	**Disruption**	RIDEM	Algal Blooms	History of Cyanobacteria
Extreme Wind	100 %	Health / Wellness	Damage	Disruption	-	-	-

Consequence Legend Primary | Cascading | Not Considered

Public Water Reservoirs - Risk

Coastal Flooding

Total Number of Assets

49

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Coastal Flood Exposure

Consequence

Health / Wellness | Damage | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	> 30% MHHW Inundation
Medium Rating	10 – 30% MHHW Inundation
Low Rating	< 10% MHHW Inundation
Negligible	Not exposed

Data Sources: URI Coastal STORMTOOLS.

Vulnerability Rating	Vulnerability Methodology
High Rating	-
Low Rating	All assets assumed to be equal vulnerability

Risk Assessment and Results

Risk Rating	Current	2035 High SLR	2050 High SLR	2100 High SLR
Very High Rating	**0**/49	**0**/49	**0**/49	**0**/49
High Rating	**0**/49	**1**/49	**2**/49	**4**/49
Medium Rating	**1**/49	**0**/49	**0**/49	**0**/49
Low Rating	**10**/49	**7**/49	**9**/49	**7**/49
Negligible	**38**/49	**41**/49	**38**/49	**38**/49

Vulnerability Methodology Legend: Used | Not Used

Consequence Legend: Primary | Cascading | Not Considered

Public Water Reservoirs - Risk

Stormwater Flooding

Total Number of Assets

49

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Stormwater Rainfall & Distance from a Superfund Site

Consequence

Health / Wellness | Damage | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Rainfall is greater than 10 inches (24-hr 100 yr rainfall)
Medium Rating	Rainfall is between 8 and 10 inches (24-hr 100 yr rainfall)
Low Rating	Rainfall is less than 8 inches (24-hr 100 yr rainfall)
Negligible	Not exposed

Data Sources: National Oceanic and Atmospheric Administration (NOAA), Northeast Regional Climate Center (NRCC), and International Panel on Climate Change (IPCC) AR6.

Vulnerability Rating	Vulnerability Methodology
High Rating	Distance from a superfund site is equal to 5,280 ft or more
Low Rating	Distance from a superfund site is less than 5,280 ft

Data Sources: Environmental Protection Agency (EPA).

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/49	**0**/49	**0**/49	**0**/49
High Rating	**0**/49	**30**/49	**49**/49	**49**/49
Medium Rating	**30**/49	**19**/49	**0**/49	**0**/49
Low Rating	**19**/49	**0**/49	**0**/49	**0**/49
Negligible	**0**/49	**0**/49	**0**/49	**0**/49

Vulnerability Methodology Legend: Used | Not Used

Consequence Legend: Primary | Cascading | Not Considered

Public Water Reservoirs - Risk

Riverine Flooding

Total Number of Assets

49

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Riverine Flood Exposure & Distance from a Superfund Site

Consequence

Health / Wellness | Damage | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Asset is in both the 100-year and 500-year floodplain
Medium Rating	Asset is in the 500-year but not the 100-year floodplain
Low Rating	Asset is not in the 100-year or 500-year floodplain
Negligible	Not exposed

Data Sources: FEMA FIRM.

Vulnerability Rating	Vulnerability Methodology
High Rating	Distance from a superfund site is equal to 5,280 ft or more
Low Rating	Distance from a superfund site is less than 5,280 ft

Data Sources: Environmental Protection Agency (EPA).

*Results are presented only for the current, because only present-day data on riverine flooding was available.

Risk Assessment and Results

Risk Rating	Current*
Very High Rating	**3**/49
High Rating	**26**/49
Medium Rating	**1**/49
Low Rating	**0**/49
Negligible	**19**/49

Vulnerability Methodology Legend: Used | Not Used

Consequence Legend: Primary | Cascading | Not Considered

Public Water Reservoirs - Risk

Extreme Heat

Total Number of Assets

49

Vulnerability Methodology

Table

Fragility Curves

Assessed Metrics

Extreme Heat Exposure & Number of Algal Bloom Advisories

Consequence

Health / Wellness | Damage | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	More than 14 annual days above 90°F
Medium Rating	Between 7 and 14 annual days above 90°F
Low Rating	Less than 7 annual days above 90°F
Negligible	Not exposed

Data Sources: RIDOH Climate Explorer and NOAA.

Vulnerability Rating	Vulnerability Methodology
High Rating	One or more algal bloom advisories from 2011 - 2025
Low Rating	No algal bloom advisories from 2011 - 2025

Data Sources: Rhode Island Department of Environmental Management (RIDEM).

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/49	**0**/49	**0**/49	**4**/49
High Rating	**0**/49	**0**/49	**37**/49	**45**/49
Medium Rating	**4**/49	**37**/49	**12**/49	**0**/49
Low Rating	**45**/49	**12**/49	**0**/49	**0**/49
Negligible	**0**/49	**0**/49	**0**/49	**0**/49

Vulnerability Methodology Legend Used | Not Used

Consequence Legend Primary | Cascading | Not Considered

Wellhead Protection Areas

Total Number of Assets

62

Available Asset Characteristics

Number of Wells per County & Proximity to Algal Blooms and Superfund Sites

Asset – Hazard Pairing

Asset Summary

There are 62 wellhead protection areas throughout the state of Rhode Island and their vulnerability are assessed for coastal flooding, stormwater flooding, riverine flooding, and extreme heat.

Climate hazards are a threat to drinking water quality due to contamination of wellhead protection areas. Coastal flooding can cause saltwater intrusion, while all flooding increases contamination risks. Extreme heat can reduce the quality and availability of water.



Example Asset Buffer:
Wellhead Protection Areas

Asset
Buffer

Hazard	% Exposed Under Most Extreme Scenario	Consequence			Vulnerability Source	Assessed Metric	High Risk Indicator(s)
Coastal Flooding	19 %	Health / Wellness	Damage	Disruption	Asset Data	Area	Large % of Asset Exposed
Stormwater Flooding	100 %	Health / Wellness	Damage	Disruption	RIDEM; EPA	Proximity to Contamination Sites	Close Proximity
Riverine Flooding	77 %	Health / Wellness	Damage	Disruption	RIDEM; EPA	Proximity to Contamination Sites	Close Proximity
Extreme Heat	100 %	Health / Wellness	Damage	Disruption	RIDEM	Algal Blooms	History of Cyanobacteria
Extreme Wind	100 %	Health / Wellness	Damage	Disruption	-	-	-

Consequence Legend Primary | Cascading | Not Considered

Wellhead Protection Areas - Risk

Coastal Flooding

Total Number of Assets

62

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Coastal Flood Exposure

Consequence

Health / Wellness | Damage | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	> 30% MHHW Inundation
Medium Rating	10 – 30% MHHW Inundation
Low Rating	< 10% MHHW Inundation
Negligible	Not exposed

Data Sources: URI Coastal STORMTOOLS.

Vulnerability Rating	Vulnerability Methodology
High Rating	-
Low Rating	All assets assumed to be equal vulnerability

Risk Assessment and Results

Risk Rating	Current	2035 High SLR	2050 High SLR	2100 High SLR
Very High Rating	**0**/62	**0**/62	**0**/62	**0**/62
High Rating	**0**/62	**0**/62	**0**/62	**0**/62
Medium Rating	**0**/62	**0**/62	**0**/62	**3**/62
Low Rating	**12**/62	**12**/62	**12**/62	**9**/62
Negligible	**50**/62	**50**/62	**50**/62	**50**/62

Vulnerability Methodology Legend: Used | Not Used

Consequence Legend: Primary | Cascading | Not Considered

Wellhead Protection Areas - Risk

Stormwater Flooding

Total Number of Assets

62

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Stormwater Rainfall & Distance from a Superfund Site

Consequence

Health / Wellness | Damage | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Rainfall is greater than 10 inches (24-hr 100 yr rainfall)
Medium Rating	Rainfall is between 8 and 10 inches (24-hr 100 yr rainfall)
Low Rating	Rainfall is less than 8 inches (24-hr 100 yr rainfall)
Negligible	Not exposed

Data Sources: National Oceanic and Atmospheric Administration (NOAA), Northeast Regional Climate Center (NRCC), and International Panel on Climate Change (IPCC) AR6.

Vulnerability Rating	Vulnerability Methodology
High Rating	Distance from a superfund site is equal to 5,280 ft or more
Low Rating	Distance from a superfund site is less than 5,280 ft

Data Sources: Environmental Protection Agency (EPA).

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/62	**0**/62	**0**/62	**0**/62
High Rating	**0**/62	**22**/62	**62**/62	**62**/62
Medium Rating	**22**/62	**40**/62	**0**/62	**0**/62
Low Rating	**40**/62	**0**/62	**0**/62	**0**/62
Negligible	**0**/62	**0**/62	**0**/62	**0**/62

Vulnerability Methodology Legend: Used | Not Used

Consequence Legend: Primary | Cascading | Not Considered

Wellhead Protection Areas - Risk

Riverine Flooding

Total Number of Assets

62

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Riverine Flood Exposure & Distance from a Superfund Site

Consequence

Health / Wellness | Damage | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Asset is in both the 100-year and 500-year floodplain
Medium Rating	Asset is in the 500-year but not the 100-year floodplain
Low Rating	Asset is not in the 100-year or 500-year floodplain
Negligible	Not exposed

Data Sources: FEMA FIRM.

Vulnerability Rating	Vulnerability Methodology
High Rating	Distance from a superfund site is equal to 5,280 ft or more
Low Rating	Distance from a superfund site is less than 5,280 ft

Data Sources: Environmental Protection Agency (EPA).

*Results are presented only for the current, because only present-day data on riverine flooding was available.

Risk Assessment and Results

Risk Rating	Current*
Very High Rating	**9**/62
High Rating	**37**/62
Medium Rating	**2**/62
Low Rating	**0**/62
Negligible	**14**/62

Vulnerability Methodology Legend: Used | Not Used

Consequence Legend: Primary | Cascading | Not Considered

Wellhead Protection Areas - Risk

Extreme Heat

Total Number of Assets

62

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Extreme Heat Exposure and Distance from Reported Algal Blooms

Consequence

Health / Wellness | Damage | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	More than 14 annual days above 90°F
Medium Rating	Between 7 and 14 annual days above 90°F
Low Rating	Less than 7 annual days above 90°F
Negligible	Not exposed

Data Sources: RIDOH Climate Explorer and NOAA.

Vulnerability Rating	Vulnerability Methodology
High Rating	Distance from a body of water with reported algal bloom is equal to 5,280 ft or more
Low Rating	Distance from a body of water with reported algal boom is less than 5, 280 ft

Data Sources: Rhode Island Department of Environmental Management (RIDEM).

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/62	**0**/62	**10**/62	**14**/62
High Rating	**0**/62	**10**/62	**26**/62	**48**/62
Medium Rating	**14**/62	**26**/62	**26**/62	**0**/62
Low Rating	**48**/62	**26**/62	**0**/62	**0**/62
Negligible	**0**/62	**0**/62	**0**/62	**0**/62

Vulnerability Methodology Legend: Used | Not Used

Consequence Legend: Primary | Cascading | Not Considered

Electric Grid

1. Electrical Transmission Lines
2. Power Plants
3. Wind Turbines
4. Solar Systems

Electrical Transmission Lines

Total Number of Assets

1,170 ½ mile segments

Available Asset Characteristics

N/a

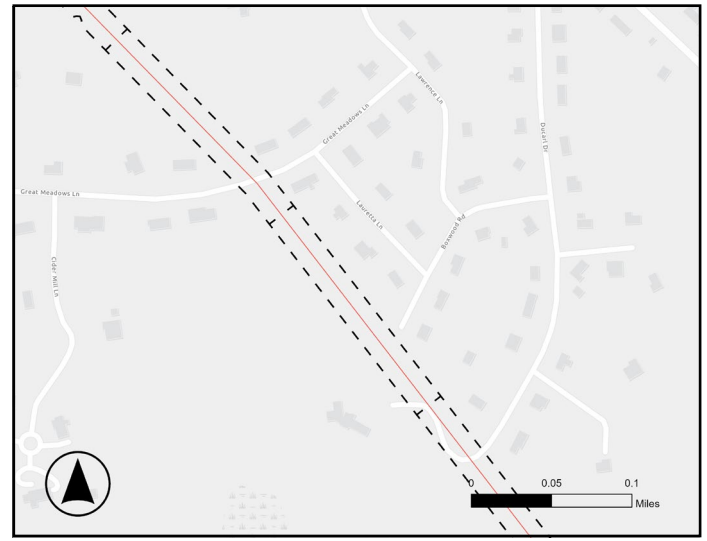
Asset – Hazard Pairing



Asset Summary

There are over 800 miles of electrical transmission lines throughout the state of Rhode Island and their vulnerability are assessed for extreme wind.

Infrastructure damage can result from climate hazards—all of which may lead to power outages. In particular, extreme winds may bring down overhead power lines.



Example Asset Buffer:
Electrical Transmission Lines

Asset
Buffer

Hazard	% Exposed Under Most Extreme Scenario	Consequence			Vulnerability Source	Assessed Metric	High Risk Indicator(s)
Coastal Flooding	4 %	Health / Wellness	Damage	Disruption	-	-	-
Stormwater Flooding	100 %	Health / Wellness	Damage	Disruption	-	-	-
Riverine Flooding	20 %	Health / Wellness	Damage	Disruption	-	-	-
Extreme Heat	100 %	Health / Wellness	Damage	Disruption	-	-	-
Extreme Wind	100 %	Health / Wellness	**Damage**	Disruption	Engineering Judgment	Hazard Exposure	High Wind Speeds

Consequence Legend Primary | Cascading | Not Considered

Electrical Transmission Lines - Risk

Extreme Wind

Total Number of Assets

1,770 ½ mile segments

Vulnerability Methodology

Table

Fragility Curves

Assessed Metrics

Length

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	100-year, 3-s gust is Category 2 or higher
Medium Rating	100-year, 3-s gust is equal to Category 1
Low Rating	100-year, 3-s gust is lower than Category 1
Negligible	Not exposed

Data Sources: ASCE7 Design Wind Speeds.

Vulnerability Rating	Vulnerability Methodology
High Rating	-
Low Rating	All assets assumed to be equal vulnerability

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/1770	**0**/1770	**0**/1770	**0**/1770
High Rating	**376**/1770	**376**/1770	**655**/1770	**1770**/1770
Medium Rating	**1394**/1770	**1394**/1770	**1115**/1770	**0**/1770
Low Rating	**0**/1770	**0**/1770	**0**/1770	**0**/1770
Negligible	**0**/1770	**0**/1770	**0**/1770	**0**/1770

Vulnerability Methodology Legend

Used | Not Used

Consequence Legend

Primary | Cascading | Not Considered

Power Plants

Total Number of Assets

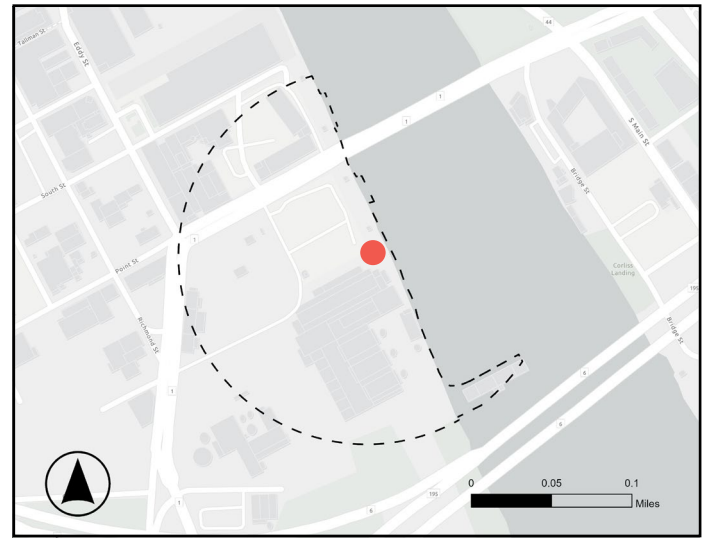
15

Available Asset Characteristics

Fuel Source

Asset – Hazard Pairing





Example Asset Buffer:
Manchester Powerplant – Providence, RI

Asset
Buffer

Asset Summary

There are 15 power plants throughout the state of Rhode Island and their vulnerability are assessed for all climate hazards.

Infrastructure damage can result from climate hazards—all of which may lead to power outages. Flooding can directly damage electrical equipment, while extreme heat increases energy demand from cooling systems, straining the powerplant. Extreme winds may bring additional damage.

Power Plants are evaluated as FEMA Occupancy Class: IND1

Hazard	% Exposed Under Most Extreme Scenario	Consequence			Vulnerability Source	Assessed Metric	High Risk Indicator(s)
Coastal Flooding	20 %	Health / Wellness	**Damage**	Disruption	Hazus Flood Fragilities	Occupancy Class	High Damage
Stormwater Flooding	100 %	Health / Wellness	**Damage**	Disruption	Engineering Judgment	Hazard Exposure	High Rainfall, Located in a Depression
Riverine Flooding	33 %	Health / Wellness	**Damage**	Disruption	Engineering Judgment	Hazard Exposure	Exposed
Extreme Heat	100 %	Health / Wellness	Damage	**Disruption**	Asset Data	Primary Type	Natural Gas or Petroleum
Extreme Wind	100 %	Health / Wellness	**Damage**	Disruption	Engineering Judgment	Hazard Exposure	High Wind Speeds

Consequence Legend Primary | Cascading | Not Considered

Power Plants - Risk

Coastal Flooding

Total Number of Assets

15

Vulnerability Methodology

Table

Fragility Curves

Assessed Metrics

Coastal Flood Depth

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Risk Rating	Risk Methodology
Very High Rating	> 30% damage to the 100-yr flood
High Rating	10-30% damage to the 100-yr flood
Medium Rating	<10 % damage to the 100-yr flood
Low Rating	Exposure damage to the 100-yr flood
Negligible	Not exposed

Data Sources: URI Coastal STORMTOOLs and Hazus Flood Fragilities*

* Occupancy code IND1 assumed at-grade

Risk Assessment and Results

Risk Rating	Current	2035 High SLR	2050 High SLR	2100 High SLR
Very High Rating	**1**/15	**1**/15	**1**/15	**1**/15
High Rating	**0**/15	**1**/15	**1**/15	**1**/15
Medium Rating	**0**/15	**0**/15	**0**/15	**1**/15
Low Rating	**1**/15	**0**/15	**0**/15	**0**/15
Negligible	**13**/15	**13**/15	**13**/15	**12**/15

Vulnerability Methodology Legend

Used | Not Used

Consequence Legend

Primary | Cascading | Not Considered

Power Plants - Risk

Stormwater Flooding

Total Number of Assets

15

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Stormwater Rainfall & Location in a Land Depression

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Rainfall is greater than 10 inches (24-hr 100 yr rainfall)
Medium Rating	Rainfall is between 8 and 10 inches (24-hr 100 yr rainfall)
Low Rating	Rainfall is less than 8 inches (24-hr 100 yr rainfall)
Negligible	Not exposed

Data Sources: National Oceanic and Atmospheric Administration (NOAA), Northeast Regional Climate Center (NRCC), and International Panel on Climate Change (IPCC) AR6.

Vulnerability Rating	Vulnerability Methodology
High Rating	Located in a depression
Low Rating	Not located is a depression

Data Sources: SCALGO (Location in a Depression).

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/15	**10**/15	**11**/15	**11**/15
High Rating	**10**/15	**3**/15	**4**/15	**4**/15
Medium Rating	**3**/15	**2**/15	**0**/15	**0**/15
Low Rating	**2**/15	**0**/15	**0**/15	**0**/15
Negligible	**0**/15	**0**/15	**0**/15	**0**/15

Vulnerability Methodology Legend: Used | Not Used

Consequence Legend: Primary | Cascading | Not Considered

Power Plants - Risk

Riverine Flooding

Total Number of Assets

15

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Riverine Flood Exposure

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Asset is in both the 100-year and 500-year floodplain
Medium Rating	Asset is in the 500-year but not the 100-year floodplain
Low Rating	Asset is not in the 100-year or 500-year floodplain
Negligible	Not exposed

Data Sources: FEMA FIRM.

Vulnerability Rating	Vulnerability Methodology
High Rating	-
Low Rating	All assets assumed to be equal vulnerability

*Results are presented only for the current, because only present-day data on riverine flooding was available.

Risk Assessment and Results

Risk Rating	Current*
Very High Rating	**0**/15
High Rating	**3**/15
Medium Rating	**2**/15
Low Rating	**0**/15
Negligible	**10**/15

Vulnerability Methodology Legend: **Used** | Not Used

Consequence Legend: **Primary** | Cascading | Not Considered

Power Plants - Risk

Extreme Heat

Total Number of Assets

15

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Extreme Heat Exposure & Type of Powerplant

Consequence

Health / Wellness | **Damage** | **Disruption**

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	More than 14 annual days above 90°F
Medium Rating	Between 7 and 14 annual days above 90°F
Low Rating	Less than 7 annual days above 90°F
Negligible	Not exposed

Data Sources: RIDOH Climate Explorer and NOAA.

Vulnerability Rating	Vulnerability Methodology
High Rating	Primary type is Natural Gas or Petroleum
Low Rating	Primary type is not Natural Gas or Petroleum

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/15	**0**/15	**6**/15	**9**/15
High Rating	**0**/15	**6**/15	**9**/15	**6**/15
Medium Rating	**9**/15	**9**/15	**0**/15	**0**/15
Low Rating	**6**/15	**0**/15	**0**/15	**0**/15
Negligible	**0**/15	**0**/15	**0**/15	**0**/15

Vulnerability Methodology Legend: **Used** | Not Used

Consequence Legend: **Primary** | Cascading | Not Considered

Power Plants - Risk

Extreme Wind

Total Number of Assets

15

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Wind Exposure

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	100-yr, 3-s gust is more than Category 3
Medium Rating	100-yr, 3-s gust is greater than Category 1
Low Rating	100-yr, 3-s gust is equal to Category 1
Negligible	Not applicable

Data Sources: ASCE7 Design Wind Speeds.

Vulnerability Rating	Vulnerability Methodology
High Rating	-
Low Rating	All assets assumed to be equal vulnerability

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/15	**0**/15	**0**/15	**0**/15
High Rating	**0**/15	**0**/15	**0**/15	**0**/15
Medium Rating	**3**/15	**3**/15	**3**/15	**15**/15
Low Rating	**12**/15	**12**/15	**12**/15	**0**/15
Negligible	**0**/15	**0**/15	**0**/15	**0**/15

Vulnerability Methodology Legend: **Used** | Not Used

Consequence Legend: **Primary** | Cascading | Not Considered

Wind Turbines

Total Number of Assets

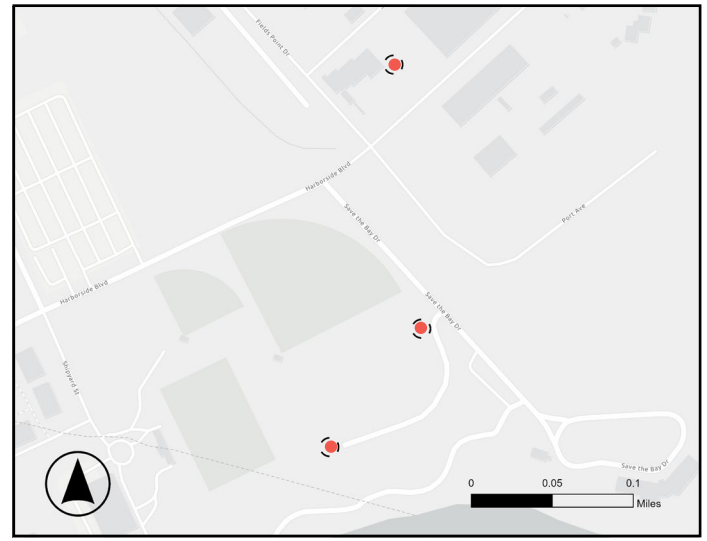
30

Available Asset Characteristics

Fuel Source

Asset – Hazard Pairing





Example Asset Buffer:
Wind Turbines – Providence County

Asset
Buffer

Asset Summary

There are 30 wind turbines throughout the state of Rhode Island and their vulnerability are assessed for flooding and extreme wind.

Infrastructure damage can result from flooding and extreme heat—all of which may lead to disruption. Excessive flooding can directly damage turbines, while extreme heat increases energy demand from cooling systems.

Hazard	% Exposed Under Most Extreme Scenario	Consequence			Vulnerability Source	Assessed Metric	High Risk Indicator(s)
Coastal Flooding	20 %	Health / Wellness	Damage	Disruption	Engineering Judgment	Hazard Exposure	High Flood Depth
Stormwater Flooding	100 %	Health / Wellness	Damage	Disruption	Engineering Judgment	Hazard Exposure	High Rainfall, Located in a Depression
Riverine Flooding	17 %	Health / Wellness	Damage	Disruption	Engineering Judgment	Hazard Exposure	Exposed
Extreme Heat	100 %	Health / Wellness	Damage	Disruption	-	-	-
Extreme Wind	100 %	Health / Wellness	Damage	Disruption	Engineering Judgment	Hazard Exposure	High Wind Speeds

Consequence Legend Primary | Cascading | Not Considered

Wind Turbines - Risk

Coastal Flooding

Total Number of Assets

30

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Coastal Flood Depth

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Depth of 100-yr flood is more than 2 ft
Medium Rating	Depth of 100-yr flood is between 0.5 and 2 ft
Low Rating	Depth of 100-yr flood is less than 0.5 ft
Not Assessed	Not assessed

Data Sources: URI Coastal STORMTOOLS.

Vulnerability Rating	Vulnerability Methodology
High Rating	-
Low Rating	All assets assumed to be equal vulnerability

Risk Assessment and Results

Risk Rating	Current	2035 High SLR	2050 High SLR	2100 High SLR
Very High Rating	**0**/30	**0**/30	**0**/30	**0**/30
High Rating	**3**/30	**3**/30	**5**/30	**6**/30
Medium Rating	**2**/30	**2**/30	**1**/30	**0**/30
Low Rating	**1**/30	**1**/30	**0**/30	**0**/30
Negligible	**24**/30	**24**/30	**24**/30	**24**/30

Vulnerability Methodology Legend: **Used** | Not Used

Consequence Legend: **Primary** | Cascading | Not Considered

Wind Turbines - Risk

Stormwater Flooding

Total Number of Assets

30

Vulnerability Methodology

Table

Fragility Curves

Assessed Metrics

Stormwater Rainfall & Location in a Depression

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Rainfall is greater than 10 inches (24-hr 100 yr rainfall)
Medium Rating	Rainfall is between 8 and 10 inches (24-hr 100 yr rainfall)
Low Rating	Rainfall is less than 8 inches (24-hr 100 yr rainfall)
Negligible	Not exposed

Data Sources: National Oceanic and Atmospheric Administration (NOAA), Northeast Regional Climate Center (NRCC), and International Panel on Climate Change (IPCC) AR6.

Vulnerability Rating	Vulnerability Methodology
High Rating	Located in a depression
Low Rating	Not located is a depression

Data Sources: SCALGO (Location in a Depression).

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/30	**4**/30	**5**/30	**5**/30
High Rating	**4**/30	**10**/30	**25**/30	**25**/30
Medium Rating	**10**/30	**16**/30	**0**/30	**0**/30
Low Rating	**16**/30	**0**/30	**0**/30	**0**/30
Negligible	**0**/30	**0**/30	**0**/30	**0**/30

Vulnerability Methodology Legend — **Used** | Not Used

Consequence Legend — **Primary** | Cascading | Not Considered

Wind Turbines - Risk

Riverine Flooding

Total Number of Assets

30

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Riverine Flood Exposure

Consequence

Health / Wellness | **Damage** | **Disruption**

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Asset is in both the 100-year and 500-year floodplain
Medium Rating	Asset is in the 500-year but not the 100-year floodplain
Low Rating	Asset is not in the 100-year or 500-year floodplain
Negligible	Not exposed

Data Sources: FEMA FIRM.

Vulnerability Rating	Vulnerability Methodology
High Rating	-
Low Rating	All assets assumed to be equal vulnerability

*Results are presented only for the current, because only present-day data on riverine flooding was available.

Risk Assessment and Results

Risk Rating	Current*
Very High Rating	**0**/30
High Rating	**2**/30
Medium Rating	**3**/30
Low Rating	**0**/30
Negligible	**25**/30

Vulnerability Methodology Legend: Used | Not Used

Consequence Legend: Primary | Cascading | Not Considered

Wind Turbines - Risk

Extreme Wind

Total Number of Assets

30

Vulnerability Methodology

Table

Fragility Curves

Assessed Metrics

Wind Exposure

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	100-yr, 3-s gust is more than Category 3
Medium Rating	100-yr, 3-s gust is greater than Category 1
Low Rating	100-yr, 3-s gust is equal to Category 1
Negligible	Not applicable

Data Sources: ASCE7 Design Wind Speeds.

Vulnerability Rating	Vulnerability Methodology
High Rating	-
Low Rating	All assets assumed to be equal vulnerability

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/30	**0**/30	**0**/30	**0**/30
High Rating	**0**/30	**0**/30	**0**/30	**0**/30
Medium Rating	**5**/30	**5**/30	**17**/30	**30**/30
Low Rating	**25**/30	**25**/30	**13**/30	**0**/30
Negligible	**0**/30	**0**/30	**0**/30	**0**/30

Vulnerability Methodology Legend — **Used** | Not Used

Consequence Legend — **Primary** | Cascading | Not Considered

Solar Systems

Total Number of Assets

173

Available Asset Characteristics

N/A

Asset – Hazard Pairing





Example Asset Buffer:
Solar Farm (ID150) – Providence, RI

Asset
Buffer

Asset Summary

There are 173 solar systems throughout the state of Rhode Island and their vulnerability are assessed for flooding and extreme wind.

Infrastructure damage can result from climate hazards—all of which may lead to disruption. Excessive flooding can directly damage electrical equipment, while extreme heat increases energy demand from cooling systems. Extreme winds may bring additional damage.

Hazard	% Exposed Under Most Extreme Scenario	Consequence			Vulnerability Source	Assessed Metric	High Risk Indicator(s)
Coastal Flooding	3 %	Health / Wellness	**Damage**	**Disruption**	Engineering Judgment	Hazard Exposure	High Flood Depth
Stormwater Flooding	100 %	Health / Wellness	**Damage**	**Disruption**	Engineering Judgment	Hazard Exposure	High Rainfall, Located in a Depression
Riverine Flooding	7 %	Health / Wellness	**Damage**	**Disruption**	Engineering Judgment	Hazard Exposure	Exposed
Extreme Heat	100 %	Health / Wellness	Damage	Disruption	-	-	-
Extreme Wind	100 %	Health / Wellness	**Damage**	**Disruption**	Engineering Judgment	Hazard Exposure	High Wind Speeds

Consequence Legend Primary | Cascading | Not Considered

Solar Systems - Risk

Coastal Flooding

Total Number of Assets

173

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Coastal Flood Depth

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Depth of 100-yr flood is more than 2 ft
Medium Rating	Depth of 100-yr flood is between 0.5 and 2 ft
Low Rating	Depth of 100-yr flood is less than 0.5 ft
Not Assessed	Not assessed

Data Sources: URI Coastal STORMTOOLS.

Vulnerability Rating	Vulnerability Methodology
High Rating	-
Low Rating	All assets assumed to be equal vulnerability

Risk Assessment and Results

Risk Rating	Current	2035 High SLR	2050 High SLR	2100 High SLR
Very High Rating	**0**/173	**0**/173	**0**/173	**0**/173
High Rating	**0**/173	**0**/173	**1**/173	**3**/173
Medium Rating	**2**/173	**2**/173	**2**/173	**1**/173
Low Rating	**1**/173	**1**/173	**0**/173	**2**/173
Negligible	**170**/173	**170**/173	**170**/173	**167**/173

Vulnerability Methodology Legend: **Used** | Not Used

Consequence Legend: **Primary** | Cascading | Not Considered

Solar Systems - Risk

Stormwater Flooding

Total Number of Assets

173

Vulnerability Methodology

Table

Fragility Curves

Assessed Metrics

Stormwater Rainfall & Location in a Land Depression

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Rainfall is greater than 10 inches (24-hr 100 yr rainfall)
Medium Rating	Rainfall is between 8 and 10 inches (24-hr 100 yr rainfall)
Low Rating	Rainfall is less than 8 inches (24-hr 100 yr rainfall)
Negligible	Not exposed

Data Sources: National Oceanic and Atmospheric Administration (NOAA), Northeast Regional Climate Center (NRCC), and International Panel on Climate Change (IPCC) AR6.

Vulnerability Rating	Vulnerability Methodology
High Rating	Located in a depression
Low Rating	Not located is a depression

Data Sources: SCALGO (Location in a Depression).

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/173	**40**/173	**110**/173	**110**/173
High Rating	**40**/173	**96**/173	**63**/173	**63**/173
Medium Rating	**96**/173	**37**/173	**0**/173	**0**/173
Low Rating	**37**/173	**0**/173	**0**/173	**0**/173
Negligible	**0**/173	**0**/173	**0**/173	**0**/173

Vulnerability Methodology Legend — **Used** | Not Used

Consequence Legend — **Primary** | Cascading | Not Considered

Solar Systems - Risk

Riverine Flooding

Total Number of Assets

173

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Riverine Flood Exposure

Consequence

Health / Wellness | **Damage** | **Disruption**

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Asset is in both the 100-year and 500-year floodplain
Medium Rating	Asset is in the 500-year but not the 100-year floodplain
Low Rating	Asset is not in the 100-year or 500-year floodplain
Negligible	Not exposed

Data Sources: FEMA FIRM.

Vulnerability Rating	Vulnerability Methodology
High Rating	-
Low Rating	All assets assumed to be equal vulnerability

*Results are presented only for the current, because only present-day data on riverine flooding was available.

Risk Assessment and Results

Risk Rating	Current*
Very High Rating	**0**/173
High Rating	**4**/173
Medium Rating	**8**/173
Low Rating	**0**/173
Negligible	**161**/173

Vulnerability Methodology Legend: Used | Not Used

Consequence Legend: Primary | Cascading | Not Considered

Solar Systems - Risk

Extreme Wind

Total Number of Assets

173

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Wind Exposure

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	100-yr, 3-s gust is more than Category 2
Medium Rating	100-yr, 3-s gust is greater than Category 1
Low Rating	100-yr, 3-s gust is equal to Category 1
Negligible	Not applicable

Data Sources: ASCE7 Design Wind Speeds.

Vulnerability Rating	Vulnerability Methodology
High Rating	-
Low Rating	All assets assumed to be equal vulnerability

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/173	**0**/173	**0**/173	**0**/173
High Rating	**0**/173	**0**/173	**0**/173	**0**/173
Medium Rating	**78**/173	**78**/173	**107**/173	**173**/173
Low Rating	**95**/173	**95**/173	**66**/173	**0**/173
Negligible	**0**/173	**0**/173	**0**/173	**0**/173

Vulnerability Methodology Legend: **Used** | Not Used

Consequence Legend: **Primary** | Cascading | Not Considered

Fuel Supply

1. Underground Storage Tanks

Underground Storage Tanks

Total Number of Assets

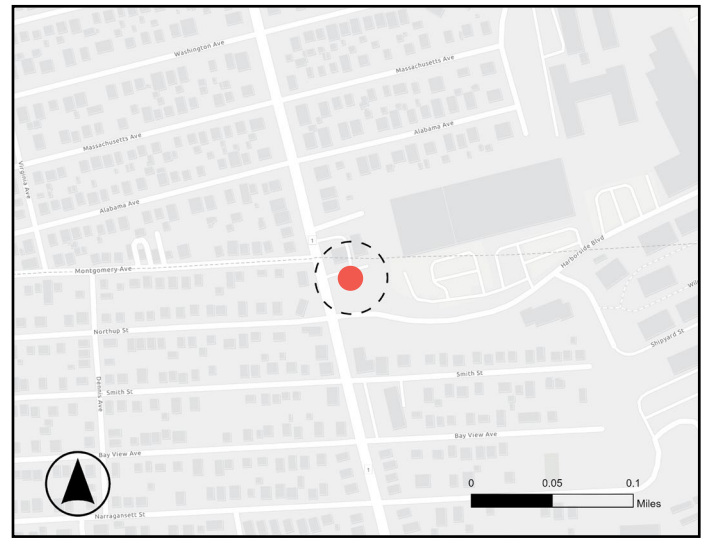
317

Available Asset Characteristics

Tank Capacity, Tank Wall, & Leaking Status

Asset – Hazard Pairing





Example Asset Buffer:
Harbor Shell Food Mart - Providence, RI

Asset
Buffer

Asset Summary

There are 317 underground storage tanks throughout the state of Rhode Island and their vulnerability are assessed for coastal flooding, stormwater flooding, and riverine flooding.

Fuel supply is considered vulnerable to flooding. Flooding can physically damage the storage tank, leading to repair costs and subsequent downtime. This is especially consequential for leaking underground storage tanks.

Hazard	% Exposed Under Most Extreme Scenario	Consequence			Vulnerability Source	Assessed Metric	High Risk Indicator(s)
Coastal Flooding	9 %	Health / Wellness	Damage	Disruption	RIDEM	LUST Status	Identified as LUST
Stormwater Flooding	100 %	Health / Wellness	Damage	Disruption	RIDEM	LUST Status	Identified as LUST
Riverine Flooding	12 %	Health / Wellness	Damage	Disruption	RIDEM	LUST Status	Identified as LUST
Extreme Heat	100 %	Health / Wellness	Damage	Disruption	-	-	-
Extreme Wind	100 %	Health / Wellness	Damage	Disruption	-	-	-

Consequence Legend Primary | Cascading | Not Considered

Underground Storage Tanks - Risk

Coastal Flooding

Total Number of Assets

317

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Coastal Flood Depth & Leaky Underground Storage Tank (LUST)

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Depth of 100-yr flood is more than 2 ft
Medium Rating	Depth of 100-yr flood is between 0.5 and 2 ft
Low Rating	Depth of 100-yr flood is less than 0.5 ft
Not Assessed	Not assessed

Data Sources: URI Coastal STORMTOOLS.

Vulnerability Rating	Vulnerability Methodology
High Rating	Leaky Underground Storage Tank (LUST)
Low Rating	Not Leaky Underground Storage Tank (LUST)

Data Sources: Rhode Island Department of Environmental Management (RIDEM)

Risk Assessment and Results

Risk Rating	Current	2035 High SLR	2050 High SLR	2100 High SLR
Very High Rating	**10**/317	**11**/317	**13**/317	**20**/317
High Rating	**6**/317	**9**/317	**10**/317	**9**/317
Medium Rating	**1**/317	**2**/317	**1**/317	**1**/317
Low Rating	**11**/317	**6**/317	**4**/317	**0**/317
Negligible	**289**/317	**289**/317	**289**/317	**287**/317

Vulnerability Methodology Legend — **Used** | Not Used

Consequence Legend — **Primary** | Cascading | Not Considered

Underground Storage Tanks - Risk

Stormwater Flooding

Total Number of Assets

317

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Stormwater Rainfall, Leaky Underground Storage Tank (LUST), & Location in a Land Depression

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Rainfall is greater than 10 inches (24-hr 100 yr rainfall)
Medium Rating	Rainfall is between 8 and 10 inches (24-hr 100 yr rainfall)
Low Rating	Rainfall is less than 8 inches (24-hr 100 yr rainfall)
Negligible	Not exposed

Data Sources: National Oceanic and Atmospheric Administration (NOAA), Northeast Regional Climate Center (NRCC), and International Panel on Climate Change (IPCC) AR6.

Vulnerability Rating	Vulnerability Methodology
High Rating	Located in a depression or a Leaky Underground Storage Tank (LUST)
Low Rating	Not located in a depression and not a Leaky Underground Storage Tank (LUST)

Data Sources: Rhode Island Department of Environmental Management (RIDEM) (LUST classification) and SCALGO (Location in a Depression).

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/317	**162**/317	**292**/317	**292**/317
High Rating	**162**/317	**143**/317	**25**/317	**25**/317
Medium Rating	**143**/317	**12**/317	**0**/317	**0**/317
Low Rating	**12**/317	**0**/317	**0**/317	**0**/317
Negligible	**0**/317	**0**/317	**0**/317	**0**/317

Vulnerability Methodology Legend: **Used** | Not Used

Consequence Legend: **Primary** | Cascading | Not Considered

Ports

1. Ports and Harbors

Ports and Harbors

Total Number of Assets

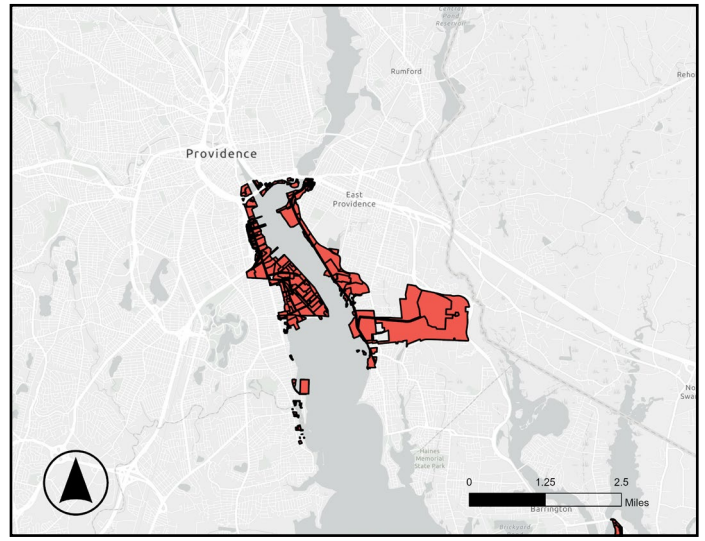
1,568

Available Asset Characteristics

Use Type, Use Level, & Community Use

Asset – Hazard Pairing





Example Asset Buffer:
Ports and Harbors - Providence, RI

Asset
Buffer

Asset Summary

There are 1,568 ports and harbors segments throughout the state of Rhode Island and their vulnerability are assessed for coastal flooding, stormwater flooding, and extreme wind.

The ports generate more than $200 million in economic benefits and over 2,400 jobs for the State, making them essential infrastructure. Flooding and extreme wind may cause port infrastructure damage causing an impact to delivery times and other port operations.

Hazard	% Exposed Under Most Extreme Scenario	Consequence			Vulnerability Source	Assessed Metric	High Risk Indicator(s)
Coastal Flooding	89 %	Health / Wellness	**Damage**	**Disruption**	URI Environmental Data Center and RIGIS	Use Type	Commercial or Industrial
Stormwater Flooding	100 %	Health / Wellness	**Damage**	**Disruption**	URI Environmental Data Center and RIGIS	Use Type	Commercial or Industrial
Riverine Flooding	25 %	Health / Wellness	Damage	Disruption	-	-	-
Extreme Heat	100 %	Health / Wellness	Damage	Disruption	-	-	-
Extreme Wind	100 %	Health / Wellness	**Damage**	**Disruption**	Engineering Judgment	Hazard Exposure	High Wind Speeds

Consequence Legend Primary | Cascading | Not Considered

Ports and Harbors - Risk

Coastal Flooding

Total Number of Assets

1,568

Vulnerability Methodology

Table

Fragility Curves

Assessed Metrics

Coastal Flood Depth & Use Type

Consequence

Health / Wellness | Damage | **Disruption**

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	> 30% MHHW Inundation
Medium Rating	10 – 30% MHHW Inundation
Low Rating	< 10% MHHW Inundation
Negligible	Not exposed

Data Sources: URI Coastal STORMTOOLS.

Vulnerability Rating	Vulnerability Methodology
High Rating	Commercial and industrial use type
Low Rating	All other use types

Data Sources: URI Environmental Data Cener and RIGIS (Port Type) and SCALGO (Location in a Depression).

Risk Assessment and Results

Risk Rating	Current	2035 High SLR	2050 High SLR	2100 High SLR
Very High Rating	**35**/1568	**37**/1568	**52**/1568	**467**/1568
High Rating	**103**/1568	**113**/1568	**144**/1568	**346**/1568
Medium Rating	**240**/1568	**247**/1568	**234**/1568	**116**/1568
Low Rating	**977**/1568	**958**/1568	**926**/1568	**466**/1568
Negligible	**213**/1568	**213**/1568	**212**/1568	**176**/1568

Vulnerability Methodology Legend Used | Not Used

Consequence Legend Primary | Cascading | Not Considered

Ports and Harbors - Risk

Stormwater Flooding

Total Number of Assets

1,568

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Stormwater Rainfall, Use Type, & Location in a Land Depression

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Rainfall is greater than 10 inches (24-hr 100 yr rainfall)
Medium Rating	Rainfall is between 8 and 10 inches (24-hr 100 yr rainfall)
Low Rating	Rainfall is less than 8 inches (24-hr 100 yr rainfall)
Negligible	Not exposed

Data Sources: National Oceanic and Atmospheric Administration (NOAA), Northeast Regional Climate Center (NRCC), and International Panel on Climate Change (IPCC) AR6.

Vulnerability Rating	Vulnerability Methodology
High Rating	Commercial and industrial use type
Low Rating	All other use types

Data Sources: URI Environmental Data Cener and RIGIS.

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/1568	**178**/1568	**1028**/1568	**1028**/1568
High Rating	**178**/1568	**1006**/1568	**539**/1568	**539**/1568
Medium Rating	**1006**/1568	**383**/1568	**0**/1568	**0**/1568
Low Rating	**384**/1568	**1**/1568	**1**/1568	**1**/1568
Negligible	**0**/1568	**0**/1568	**0**/1568	**0**/1568

Vulnerability Methodology Legend: **Used** | Not Used

Consequence Legend: **Primary** | Cascading | Not Considered

Ports and Harbors - Risk

Extreme Wind

Total Number of Assets

1,568

Vulnerability Methodology

Table

Fragility Curves

Assessed Metrics

Wind Exposure & Use Type

Consequence

Health / Wellness | Damage | **Disruption**

Exposure and Vulnerability Assessment Inputs

Risk Rating	Risk Methodology
Very High Rating	> 50% Damage, 700-yr 3-s gust
High Rating	30 - 50% Damage, 700-yr 3-s gust
Medium Rating	10 - 30% Damage, 700-yr 3-s gust
Low Rating	< 10% Damage, 700-yr 3-s gust
Negligible	Not exposed

Data Sources: ASCE7 Hazard Tool, International Panel on Climate Change (IPCC) AR5, and Hazus Wind Fragilities.*

* Hazus wind fragility SECBL with built-up roof, medium window area, no shutters, missile environment A, and standard roof assumed. Open Terrain, damage state 4.

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/1568	**0**/1568	**0**/1568	**0**/1568
High Rating	**0**/1568	**0**/1568	**0**/1568	**0**/1568
Medium Rating	**335**/1568	**335**/1568	**335**/1568	**335**/1568
Low Rating	**1233**/1568	**1233**/1568	**1233**/1568	**1233**/1568
Negligible	**0**/1568	**0**/1568	**0**/1568	**0**/1568

Vulnerability Methodology Legend

Used | Not Used

Consequence Legend

Primary | Cascading | Not Considered

Public Transportation

1. RIPTA Bus Stops
2. RIPTA Bus Routes
3. MBTA Commuter Rail Stations
4. MBTA Commuter Rail Line

RIPTA Bus Stops

Total Number of Assets

3,588

Available Asset Characteristics

N/A

Asset – Hazard Pairing





Example Asset Buffer:
Bus Stops at Point Judith after Sunnybrook Farm

Asset
Buffer

Asset Summary

There are 3,588 bus stops throughout the state of Rhode Island, as of August 2025, and their vulnerability are assessed for coastal flooding, stormwater flooding, and extreme heat.

RIPTA's statewide bus network serves approximately 15,000 Rhode Islanders daily. Flooding at bus stops can lead to significant delays, while extreme heat poses health risks to riders as they wait and commute to the bus.

Hazard	% Exposed Under Most Extreme Scenario	Consequence			Vulnerability Source	Assessed Metric	High Risk Indicator(s)
Coastal Flooding	10 %	Health / Wellness	**Damage**	**Disruption**	Engineering Judgment	Hazard Exposure	High Flood Depth
Stormwater Flooding	100 %	Health / Wellness	**Damage**	**Disruption**	Engineering Judgment	Hazard Exposure	High Rainfall, Located in a Depression
Riverine Flooding	7 %	Health / Wellness	**Damage**	**Disruption**	Engineering Judgment	Hazard Exposure	Exposure
Extreme Heat	100 %	**Health / Wellness**	Damage	**Disruption**	NOAA	Heat Index Classification	Heat Index exceeding Tolerable Conditions
Extreme Wind	100 %	Health / Wellness	Damage	Disruption	-	-	-

* Note: RIPTA stops and routes undergo regular changes which may impact the number of stops and segments. These numbers represent the assets recorded at the time of this evaluation.

Consequence Legend Primary | Cascading | Not Considered

RIPTA Bus Stops - Risk

Coastal Flooding

Total Number of Assets

3,588

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Coastal Flood Depth

Consequence

Health / Wellness | **Damage** | **Disruption**

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Depth of 100-yr flood is more than 2 ft
Medium Rating	Depth of 100-yr flood is between 0.5 and 2 ft
Low Rating	Depth of 100-yr flood is less than 0.5 ft
Not Assessed	Not assessed

Data Sources: URI Coastal STORMTOOLS.

Vulnerability Rating	Vulnerability Methodology
High Rating	-
Low Rating	All assets assumed to be equal vulnerability

Risk Assessment and Results

Risk Rating	Current	2035 High SLR	2050 High SLR	2100 High SLR
Very High Rating	**0**/3588	**0**/3588	**0**/3588	**0**/3588
High Rating	**113**/3588	**114**/3588	**147**/3588	**230**/3588
Medium Rating	**77**/3588	**79**/3588	**72**/3588	**108**/3588
Low Rating	**102**/3588	**99**/3588	**73**/3588	**18**/3588
Negligible	**3296**/3588	**3296**/3588	**3296**/3588	**3232**/3588

Vulnerability Methodology Legend Used | Not Used

Consequence Legend Primary | Cascading | Not Considered

RIPTA Bus Stops - Risk

Stormwater Flooding

Total Number of Assets

3,588

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Stormwater Rainfall & Location in a Land Depression

Consequence

Health / Wellness | **Damage** | **Disruption**

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Rainfall is greater than 10 inches (24-hr 100 yr rainfall)
Medium Rating	Rainfall is between 8 and 10 inches (24-hr 100 yr rainfall)
Low Rating	Rainfall is less than 8 inches (24-hr 100 yr rainfall)
Negligible	Not exposed

Data Sources: National Oceanic and Atmospheric Administration (NOAA), Northeast Regional Climate Center (NRCC), and International Panel on Climate Change (IPCC) AR6.

Vulnerability Rating	Vulnerability Methodology
High Rating	Located in a depression
Low Rating	Not located is a depression

Data Sources: SCALGO (Location in a Depression).

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/3588	**393**/3588	**706**/3588	**706**/3588
High Rating	**393**/3588	**2078**/3588	**2882**/3588	**2882**/3588
Medium Rating	**2078**/3588	**1117**/3588	**0**/3588	**0**/3588
Low Rating	**1117**/3588	**0**/3588	**0**/3588	**0**/3588
Negligible	**0**/3588	**0**/3588	**0**/3588	**0**/3588

Vulnerability Methodology Legend — Used | Not Used

Consequence Legend — Primary | Cascading | Not Considered

RIPTA Bus Stops - Risk

Riverine Flooding

Total Number of Assets

3,588

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Riverine Flood Exposure

Consequence

Health / Wellness | **Damage** | **Disruption**

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Asset is in both the 100-year and 500-year floodplain
Medium Rating	Asset is in the 500-year but not the 100-year floodplain
Low Rating	Asset is not in the 100-year or 500-year floodplain
Negligible	Not exposed

Data Sources: FEMA FIRM.

Vulnerability Rating	Vulnerability Methodology
High Rating	-
Low Rating	All assets assumed to be equal vulnerability

*Results are presented only for the current, because only present-day data on riverine flooding was available.

Risk Assessment and Results

Risk Rating	Current*
Very High Rating	**0**/3588
High Rating	**127**/3588
Medium Rating	**124**/3588
Low Rating	**0**/3588
Negligible	**3337**/3588

Vulnerability Methodology Legend: Used | Not Used

Consequence Legend: Primary | Cascading | Not Considered

RIPTA Bus Stops - Risk

Extreme Heat

Total Number of Assets

3,588

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Extreme Heat Exposure & Heat Index Classification

Consequence

Health / Wellness | Damage | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	1- or 5-yr = Extreme Danger (>123F)
Medium Rating	1-yr = Danger (>103 F)
Low Rating	1-yr < Danger (<103 F)
Negligible	Not exposed

Data Sources: NASA Earth Exchange GDDP, NOAA Heat Index Classifications

Vulnerability Rating	Vulnerability Methodology
High Rating	-
Low Rating	All assets assumed to be equal vulnerability

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/3588	**0**/3588	**0**/3588	**3588**/3588
High Rating	**0**/3588	**2879**/3588	**2879**/3588	**0**/3588
Medium Rating	**3588**/3588	**709**/3588	**709**/3588	**0**/3588
Low Rating	**0**/3588	**0**/3588	**0**/3588	**0**/3588
Negligible	**0**/3588	**0**/3588	**0**/3588	**0**/3588

Vulnerability Methodology Legend: Used | Not Used

Consequence Legend: Primary | Cascading | Not Considered

RIPTA Bus Routes

Total Number of Assets

5,079 half-mile segments

Available Asset Characteristics

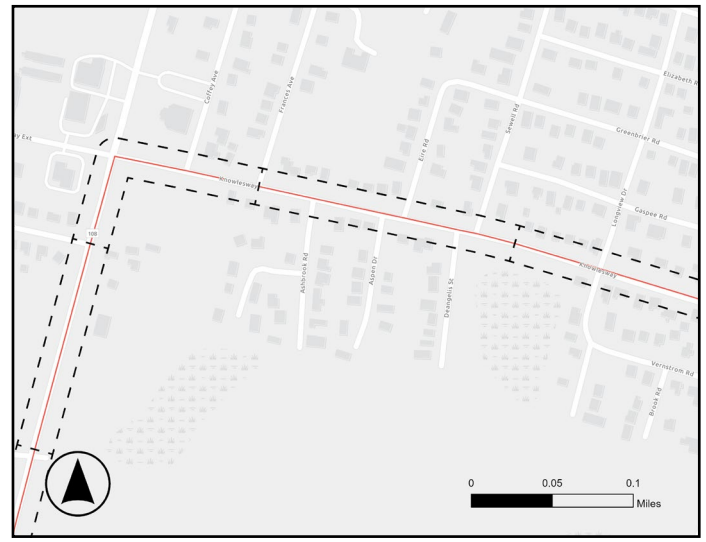
Route Name, Pavement Condition (Sensitivity), & Route Density (Adaptive Capacity)

Asset – Hazard Pairing

Asset Summary

There is over 2,500 miles of bus routes, as of August 2025, throughout the state of Rhode Island and their vulnerability are assessed for coastal flooding, stormwater flooding, and riverine flooding.

RIPTA's statewide bus network serves approximately 15,000 Rhode Islanders daily. Flooding of bus routes can lead to significant delays.



Example Asset Buffer:
Bus Routes – Newport County

Asset
Buffer

Hazard	% Exposed Under Most Extreme Scenario	Consequence			Vulnerability Source	Assessed Metric	High Risk Indicator(s)
Coastal Flooding	14 %	Health / Wellness	Damage	Disruption	RIDOT RIP	Sensitivity	Poor Condition
Stormwater Flooding	100 %	Health / Wellness	Damage	Disruption	RIDOT RIP	Sensitivity	Poor Condition, Located in a Depression
Riverine Flooding	14 %	Health / Wellness	Damage	Disruption	RIDOT RIP	Sensitivity	Poor Condition
Extreme Heat	100 %	Health / Wellness	Damage	Disruption	-	-	-
Extreme Wind	100 %	Health / Wellness	Damage	Disruption	-	-	-

Consequence Legend Primary | Cascading | Not Considered

RIPTA Bus Routes - Risk

Coastal Flooding

Total Number of Assets

5,079 half-mile segments

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Coastal Flood Depth & Pavement Condition

Consequence

Health / Wellness | **Damage** | **Disruption**

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Depth of 100-yr flood is more than 2 ft
Medium Rating	Depth of 100-yr flood is between 0.5 and 2 ft
Low Rating	Depth of 100-yr flood is less than 0.5 ft
Not Assessed	Not assessed

Data Sources: URI Coastal STORMTOOLS.

Vulnerability Rating	Vulnerability Methodology
High Rating	Poor, fair, or no information on pavement condition
Low Rating	Excellent or good pavement condition

Data Sources: Rhode Island Department of Transportation Resilience Improvement Plan (RIDOT), 2024.

Risk Assessment and Results

Risk Rating	Current	2035 High SLR	2050 High SLR	2100 High SLR
Very High Rating	**244**/5079	**250**/5079	**292**/5079	**386**/5079
High Rating	**197**/5079	**206**/5079	**211**/5079	**256**/5079
Medium Rating	**47**/5079	**48**/5079	**54**/5079	**50**/5079
Low Rating	**146**/5079	**130**/5079	**84**/5079	**33**/5079
Negligible	**4445**/5079	**4445**/5079	**4438**/5079	**4354**/5079

Vulnerability Methodology Legend: Used | Not Used

Consequence Legend: Primary | Cascading | Not Considered

RIPTA Bus Routes - Risk

Stormwater Flooding

Total Number of Assets

5,079 half-mile segments

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Stormwater Rainfall, Pavement Condition, & Location in a Land Depression

Consequence

Health / Wellness | **Damage** | **Disruption**

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Rainfall is greater than 10 inches (24-hr 100 yr rainfall)
Medium Rating	Rainfall is between 8 and 10 inches (24-hr 100 yr rainfall)
Low Rating	Rainfall is less than 8 inches (24-hr 100 yr rainfall)
Negligible	Not exposed

Data Sources: National Oceanic and Atmospheric Administration (NOAA), Northeast Regional Climate Center (NRCC), and International Panel on Climate Change (IPCC) AR6.

Vulnerability Rating	Vulnerability Methodology
High Rating	Poor, fair, or no information on pavement condition or located in a depression
Low Rating	Excellent or good pavement condition and not located in a depression

Data Sources: Rhode Island Department of Transportation Resilience Improvement Plan (RIDOT), 2024.

Risk Assessment and Results

Risk Rating	Current	**2035** (RCP8.5)	**2050** (RCP8.5)	**2100** (RCP8.5)
Very High Rating	**0**/5079	**2364**/5079	**4503**/5079	**4503**/5079
High Rating	**2364**/5079	**2400**/5079	**576**/5079	**576**/5079
Medium Rating	**2400**/5079	**315**/5079	**0**/5079	**0**/5079
Low Rating	**315**/5079	**0**/5079	**0**/5079	**0**/5079
Negligible	**0**/5079	**0**/5079	**0**/5079	**0**/5079

Vulnerability Methodology Legend: Used | Not Used

Consequence Legend: Primary | Cascading | Not Considered

RIPTA Bus Routes - Risk

Riverine Flooding

Total Number of Assets

5,079 half-mile segments

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Riverine Flood Exposure and Pavement Condition

Consequence

Health / Wellness | **Damage** | **Disruption**

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Asset is in both the 100-year and 500-year floodplain
Medium Rating	Asset is in the 500-year but not the 100-year floodplain
Low Rating	Asset is not in the 100-year or 500-year floodplain
Negligible	Not exposed

Data Sources: FEMA FIRM.

Vulnerability Rating	Vulnerability Methodology
High Rating	Poor, fair, or no information on pavement condition
Low Rating	Excellent or good pavement condition

Data Sources: Rhode Island Department of Transportation Resilience Improvement Plan (RIDOT), 2024.

*Results are presented only for the current, because only present-day data on riverine flooding was available.

Risk Assessment and Results

Risk Rating	Current*
Very High Rating	**341**/5079
High Rating	**295**/5079
Medium Rating	**72**/5079
Low Rating	**0**/5079
Negligible	**4371**/5079

Vulnerability Methodology Legend: Used | Not Used

Consequence Legend: Primary | Cascading | Not Considered

MBTA Commuter Rail Stations

Total Number of Assets

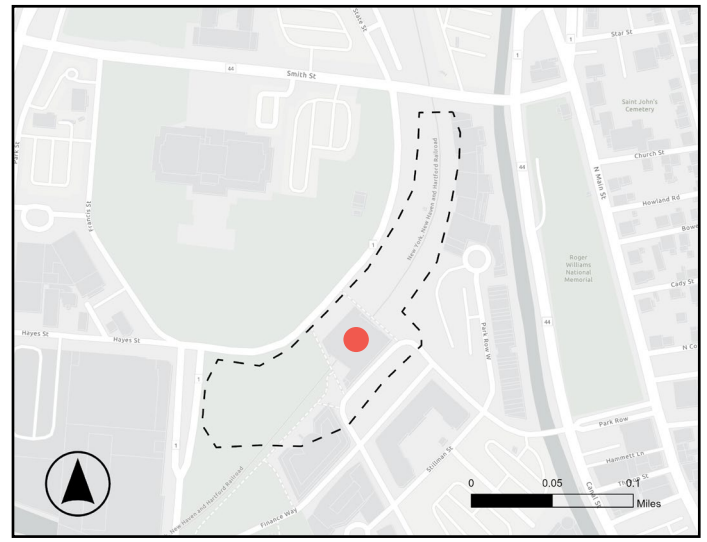
4

Available Asset Characteristics

N/A

Asset – Hazard Pairing





Example Asset Buffer:
Train Station – Providence, RI

Asset
Buffer

Asset Summary

There are 4 train stations throughout the state of Rhode Island and their vulnerability are assessed for coastal flooding, stormwater flooding, riverine flooding, and extreme heat.

The train stations support the commuter rail which supports riders efficient commute throughout the State and neighboring states. Flooding of train stations can lead to damage and significant delays, while extreme heat poses health risks to riders as they wait and commute to the train.

MBTA Commuter Rail Stations are evaluated as FEMA Occupancy Class: GOV1

Hazard	% Exposed Under Most Extreme Scenario	Consequence			Vulnerability Source	Assessed Metric	High Risk Indicator(s)
Coastal Flooding	25 %	Health / Wellness	**Damage**	**Disruption**	Hazus Flood Fragilities	Occupancy Class	High Damage
Stormwater Flooding	100 %	Health / Wellness	**Damage**	**Disruption**	Hazus Flood Fragilities	Occupancy Class	Occupancy Class, Located in a Depression
Riverine Flooding	50 %	Health / Wellness	**Damage**	**Disruption**	Hazus Flood Fragilities	Occupancy Class	Relatively Vulnerable Occupancy Class
Extreme Heat	100 %	**Health / Wellness**	Damage	**Disruption**	NOAA	Heat Index Classification	Heat Index exceeding Tolerable Conditions
Extreme Wind	100 %	Health / Wellness	**Damage**	**Disruption**	Hazus Wind Fragilities	Building Typology	High Damage

Consequence Legend Primary | Cascading | Not Considered

MBTA Commuter Rail Stations - Risk

Coastal Flooding

Total Number of Assets

4

Vulnerability Methodology

Table

Fragility Curves

Assessed Metrics

Coastal Flood Depth & Occupancy Class

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Risk Rating	Risk Methodology
Very High Rating	> 30% damage to the 100-yr flood
High Rating	10-30% damage to the 100-yr flood
Medium Rating	<10 % damage to the 100-yr flood
Low Rating	Exposure damage to the 100-yr flood
Negligible	Not exposed

Data Sources: URI Coastal STORMTOOLs and Hazus Flood Fragilities*

* Occupancy code GOV1 assumed at-grade

Risk Assessment and Results

Risk Rating	Current	2035 High SLR	2050 High SLR	2100 High SLR
Very High Rating	1/4	1/4	1/4	1/4
High Rating	0/4	0/4	0/4	0/4
Medium Rating	0/4	0/4	0/4	0/4
Low Rating	0/4	0/4	0/4	0/4
Negligible	3/4	3/4	3/4	3/4

Vulnerability Methodology Legend Used | Not Used

Consequence Legend Primary | Cascading | Not Considered

MBTA Commuter Rail Stations - Risk

Stormwater Flooding

Total Number of Assets

4

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Stormwater Rainfall & Location in a Land Depression

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Rainfall is greater than 10 inches (24-hr 100 yr rainfall)
Medium Rating	Rainfall is between 8 and 10 inches (24-hr 100 yr rainfall)
Low Rating	Rainfall is less than 8 inches (24-hr 100 yr rainfall)
Negligible	Not exposed

Data Sources: National Oceanic and Atmospheric Administration (NOAA), Northeast Regional Climate Center (NRCC), and International Panel on Climate Change (IPCC) AR6.

Vulnerability Rating	Vulnerability Methodology
High Rating	Located in a depression
Low Rating	Not located is a depression

Data Sources: SCALGO (Location in a Depression).

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/4	**2**/4	**4**/4	**4**/4
High Rating	**2**/4	**2**/4	**0**/4	**0**/4
Medium Rating	**2**/4	**0**/4	**0**/4	**0**/4
Low Rating	**0**/4	**0**/4	**0**/4	**0**/4
Negligible	**0**/4	**0**/4	**0**/4	**0**/4

Vulnerability Methodology Legend — Used | Not Used

Consequence Legend — Primary | Cascading | Not Considered

MBTA Commuter Rail Stations - Risk

Riverine Flooding

Total Number of Assets

4

Vulnerability Methodology

Table

Fragility Curves

Assessed Metrics

Riverine Flood Exposure

Consequence

Health / Wellness | **Damage** | **Disruption**

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Asset is in both the 100-year and 500-year floodplain
Medium Rating	Asset is in the 500-year but not the 100-year floodplain
Low Rating	Asset is not in the 100-year or 500-year floodplain
Negligible	Not exposed

Data Sources: FEMA FIRM.

Vulnerability Rating	Vulnerability Methodology
High Rating	-
Low Rating	All assets assumed to be low vulnerability

*Results are presented only for the current, because only present-day data on riverine flooding was available.

Risk Assessment and Results

Risk Rating	Current*
Very High Rating	**0**/4
High Rating	**2**/4
Medium Rating	**0**/4
Low Rating	**0**/4
Negligible	**2**/4

Vulnerability Methodology Legend — Used | Not Used

Consequence Legend — Primary | Cascading | Not Considered

MBTA Commuter Rail Stations - Risk

Extreme Heat

Total Number of Assets

4

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Extreme Heat Exposure & Heat Index Classification

Consequence

Health / Wellness | Damage | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	1- or 5-yr = Extreme Danger (>123F)
Medium Rating	1-y r = Danger (>103 F)
Low Rating	1-yr < Danger (<103 F)
Negligible	Not exposed

Data Sources: NASA Earth Exchange GDDP, NOAA Heat Index Classifications

Vulnerability Rating	Vulnerability Methodology
High Rating	-
Low Rating	All assets assumed to be equal vulnerability

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	0/4	0/4	0/4	0/4
High Rating	0/4	0/4	0/4	4/4
Medium Rating	0/4	3/4	3/4	0/4
Low Rating	4/4	1/4	1/4	0/4
Negligible	0/4	0/4	0/4	0/4

Vulnerability Methodology Legend: Used | Not Used

Consequence Legend: Primary | Cascading | Not Considered

MBTA Commuter Rail Stations - Risk

Extreme Wind

Total Number of Assets

4

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Wind Exposure & Building Typology

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Risk Rating	Risk Methodology
Very High Rating	> 50% Damage, 700-yr 3-s gust
High Rating	30 - 50% Damage, 700-yr 3-s gust
Medium Rating	10 - 30% Damage, 700-yr 3-s gust
Low Rating	< 10% Damage, 700-yr 3-s gust
Negligible	Not exposed

Data Sources: ASCE7 Hazard Tool, International Panel on Climate Change (IPCC) AR5, and Hazus Wind Fragilities.*

* Hazus wind fragility SECBL with built-up roof, medium window area, no shutters, missile environment A, and standard roof assumed. Open Terrain, damage state 4.

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/4	**0**/4	**0**/4	**0**/4
High Rating	**0**/4	**0**/4	**0**/4	**0**/4
Medium Rating	**2**/4	**2**/4	**2**/4	**2**/4
Low Rating	**2**/4	**2**/4	**2**/4	**2**/4
Negligible	**0**/4	**0**/4	**0**/4	**0**/4

Vulnerability Methodology Legend — **Used** | Not Used

Consequence Legend — **Primary** | Cascading | Not Considered

MBTA Commuter Rail Line

Total Number of Assets

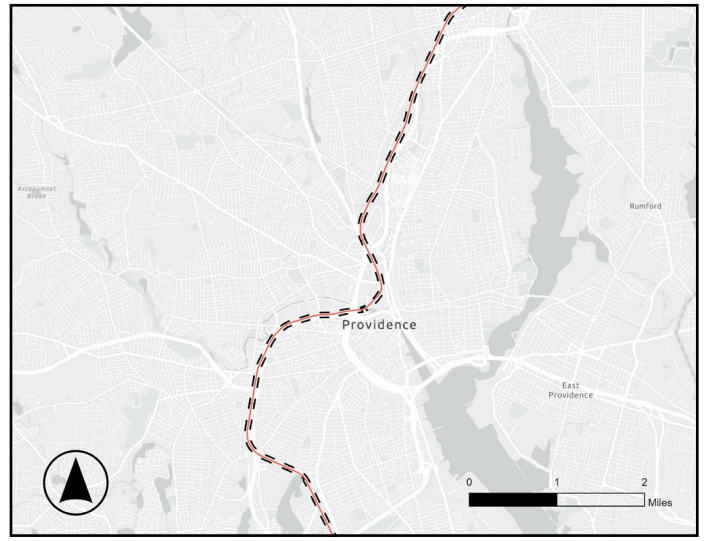
51 haf-mile segments

Available Asset Characteristics

Route Name

Asset – Hazard Pairing





Example Asset Buffer:
Commuter Rail – Providence, RI

Asset
Buffer

Asset Summary

There are 25 miles of the commuter rail throughout the state of Rhode Island and their vulnerability are assessed for coastal flooding, stormwater flooding, and riverine flooding.

The commuter rails supports riders efficient commute throughout the State and neighboring states. Flooding and extreme heat may cause damage to the rail, causing significantly delays.

Hazard	% Exposed Under Most Extreme Scenario	Consequence			Vulnerability Source	Assessed Metric	High Risk Indicator(s)
Coastal Flooding	14 %	Health / Wellness	Damage	Disruption	Engineering Judgment	Hazard Exposure	High Flood Depth
Stormwater Flooding	100 %	Health / Wellness	Damage	Disruption	Engineering Judgment	Hazard Exposure	High Rainfall, Located in a Depression
Riverine Flooding	53 %	Health / Wellness	Damage	Disruption	Engineering Judgment	Hazard Exposure	Exposure
Extreme Heat	100 %	Health / Wellness	Damage	Disruption	-	-	-
Extreme Wind	100 %	Health / Wellness	Damage	Disruption	-	-	-

Consequence Legend Primary | Cascading | Not Considered

MBTA Commuter Rail Line - Risk

Coastal Flooding

Total Number of Assets

51 half-mile segments

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Depth of Coastal Flooding

Consequence

Health / Wellness | Damage | **Disruption**

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Depth of 100-yr flood is more than 2 ft
Medium Rating	Depth of 100-yr flood is between 0.5 and 2 ft
Low Rating	Depth of 100-yr flood is less than 0.5 ft
Not Assessed	Not assessed

Data Sources: URI Coastal STORMTOOLS.

Vulnerability Rating	Vulnerability Methodology
High Rating	-
Low Rating	All assets assumed to be equal vulnerability

Risk Assessment and Results

Risk Rating	Current	2035 High SLR	2050 High SLR	2100 High SLR
Very High Rating	**0**/51	**0**/51	**0**/51	**0**/51
High Rating	**8**/51	**9**/51	**9**/51	**10**/51
Medium Rating	**0**/51	**0**/51	**1**/51	**1**/51
Low Rating	**3**/51	**2**/51	**1**/51	**1**/51
Negligible	**40**/51	**40**/51	**40**/51	**39**/51

Vulnerability Methodology Legend: Used | Not Used

Consequence Legend: Primary | Cascading | Not Considered

MBTA Commuter Rail Line - Risk

Stormwater Flooding

Total Number of Assets

51 half-mile segments

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Stormwater Rainfall & Location in a Depression

Consequence

Health / Wellness | **Damage** | **Disruption**

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Rainfall is greater than 10 inches (24-hr 100 yr rainfall)
Medium Rating	Rainfall is between 8 and 10 inches (24-hr 100 yr rainfall)
Low Rating	Rainfall is less than 8 inches (24-hr 100 yr rainfall)
Negligible	Not exposed

Data Sources: National Oceanic and Atmospheric Administration (NOAA), Northeast Regional Climate Center (NRCC), and International Panel on Climate Change (IPCC) AR6.

Vulnerability Rating	Vulnerability Methodology
High Rating	Located in a depression
Low Rating	Not located is a depression

Data Sources: SCALGO (Location in a Depression).

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/51	**14**/51	**51**/51	**51**/51
High Rating	**14**/51	**37**/51	**0**/51	**0**/51
Medium Rating	**37**/51	**0**/51	**0**/51	**0**/51
Low Rating	**0**/51	**0**/51	**0**/51	**0**/51
Negligible	**0**/51	**0**/51	**0**/51	**0**/51

Vulnerability Methodology Legend Used | Not Used

Consequence Legend Primary | Cascading | Not Considered

MBTA Commuter Rail Line - Risk

Riverine Flooding

Total Number of Assets

51 half-mile segments

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Riverine Flood Exposure

Consequence

Health / Wellness | **Damage** | **Disruption**

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Asset is in both the 100-year and 500-year floodplain
Medium Rating	Asset is in the 500-year but not the 100-year floodplain
Low Rating	Asset is not in the 100-year or 500-year floodplain
Negligible	Not exposed

Data Sources: FEMA FIRM.

Vulnerability Rating	Vulnerability Methodology
High Rating	-
Low Rating	All assets assumed to be equal vulnerability

*Results are presented only for the current, because only present-day data on riverine flooding was available.

Risk Assessment and Results

Risk Rating	Current*
Very High Rating	**0**/51
High Rating	**26**/51
Medium Rating	**1**/51
Low Rating	**0**/51
Negligible	**24**/51

Vulnerability Methodology Legend: Used | Not Used

Consequence Legend: Primary | Cascading | Not Considered

Roads, Bridges, and Culverts

1. Roads
2. Bridges

Roads

Total Number of Assets

84,699 half-mile segments

Available Asset Characteristics

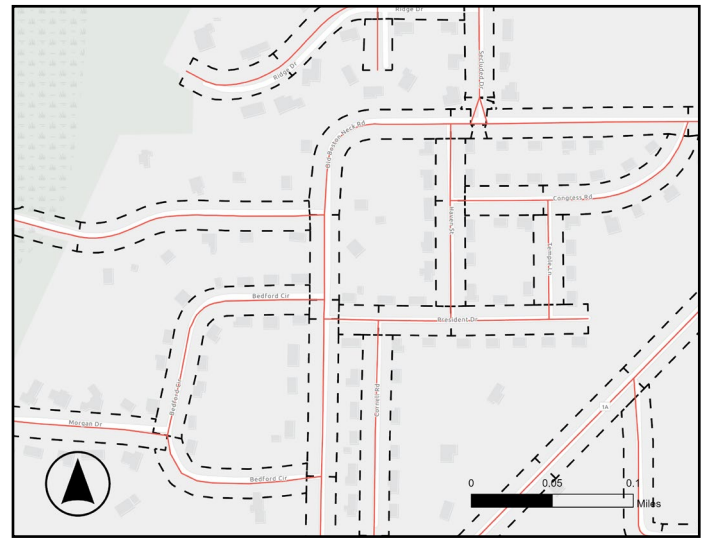
Route Name, Pavement Condition (Sensitivity), & Route Density (Adaptive Capacity)

Asset – Hazard Pairing

Asset Summary

There are over 40,000 miles of roads throughout the state of Rhode Island and their vulnerability are assessed for coastal flooding, stormwater flooding, and riverine flooding.

Roads are a vital part of the State's infrastructure, serving as the primary means of transportation for Rhode Islanders. Flooding can significantly disrupt the daily commute.



Example Asset Buffer:
Roads - Narragansett, RI

Asset
Buffer

Hazard	% Exposed Under Most Extreme Scenario	Consequence			Vulnerability Source	Assessed Metric	High Risk Indicator(s)
Coastal Flooding	12 %	Health / Wellness	Damage	Disruption	RIDOT RIP	Sensitivity	Poor Condition
Stormwater Flooding	100 %	Health / Wellness	Damage	Disruption	RIDOT RIP	Sensitivity	Poor Condition, Located in a Depression
Riverine Flooding	49 %	Health / Wellness	Damage	Disruption	RIDOT RIP	Sensitivity	Poor Condition
Extreme Heat	100 %	Health / Wellness	Damage	Disruption	-	-	-
Extreme Wind	100 %	Health / Wellness	Damage	Disruption	-	-	-

Consequence Legend Primary | Cascading | Not Considered

Roads - Risk

Coastal Flooding

Total Number of Assets

84,699 half-mile segments

Vulnerability Methodology

Table

Fragility Curves

Assessed Metrics

Depth of Coastal Flooding & Pavement Condition

Consequence

Health / Wellness | Damage | **Disruption**

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Depth of 100-yr flood is more than 2 ft
Medium Rating	Depth of 100-yr flood is between 0.5 and 2 ft
Low Rating	Depth of 100-yr flood is less than 0.5 ft
Not Assessed	Not assessed

Data Sources: URI Coastal STORMTOOLS.

Vulnerability Rating	Vulnerability Methodology
High Rating	Poor, fair, or no information on pavement condition
Low Rating	Excellent or good pavement condition

Data Sources: Rhode Island Department of Transportation Resilience Improvement Plan (RIDOT), 2024.

Risk Assessment and Results

Risk Rating	Current	2035 High SLR	2050 High SLR	2100 High SLR
Very High Rating	**3636**/84699	**3715**/84699	**4694**/84699	**6887**/84699
High Rating	**2261**/84699	**2445**/84699	**2357**/84699	**2589**/84699
Medium Rating	**613**/84699	**701**/84699	**708**/84699	**629**/84699
Low Rating	**2226**/84699	**1875**/84699	**1040**/84699	**163**/84699
Negligible	**75963**/84699	**75963**/84699	**75900**/84699	**74431**/84699

Vulnerability Methodology Legend: Used | Not Used

Consequence Legend: Primary | Cascading | Not Considered

Roads - Risk

Stormwater Flooding

Total Number of Assets

84,699 half-mile segments

Vulnerability Methodology

Table

Fragility Curves

Assessed Metrics

Stormwater Rainfall, Pavement Condition, & Location in a Land Depression

Consequence

Health / Wellness | Damage | **Disruption**

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Rainfall is greater than 10 inches (24-hr 100 yr rainfall)
Medium Rating	Rainfall is between 8 and 10 inches (24-hr 100 yr rainfall)
Low Rating	Rainfall is less than 8 inches (24-hr 100 yr rainfall)
Negligible	Not exposed

Data Sources: National Oceanic and Atmospheric Administration (NOAA), Northeast Regional Climate Center (NRCC), and International Panel on Climate Change (IPCC) AR6.

Vulnerability Rating	Vulnerability Methodology
High Rating	Poor, fair, or no information on pavement condition or located in a depression
Low Rating	Excellent or good pavement condition and not located in a depression

Data Sources: Rhode Island Department of Transportation Resilience Improvement Plan (RIDOT), 2024.

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/84699	**37814**/84699	**79532**/84699	**79532**/84699
High Rating	**37814**/84699	**44242**/84699	**5167**/84699	**5167**/84699
Medium Rating	**44242**/84699	**2643**/84699	**0**/84699	**0**/84699
Low Rating	**2643**/84669	**0**/84699	**0**/84699	**0**/84699
Negligible	**0**/84699	**0**/84699	**0**/84699	**0**/84699

Vulnerability Methodology Legend: Used | Not Used

Consequence Legend: Primary | Cascading | Not Considered

Roads - Risk

Riverine Flooding

Total Number of Assets

84,699 half-mile segments

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Riverine Flood Exposure & Pavement Condition

Consequence

Health / Wellness | **Damage** | **Disruption**

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Asset is in both the 100-year and 500-year floodplain
Medium Rating	Asset is in the 500-year but not the 100-year floodplain
Low Rating	Asset is not in the 100-year or 500-year floodplain
Negligible	Not exposed

Data Sources: FEMA FIRM.

Vulnerability Rating	Vulnerability Methodology
High Rating	Poor, fair, or no information on pavement condition
Low Rating	Excellent or good pavement condition

Data Sources: Rhode Island Department of Transportation Resilience Improvement Plan (RIDOT), 2024.

*Results are presented only for the current, because only present-day data on riverine flooding was available.

Risk Assessment and Results

Risk Rating	Current*
Very High Rating	**4542**/84699
High Rating	**3523**/84699
Medium Rating	**424**/84699
Low Rating	**0**/84669
Negligible	**76210**/84699

Vulnerability Methodology Legend Used | Not Used

Consequence Legend Primary | Cascading | Not Considered

Bridges

Total Number of Assets

1,179

Available Asset Characteristics

Condition (Sensitivity), Owner, Status, Road Density (Adaptive Capacity)

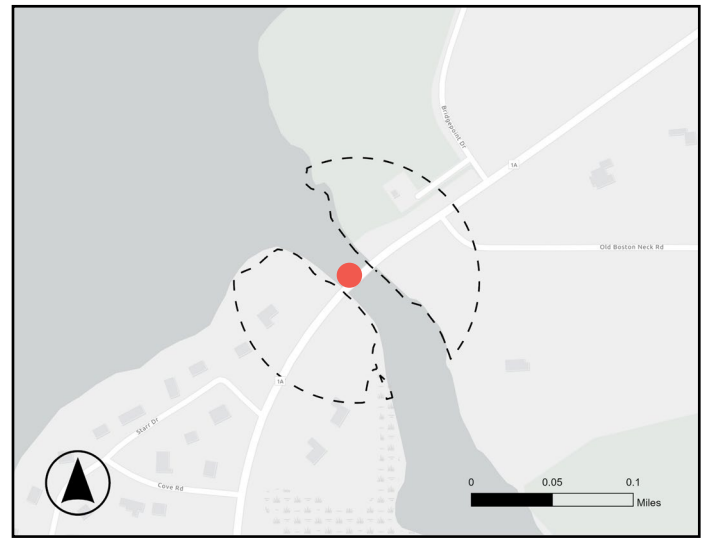
Asset – Hazard Pairing



Asset Summary

There are 1,179 bridges throughout the state of Rhode Island and their vulnerability are assessed for coastal flooding, stormwater flooding, and riverine flooding.

Bridges are densely located around the State, connecting towns and essential resources. Excessive flooding may cause significant disruptions and delays to transportation over the bridge.



Example Asset Buffer:
Governor Sprague Bridge – Narragansett, RI

Asset
Buffer

Hazard	% Exposed Under Most Extreme Scenario	Consequence			Vulnerability Source	Assessed Metric	High Risk Indicator(s)
Coastal Flooding	30 %	Health / Wellness	**Damage**	**Disruption**	RIDOT RIP	Sensitivity	Poor Condition
Stormwater Flooding	100 %	Health / Wellness	**Damage**	**Disruption**	RIDOT RIP	Sensitivity	Poor Condition, Located in a Depression
Riverine Flooding	49 %	Health / Wellness	**Damage**	**Disruption**	RIDOT RIP	Sensitivity	Poor Condition
Extreme Heat	100 %	Health / Wellness	Damage	Disruption	-	-	-
Extreme Wind	100 %	Health / Wellness	Damage	Disruption	-	-	-

Consequence Legend Primary | Cascading | Not Considered

Bridges - Risk

Coastal Flooding

Total Number of Assets

1,179

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Depth of Coastal Flooding & Bridge Condition.

Consequence

Health / Wellness | **Damage** | **Disruption**

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Depth of 100-yr flood is more than 2 ft
Medium Rating	Depth of 100-yr flood is between 0.5 and 2 ft
Low Rating	Depth of 100-yr flood is less than 0.5 ft
Not Assessed	Not assessed

Data Sources: URI Coastal STORMTOOLS.

Vulnerability Rating	Vulnerability Methodology
High Rating	Poor, fair, or no information on bridge condition
Low Rating	Excellent or good bridge condition

Data Sources: Rhode Island Department of Transportation Resilience Improvement Plan (RIDOT), 2024.

Risk Assessment and Results

Risk Rating	Current	2035 High SLR	2050 High SLR	2100 High SLR
Very High Rating	**168**/1179	**279**/1179	**287**/1179	**310**/1179
High Rating	**49**/1179	**73**/1179	**72**/1179	**58**/1179
Medium Rating	**3**/1179	**7**/1179	**8**/1179	**10**/1179
Low Rating	**161**/1179	**22**/1179	**18**/1179	**14**/1179
Negligible	**798**/1179	**798**/1179	**794**/1179	**787**/1179

Vulnerability Methodology Legend Used | Not Used

Consequence Legend Primary | Cascading | Not Considered

Bridges - Risk

Stormwater Flooding

Total Number of Assets

1,179

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Stormwater Rainfall, Bridge Condition, & Location in a Land Depression

Consequence

Health / Wellness | **Damage** | **Disruption**

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Rainfall is greater than 10 inches (24-hr 100 yr rainfall)
Medium Rating	Rainfall is between 8 and 10 inches (24-hr 100 yr rainfall)
Low Rating	Rainfall is less than 8 inches (24-hr 100 yr rainfall)
Negligible	Not exposed

Data Sources: National Oceanic and Atmospheric Administration (NOAA), Northeast Regional Climate Center (NRCC), and International Panel on Climate Change (IPCC) AR6.

Vulnerability Rating	Vulnerability Methodology
High Rating	Poor, fair or no information on bridge condition or located in a depression
Low Rating	Excellent or good bridge condition and not located is a depression

Data Sources: Rhode Island Department of Transportation Resilience Improvement Plan (RIDOT), 2024 and SCALGO (Location in a Depression).

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/1179	**648**/1179	**1175**/1179	**1175**/1179
High Rating	**648**/1179	**527**/1179	**4**/1179	**4**/1179
Medium Rating	**527**/1179	**0**/1179	**0**/1179	**0**/1179
Low Rating	**0**/1179	**0**/1179	**0**/1179	**0**/1179
Negligible	**0**/1179	**0**/1179	**0**/1179	**0**/1179

Vulnerability Methodology Legend: Used | Not Used

Consequence Legend: Primary | Cascading | Not Considered

Bridges - Risk

Riverine Flooding

Total Number of Assets

1,179

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Riverine Flood Exposure & Bridge Condition

Consequence

Health / Wellness | **Damage** | **Disruption**

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Asset is in both the 100-year and 500-year floodplain
Medium Rating	Asset is in the 500-year but not the 100-year floodplain
Low Rating	Asset is not in the 100-year or 500-year floodplain
Negligible	Not exposed

Data Sources: FEMA FIRM.

Vulnerability Rating	Vulnerability Methodology
High Rating	Poor, fair, or no information on bridge condition
Low Rating	Excellent or good bridge condition

Data Sources: Rhode Island Department of Transportation Resilience Improvement Plan (RIDOT), 2024.

*Results are presented only for the current, because only present-day data on riverine flooding was available.

Risk Assessment and Results

Risk Rating	Current*
Very High Rating	**516**/1179
High Rating	**62**/1179
Medium Rating	**5**/1179
Low Rating	**0**/1179
Negligible	**596**/1179

Vulnerability Methodology Legend: Used | Not Used

Consequence Legend: Primary | Cascading | Not Considered

Seawalls and Tidal Gates

1. Hardened Structures

Hardened Shorelines

Total Number of Assets

1,098

Available Asset Characteristics

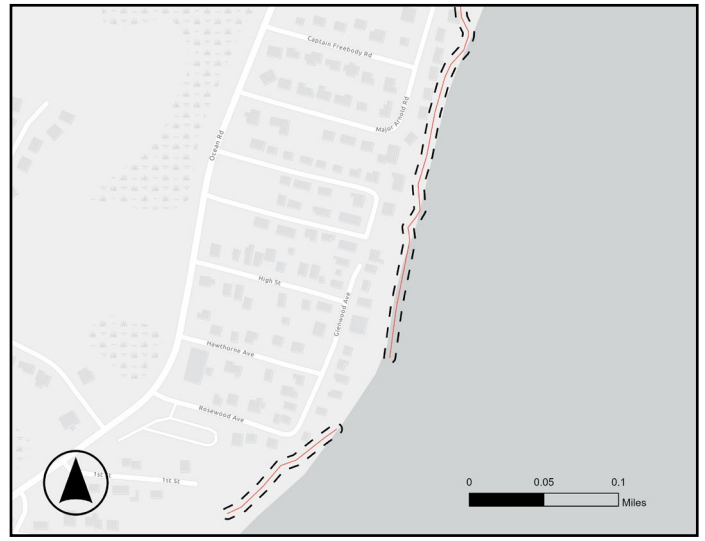
Type of Structure

Asset – Hazard Pairing

Asset Summary

The 1,098 hardened shoreline structures in Narragansett Bay and their vulnerability are assessed to coastal flooding.

Hardened structures are used to protect inland areas from coastal flooding; however, they remain vulnerable to coastal flooding and degradation caused by erosion.



Example Asset Buffer:
Hardened Shorelines – Narragansett, RI

Asset
Buffer

Hazard	% Exposed Under Most Extreme Scenario	Consequence			Vulnerability Source	Assessed Metric	High Risk Indicator(s)
Coastal Flooding	98 %	Health / Wellness	**Damage**	Disruption	Asset Data	Type of Structure	Less Protective Structure
Stormwater Flooding	100 %	Health / Wellness	Damage	Disruption	-	-	-
Riverine Flooding	0 %	Health / Wellness	Damage	Disruption	-	-	-
Extreme Heat	100 %	Health / Wellness	Damage	Disruption	-	-	-
Extreme Wind	100 %	Health / Wellness	Damage	Disruption	-	-	-

Consequence Legend Primary | Cascading | Not Considered

Hardened Shorelines - Risk

Coastal Flooding

Total Number of Assets

1,098

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Type of Structure & Location in a Wave Action Area (FEMA Zone VE)

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	-
Medium Rating	Erosion (Located in FEMA Zone VE, Wave)
Low Rating	No Erosion (Not located in FEMA Zone VE, Wave Action)
Not Assessed	Not assessed

Data Sources: FEMA FIRM.

Vulnerability Rating	Vulnerability Methodology
High Rating	Permanent Pier, Other Significant Pier, or Other Hardened Structure.
Low Rating	Revetment, Groin, Seawall, Bulkhead, Jetty, or Breakwater.

Data Sources: URI Environmental Data Center and RIGIS.

*Results are presented only for the current, because only present-day data on erosion, FEMA FIRM, was available.

Risk Assessment and Results

Risk Rating	Current*
Very High Rating	**0**/1098
High Rating	**70**/1098
Medium Rating	**844**/1098
Low Rating	**0**/1098
Negligible	**184**/1098

Vulnerability Methodology Legend: Used | Not Used

Consequence Legend: Primary | Cascading | Not Considered

Stormwater Infrastructure

1. Sewer Overflows
2. Sewered Area
3. Stormwater Treatment Unit (STU)
4. Stormwater Control Plan (SCP) Watersheds

Sewer Overflows

Total Number of Assets

93

Available Asset Characteristics

Status

Asset – Hazard Pairing





Example Asset Buffer:
Sewer Overflow – Providence, RI

Asset
Buffer

Asset Summary

There are 93 sewer overflows throughout the state of Rhode Island and their vulnerability are assessed for coastal flooding and stormwater flooding.

Sewer overflows are used when wastewater systems exceed their capacity. During periods of excessive flooding, this infrastructure can become compromised, leaving limited space to manage the additional water volume.

Hazard	% Exposed Under Most Extreme Scenario	Consequence			Vulnerability Source	Assessed Metric	High Risk Indicator(s)
Coastal Flooding	54 %	Health / Wellness	Damage	**Disruption**	Engineering Judgment	Hazard Exposure	High Flood Depth
Stormwater Flooding	100 %	Health / Wellness	Damage	**Disruption**	Engineering Judgment	Hazard Exposure	High Rainfall
Riverine Flooding	26 %	Health / Wellness	Damage	Disruption	-	-	-
Extreme Heat	100 %	Health / Wellness	Damage	Disruption	-	-	-
Extreme Wind	100 %	Health / Wellness	Damage	Disruption	-	-	-

Consequence Legend Primary | Cascading | Not Considered

Sewer Overflows - Risk

Coastal Flooding

Total Number of Assets

93

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Depth of Coastal Flooding

Consequence

Health / Wellness | **Damage** | **Disruption**

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Depth of 100-yr flood is more than 2 ft
Medium Rating	Depth of 100-yr flood is between 0.5 and 2 ft
Low Rating	Depth of 100-yr flood is less than 0.5 ft
Not Assessed	Not assessed

Data Sources: URI Coastal STORMTOOLS.

Vulnerability Rating	Vulnerability Methodology
High Rating	-
Low Rating	All assets assumed to be equal vulnerability

Risk Assessment and Results

Risk Rating	Current	2035 High SLR	2050 High SLR	2100 High SLR
Very High Rating	**0**/93	**0**/93	**0**/93	**0**/93
High Rating	**23**/93	**33**/93	**35**/93	**36**/93
Medium Rating	**3**/93	**4**/93	**3**/93	**4**/93
Low Rating	**24**/93	**13**/93	**12**/93	**10**/93
Negligible	**43**/93	**43**/93	**43**/93	**43**/93

Vulnerability Methodology Legend Used | Not Used

Consequence Legend Primary | Cascading | Not Considered

Sewer Overflows - Risk

Stormwater Flooding

Total Number of Assets

93

Vulnerability Methodology

Table

Fragility Curves

Assessed Metrics

Stormwater Rainfall & Location in a Land Depression

Consequence

Health / Wellness | Damage | **Disruption**

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Rainfall is greater than 10 inches (24-hr 100 yr rainfall)
Medium Rating	Rainfall is between 8 and 10 inches (24-hr 100 yr rainfall)
Low Rating	Rainfall is less than 8 inches (24-hr 100 yr rainfall)
Negligible	Not exposed

Data Sources: National Oceanic and Atmospheric Administration (NOAA), Northeast Regional Climate Center (NRCC), and International Panel on Climate Change (IPCC) AR6.

Vulnerability Rating	Vulnerability Methodology
High Rating	Located in a depression
Low Rating	Not located is a depression

Data Sources: SCALGO (Location in a Depression).

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/93	**35**/93	**35**/93	**35**/93
High Rating	**35**/93	**58**/93	**58**/93	**58**/93
Medium Rating	**58**/93	**0**/93	**0**/93	**0**/93
Low Rating	**0**/93	**0**/93	**0**/93	**0**/93
Negligible	**0**/93	**0**/93	**0**/93	**0**/93

Vulnerability Methodology Legend — Used | Not Used

Consequence Legend — Primary | Cascading | Not Considered

Sewered Area

Total Number of Assets

21

Available Asset Characteristics

Condition, Owner, & Status

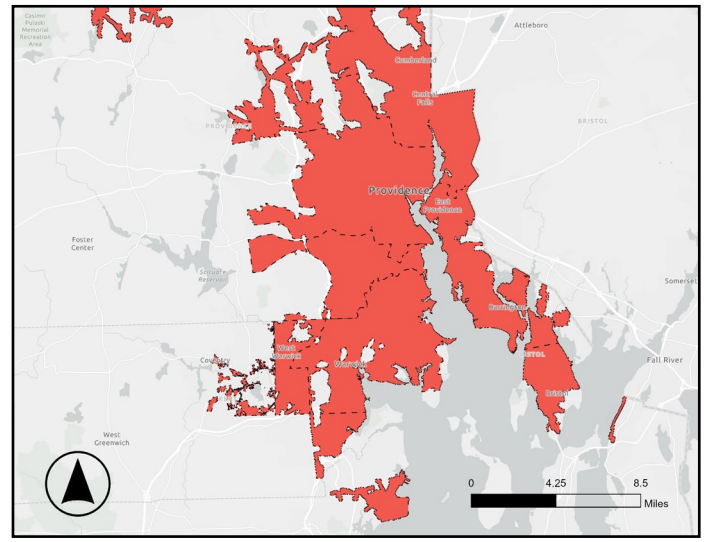
Asset – Hazard Pairing



Asset Summary

There are 21 sewer areas throughout the state of Rhode Island and their vulnerability are assessed for coastal flooding and stormwater flooding.

Sewered areas consist of regions served by both public and private sewer systems. During periods of excessive flooding, these systems can exceed their capacity, potentially leading to damage or contamination of other water supplies.



Example Asset Buffer:
Sewered Areas

Asset
Buffer

Hazard	% Exposed Under Most Extreme Scenario	Consequence			Vulnerability Source	Assessed Metric	High Risk Indicator(s)
Coastal Flooding	76 %	Health / Wellness	**Damage**	**Disruption**	Engineering Judgment	Hazard Exposure	Large % of Area Exposed
Stormwater Flooding	100 %	Health / Wellness	**Damage**	**Disruption**	Engineering Judgment	Hazard Exposure	High Rainfall
Riverine Flooding	95 %	Health / Wellness	Damage	Disruption	-	-	-
Extreme Heat	100 %	Health / Wellness	Damage	Disruption	-	-	-
Extreme Wind	100 %	Health / Wellness	Damage	Disruption	-	-	-

Consequence Legend Primary | Cascading | Not Considered

Sewered Area - Risk

Coastal Flooding

Total Number of Assets

21

Vulnerability Methodology

Table

Fragility Curves

Assessed Metrics

Depth of Coastal Flooding

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	> 30% MHHW Inundation
Medium Rating	10 – 30% MHHW Inundation
Low Rating	< 10% MHHW Inundation
Not Assessed	Not exposed

Data Sources: URI Coastal STORMTOOLS.

Vulnerability Rating	Vulnerability Methodology
High Rating	-
Low Rating	All assets assumed to be equal vulnerability

Risk Assessment and Results

Risk Rating	Current	2035 High SLR	2050 High SLR	2100 High SLR
Very High Rating	**0**/21	**0**/21	**0**/21	**0**/21
High Rating	**0**/21	**0**/21	**0**/21	**0**/21
Medium Rating	**0**/21	**0**/21	**0**/21	**5**/21
Low Rating	**16**/21	**16**/21	**16**/21	**11**/21
Negligible	**5**/21	**5**/21	**5**/21	**5**/21

Vulnerability Methodology Legend

Used | Not Used

Consequence Legend

Primary | Cascading | Not Considered

Sewered Area - Risk

Stormwater Flooding

Total Number of Assets

21

Vulnerability Methodology

Table

Fragility Curves

Assessed Metrics

Stormwater Rainfall & Location in a Land Depression

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Rainfall is greater than 10 inches (24-hr 100 yr rainfall)
Medium Rating	Rainfall is between 8 and 10 inches (24-hr 100 yr rainfall)
Low Rating	Rainfall is less than 8 inches (24-hr 100 yr rainfall)
Negligible	Not exposed

Data Sources: National Oceanic and Atmospheric Administration (NOAA), Northeast Regional Climate Center (NRCC), and International Panel on Climate Change (IPCC) AR6.

Vulnerability Rating	Vulnerability Methodology
High Rating	Located in a depression
Low Rating	Not located is a depression

Data Sources: SCALGO (Location in a Depression).

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/21	**10**/21	**21**/21	**21**/21
High Rating	**0**/21	**11**/21	**0**/21	**0**/21
Medium Rating	**11**/21	**0**/21	**0**/21	**0**/21
Low Rating	**10**/21	**0**/21	**0**/21	**0**/21
Negligible	**0**/21	**0**/21	**0**/21	**0**/21

Vulnerability Methodology Legend — **Used** | Not Used

Consequence Legend — **Primary** | Cascading | Not Considered

Stormwater Treatment Unit (STU)

Total Number of Assets

2,476

Available Asset Characteristics

Type of STU & Inspection Scores

Asset – Hazard Pairing





Example Asset Buffer:
I-295 from Rt 37 to Plainfield Pike

Asset
Buffer

Asset Summary

There are 2,476 stormwater treatment units (STUs) throughout the state of Rhode Island and their vulnerability are assessed for coastal flooding and stormwater flooding.

The STUs is a type of stormwater infrastructure that treats the pollutants in stormwater runoff, so water can re-enter the natural environment. During periods of excessive flooding, these systems can exceed their capacity and potentially get damaged.

Hazard	% Exposed Under Most Extreme Scenario	Consequence			Vulnerability Source	Assessed Metric	High Risk Indicator(s)
Coastal Flooding	16 %	Health / Wellness	**Damage**	Disruption	RIDOT RIP	Sensitivity and Adaptive Capacity	Poor Condition
Stormwater Flooding	100 %	Health / Wellness	**Damage**	Disruption	RIDOT RIP	Sensitivity and Adaptive Capacity	Poor Condition
Riverine Flooding	17 %	Health / Wellness	Damage	Disruption	-	-	-
Extreme Heat	100 %	Health / Wellness	Damage	Disruption	-	-	-
Extreme Wind	100 %	Health / Wellness	Damage	Disruption	-	-	-

Consequence Legend Primary | Cascading | Not Considered

Stormwater Treatment Unit (STU) - Risk

Coastal Flooding

Total Number of Assets

2,476

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Depth of Coastal Flooding & Inspection Scores

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Depth of 100-yr flood is more than 2 ft
Medium Rating	Depth of 100-yr flood is between 0.5 and 2 ft
Low Rating	Depth of 100-yr flood is less than 0.5 ft
Not Assessed	Not assessed

Data Sources: URI Coastal STORMTOOLS.

Vulnerability Rating	Vulnerability Methodology
High Rating	Inspection scores between 0 and 60 or have no information
Low Rating	Inspection scores between 60 and 100

Data Sources: Rhode Island Department of Transportation Resilience Improvement Plan (RIDOT), 2024.

Risk Assessment and Results

Risk Rating	Current	2035 High SLR	2050 High SLR	2100 High SLR
Very High Rating	**24**/2476	**29**/2476	**36**/2476	**55**/2476
High Rating	**103**/2476	**183**/2476	**198**/2476	**259**/2476
Medium Rating	**72**/2476	**45**/2476	**51**/2476	**64**/2476
Low Rating	**133**/2476	**75**/2476	**54**/2476	**14**/2476
Negligible	**2144**/2476	**2144**/2476	**2137**/2476	**2084**/2476

Vulnerability Methodology Legend — Used | Not Used

Consequence Legend — Primary | Cascading | Not Considered

Stormwater Treatment Unit (STU) - Risk

Stormwater Flooding

Total Number of Assets

2,476

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Stormwater Rainfall, Location in a Land Depression, & Inspection Scores

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Rainfall is greater than 10 inches (24-hr 100 yr rainfall)
Medium Rating	Rainfall is between 8 and 10 inches (24-hr 100 yr rainfall)
Low Rating	Rainfall is less than 8 inches (24-hr 100 yr rainfall)
Negligible	Not exposed

Data Sources: National Oceanic and Atmospheric Administration (NOAA), Northeast Regional Climate Center (NRCC), and International Panel on Climate Change (IPCC) AR6.

Vulnerability Rating	Vulnerability Methodology
High Rating	Inspection scores between 0 and 60 or have no information or located in a depression
Low Rating	Inspection scores between 60 and 100 and not located is a depression

Data Sources: Rhode Island Department of Transportation Resilience Improvement Plan (RIDOT), 2024 (Inspection Scores) and SCALGO (Location in a Depression).

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/2476	**1144**/2476	**2475**/2476	**2475**/2476
High Rating	**1144**/2476	**1331**/2476	**1**/2476	**1**/2476
Medium Rating	**1331**/2476	**1**/2476	**0**/2476	**0**/2476
Low Rating	**1**/2476	**0**/2476	**0**/2476	**0**/2476
Negligible	**0**/2476	**0**/2476	**0**/2476	**0**/2476

Vulnerability Methodology Legend: **Used** | Not Used

Consequence Legend: **Primary** | Cascading | Not Considered

SCP Watersheds

Total Number of Assets

297

Available Asset Characteristics

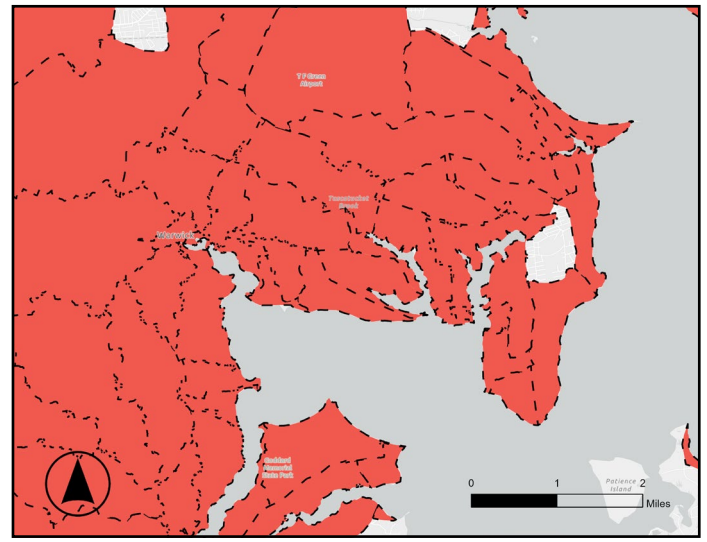
Status, Materiality, Type of Water, Total Maximum Daily Load (TWML) & Contamination

Asset – Hazard Pairing

Asset Summary

There are 297 Stormwater Control Plan (SCP) watersheds throughout the state of Rhode Island and their vulnerability are assessed for coastal flooding and stormwater flooding.

The SCP watersheds are designated bodies of water for stormwater runoff. During periods of excessive flooding, these systems can exceed their capacity and potentially get damaged due to additional contamination.



Example Asset Buffer:
SCP Watershed

Asset
Buffer

Hazard	% Exposed Under Most Extreme Scenario	Consequence			Vulnerability Source	Assessed Metric	High Risk Indicator(s)
Coastal Flooding	76 %	Health / Wellness	**Damage**	Disruption	Asset Data	Water Type	Fresh Water
Stormwater Flooding	100 %	Health / Wellness	**Damage**	Disruption	Asset Data	TMDLs	Presence of TMDL
Riverine Flooding	95 %	Health / Wellness	Damage	Disruption	-	-	-
Extreme Heat	100 %	Health / Wellness	Damage	Disruption	-	-	-
Extreme Wind	100 %	Health / Wellness	Damage	Disruption	-	-	-

Consequence Legend Primary | Cascading | Not Considered

SCP Watersheds - Risk

Coastal Flooding

Total Number of Assets

297

Vulnerability Methodology

Table

Fragility Curves

Assessed Metrics

Coastal Flooding Exposure and Type of Water

Consequence

Health / Wellness | **Damage** | **Disruption**

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	> 30% MHHW Inundation
Medium Rating	10 – 30% MHHW Inundation
Low Rating	< 10% MHHW Inundation
Negligible	Not exposed

Data Sources: URI Coastal STORMTOOLS.

Vulnerability Rating	Vulnerability Methodology
High Rating	Fresh water
Low Rating	Salt water

Data Sources: Rhode Island Department of Transportation (RIDOT) Stormwater Program

Risk Assessment and Results

Risk Rating	Current	2035 High SLR	2050 High SLR	2100 High SLR
Very High Rating	**0**/297	**0**/297	**1**/297	**5**/297
High Rating	**6**/297	**7**/297	**8**/297	**19**/297
Medium Rating	**31**/297	**38**/297	**43**/297	**58**/297
Low Rating	**43**/297	**41**/297	**37**/297	**21**/297
Negligible	**217**/297	**211**/297	**208**/297	**194**/297

Vulnerability Methodology Legend — Used | Not Used

Consequence Legend — Primary | Cascading | Not Considered

SCP Watersheds - Risk

Stormwater Flooding

Total Number of Assets

297

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Stormwater Rainfall & Total Maximum Daily Load (TMDL)

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Rainfall is greater than 10 inches (24-hr 100 yr rainfall)
Medium Rating	Rainfall is between 8 and 10 inches (24-hr 100 yr rainfall)
Low Rating	Rainfall is less than 8 inches (24-hr 100 yr rainfall)
Negligible	Not exposed

Data Sources: National Oceanic and Atmospheric Administration (NOAA), Northeast Regional Climate Center (NRCC), and International Panel on Climate Change (IPCC) AR6.

Vulnerability Rating	Vulnerability Methodology
High Rating	Listed Total Maximum Daily Load (TMDL)
Low Rating	No Total Maximum Daily Load (TMDL) listed

Data Sources: Rhode Island Department of Transportation (RIDOT) Stormwater Program

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/297	**46**/297	**172**/297	**172**/297
High Rating	**46**/297	**178**/297	**125**/297	**125**/297
Medium Rating	**178**/297	**73**/297	**0**/297	**0**/297
Low Rating	**73**/297	**0**/297	**0**/297	**0**/297
Negligible	**0**/297	**0**/297	**0**/297	**0**/297

Vulnerability Methodology Legend: **Used** | Not Used

Consequence Legend: **Primary** | Cascading | Not Considered

Wastewater Treatment Facilities

Wastewater Treatment Facility

Total Number of Assets

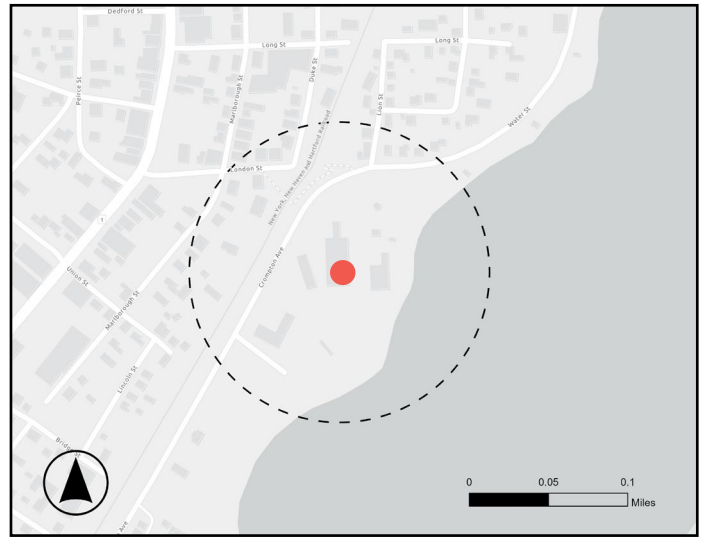
19

Available Asset Characteristics

Design Flow & Daily Flow

Asset – Hazard Pairing





Example Asset Buffer:
Wastewater Treatment Facility – East Greenwich, RI

Asset
Buffer

Asset Summary

There are 19 wastewater treatment facilities throughout the state of Rhode Island and their vulnerability are assessed for coastal flooding and stormwater flooding.

Wastewater treatment facilities process contaminated water so it can be safely returned to the natural environment. However, during periods of excessive flooding, these facilities may exceed their flow capacity. Smaller treatment plants are particularly vulnerable to the impacts of flooding.

Wastewater Treatment Facilities are evaluated as FEMA Occupancy Class: IND2

Hazard	% Exposed Under Most Extreme Scenario	Consequence			Vulnerability Source	Assessed Metric	High Risk Indicator(s)
Coastal Flooding	19 %	Health / Wellness	**Damage**	Disruption	Hazus Flood Fragilities	Occupancy Class	High Damage
Stormwater Flooding	100 %	Health / Wellness	**Damage**	Disruption	Hazus Flood Fragilities	Occupancy Class	Occupancy Class, Located in a Depression
Riverine Flooding	37 %	Health / Wellness	**Damage**	Disruption	Hazus Flood Fragilities	Occupancy Class	Relatively Vulnerable Occupancy Class
Extreme Heat	100 %	Health / Wellness	Damage	Disruption	-	-	-
Extreme Wind	100 %	Health / Wellness	Damage	Disruption	-	-	-

Consequence Legend Primary | Cascading | Not Considered

Wastewater Treatment Facility - Risk

Coastal Flooding

Total Number of Assets

19

Vulnerability Methodology

Table

Fragility Curves

Assessed Metrics

Coastal Flooding Exposure and Occupancy Class

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Risk Rating	Risk Methodology
Very High Rating	> 30% damage to the 100-yr flood
High Rating	10-30% damage to the 100-yr flood
Medium Rating	<10 % damage to the 100-yr flood
Low Rating	Exposure damage to the 100-yr flood
Negligible	Not exposed

Data Sources: URI Coastal STORMTOOLs and Hazus Flood Fragilities*

* Occupancy code IND2 assumed at-grade

Risk Assessment and Results

Risk Rating	Current	2035 High SLR	2050 High SLR	2100 High SLR
Very High Rating	**9**/19	**9**/19	**11**/19	**12**/19
High Rating	**2**/19	**2**/19	**1**/19	**1**/19
Medium Rating	**1**/19	**2**/19	**2**/19	**1**/19
Low Rating	**2**/19	**1**/19	**0**/19	**0**/19
Negligible	**5**/19	**5**/19	**5**/19	**5**/19

Vulnerability Methodology Legend: **Used** | Not Used

Consequence Legend: **Primary** | Cascading | Not Considered

Wastewater Treatment Facility - Risk

Stormwater Flooding

Total Number of Assets

19

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Stormwater Rainfall & Location in a Land Depression

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Rainfall is greater than 10 inches (24-hr 100 yr rainfall)
Medium Rating	Rainfall is between 8 and 10 inches (24-hr 100 yr rainfall)
Low Rating	Rainfall is less than 8 inches (24-hr 100 yr rainfall)
Negligible	Not exposed

Data Sources: National Oceanic and Atmospheric Administration (NOAA), Northeast Regional Climate Center (NRCC), and International Panel on Climate Change (IPCC) AR6.

Vulnerability Rating	Vulnerability Methodology
High Rating	Located in a depression
Low Rating	Not located is a depression

Data Sources: SCALGO (Location in a Depression).

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/19	**7**/19	**19**/19	**19**/19
High Rating	**7**/19	**12**/19	**0**/19	**0**/19
Medium Rating	**12**/19	**0**/19	**0**/19	**0**/19
Low Rating	**0**/19	**0**/19	**0**/19	**0**/19
Negligible	**0**/19	**0**/19	**0**/19	**0**/19

Vulnerability Methodology Legend: Used | Not Used

Consequence Legend: Primary | Cascading | Not Considered

Wastewater Treatment Facility - Risk

Riverine Flooding

Total Number of Assets

19

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Riverine Flood Exposure

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Asset is in both the 100-year and 500-year floodplain
Medium Rating	Asset is in the 500-year but not the 100-year floodplain
Low Rating	Asset is not in the 100-year or 500-year floodplain
Negligible	Not exposed

Data Sources: FEMA FIRM.

Vulnerability Rating	Vulnerability Methodology
High Rating	-
Low Rating	All assets assumed to be equal vulnerability

*Results are presented only for the current, because only present-day data on riverine flooding was available.

Risk Assessment and Results

Risk Rating	Current*
Very High Rating	**0**/19
High Rating	**5**/19
Medium Rating	**2**/19
Low Rating	**0**/19
Negligible	**12**/19

Vulnerability Methodology Legend: **Used** | Not Used

Consequence Legend: **Primary** | Cascading | Not Considered

C.2. Natural Systems

Asset Results

Natural Systems

1. Beaches and Barriers
2. Coastal Wetlands
3. Forests
4. Water Resources

Beaches and Barriers

1. Coastal Barriers

Coastal Barriers

Total Number of Assets

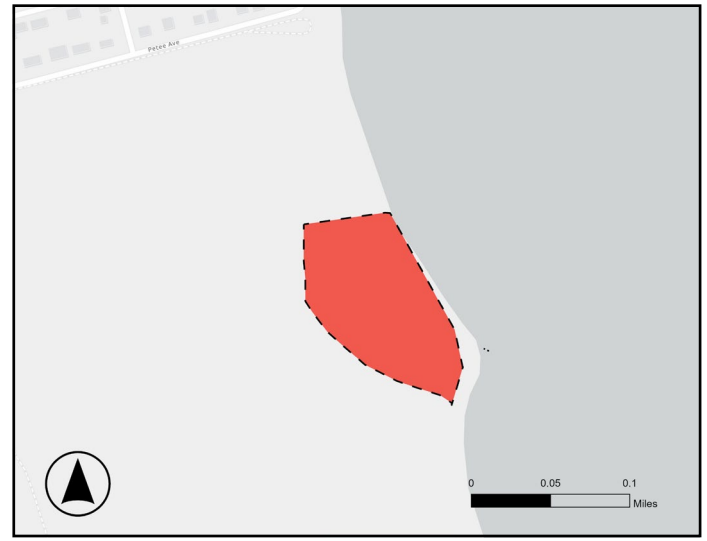
134

Available Asset Characteristics

Barrier Type & Presence of Hardened Structures

Asset – Hazard Pairing





Example Asset Buffer:
Coastal Barriers – North Kingston, RI

Asset
Buffer

Asset Summary

There are 134 coastal barriers throughout the state of Rhode Island and their vulnerability are assessed for coastal flooding.

Coastal barriers are sand or gravel islands or spits that run parallel to the shoreline and are separated from the mainland. Developed barriers, which contain houses and commercial structures, are more vulnerable to coastal flooding than undeveloped barriers, which lack such infrastructure.

Hazard	% Exposed Under Most Extreme Scenario	Consequence			Vulnerability Source	Assessed Metric	High Risk Indicator(s)
Coastal Flooding	99 %	Health / Wellness	Damage	Disruption	Asset Data	Barrier Type	Developed Barrier
Stormwater Flooding	100 %	Health / Wellness	Damage	Disruption	-	-	-
Riverine Flooding	0 %	Health / Wellness	Damage	Disruption	-	-	-
Extreme Heat	100 %	Health / Wellness	Damage	Disruption	-	-	-
Extreme Wind	100 %	Health / Wellness	Damage	Disruption	-	-	-

Consequence Legend Primary | Cascading | Not Considered

Coastal Barriers - Risk

Coastal Flooding

Total Number of Assets

134

Vulnerability Methodology

Table

Fragility Curves

Assessed Metrics

Type of Structure and Location in a Wave Action Area (FEMA Zone VE)

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	-
Medium Rating	Erosion (Located in FEMA Zone VE, Wave)
Low Rating	No Erosion (Not located in FEMA Zone VE, Wave Action)
Not Assessed	Not assessed

Data Sources: FEMA FIRM.

Vulnerability Rating	Vulnerability Methodology
High Rating	Bar type is developed or moderately developed
Low Rating	Bar type is undeveloped or welded

Data Sources: URI Environmental Data Center and RIGIS.

*Results are presented only for the current, because only present-day data on erosion, FEMA FIRM, was available.

Risk Assessment and Results

Risk Rating	Current*
Very High Rating	**0**/134
High Rating	**37**/134
Medium Rating	**92**/134
Low Rating	**0**/134
Negligible	**0**/134

Vulnerability Methodology Legend Used | Not Used

Consequence Legend **Primary** | Cascading | Not Considered

Coastal Wetlands

Coastal Wetlands

Total Number of Assets

9,953

Available Asset Characteristics

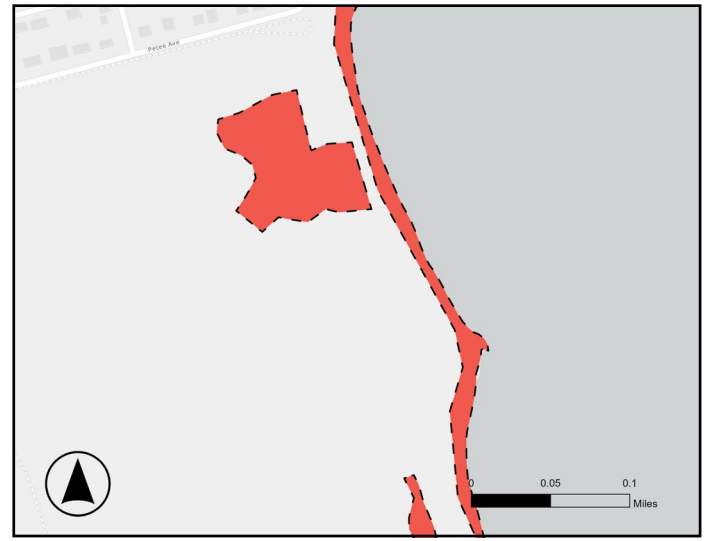
Type of Wetlands

Asset – Hazard Pairing

Asset Summary

There are 9,953 coastal wetlands throughout the state of Rhode Island and their vulnerability are assessed for coastal flooding.

Coastal wetlands are bodies of water located within 250 feet of the shoreline, but distinct from the open ocean. These areas, including ponds, rivers, and lakes, are susceptible to the impacts of coastal flooding, especially widespread inundation.



Example Asset Buffer:
Coastal Wetlands – North Kingston, RI

Asset
Buffer

Hazard	% Exposed Under Most Extreme Scenario	Consequence			Vulnerability Source	Assessed Metric	High Risk Indicator(s)
Coastal Flooding	100 %	Health / Wellness	Damage	Disruption	Asset Data	Type of Wetland	Wetland Vulnerable to Satlwater Intrusion
Stormwater Flooding	100 %	Health / Wellness	Damage	Disruption	-	-	-
Riverine Flooding	1 %	Health / Wellness	Damage	Disruption	-	-	-
Extreme Heat	100 %	Health / Wellness	Damage	Disruption	-	-	-
Extreme Wind	100 %	Health / Wellness	Damage	Disruption	-	-	-

Consequence Legend Primary | Cascading | Not Considered

Coastal Wetlands - Risk

Coastal Flooding

Total Number of Assets

9,953

Vulnerability Methodology

Table

Fragility Curves

Assessed Metrics

Coastal Flooding Exposure & Type of Wetland

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	> 30% MHHW Inundation
Medium Rating	10 – 30% MHHW Inundation
Low Rating	< 10% MHHW Inundation
Negligible	Not exposed

Data Sources: URI Coastal STORMTOOLS.

Vulnerability Rating	Vulnerability Methodology
High Rating	Freshwater Pond, Freshwater Forested/Shrub Wetland, and Freshwater Emergent Wetland
Low Rating	Lake, Estuarine and Marine Deepwater, and Estuarine and Marine Wetland, and Other

Data Sources: URI Environmental Data Cener and RIGIS.

Risk Assessment and Results

Risk Rating	Current	2035 High SLR	2050 High SLR	2100 High SLR
Very High Rating	**60**/9953	**75**/9953	**106**/9953	**279**/9953
High Rating	**8223**/9953	**8640**/9953	**8994**/9953	**9542**/9953
Medium Rating	**631**/9953	**551**/9953	**417**/9953	**46**/9953
Low Rating	**1022**/9953	**670**/9953	**419**/9953	**73**/9953
Negligible	**17**/9953	**17**/134	**17**/134	**13**/9953

Vulnerability Methodology Legend — **Used** | Not Used

Consequence Legend — **Primary** | Cascading | Not Considered

Forests

1. Forest Blocks
2. State Conservation Lands

Forest Blocks

Total Number of Assets

353

Available Asset Characteristics

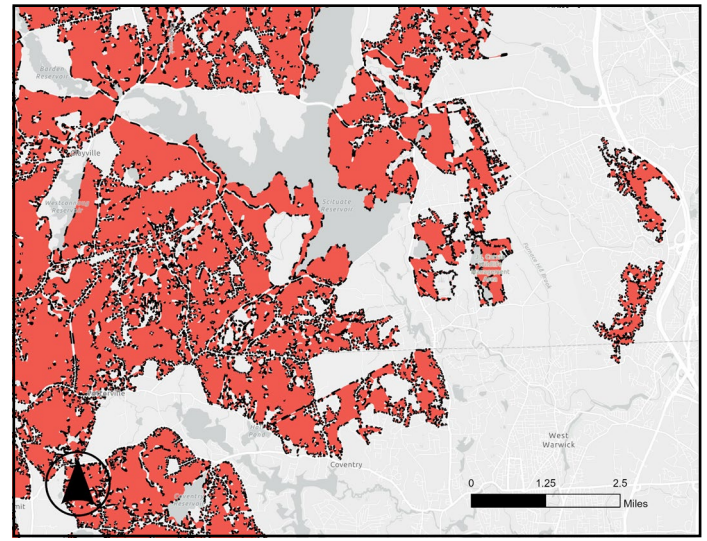
Area

Asset – Hazard Pairing

Asset Summary

There are 353 forest blocks throughout the state of Rhode Island and their vulnerability are assessed for extreme heat and wind.

Forest blocks cover approximately 55% of Rhode Island, totaling around 360,000 acres. These forests provide numerous ecological benefits, including enhanced biodiversity, improved air and water quality, and soil conservation. However, they are vulnerable to damage from extreme winds, which can cause trees to be uprooted or broken. Prolonged extreme heat can also stress forest ecosystems.



Example Asset Buffer:
Forest Blocks

Asset
Buffer

Hazard	% Exposed Under Most Extreme Scenario	Consequence			Vulnerability Source	Assessed Metric	High Risk Indicator(s)
Coastal Flooding	8 %	Health / Wellness	Damage	Disruption	-	-	-
Stormwater Flooding	100 %	Health / Wellness	Damage	Disruption	-	-	-
Riverine Flooding	91 %	Health / Wellness	Damage	Disruption	-	-	-
Extreme Heat	100 %	Health / Wellness	**Damage**	Disruption	The Nature Conservancy	Terrestrial Resilience	Least Resilient
Extreme Wind	100 %	Health / Wellness	**Damage**	Disruption	The Nature Conservancy	Terrestrial Resilience	Least Resilient

Consequence Legend Primary | Cascading | Not Considered

Forest Blocks - Risk

Extreme Heat

Total Number of Assets

353

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Extreme Heat Exposure & Terrestrial Resilience

Consequence

Health / Wellness | Damage | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	More than 14 annual days above 90°F
Medium Rating	Between 7 and 14 annual days above 90°F
Low Rating	Less than 7 annual days above 90°F
Negligible	Not exposed

Data Sources: RIDOH Climate Explorer and NOAA.

Vulnerability Rating	Vulnerability Methodology
High Rating	More than 25% of forest block has low terrestrial resilience
Low Rating	Other

Data Sources: The Nature Conservancy (TNC) Resilient Land Mapping Tool

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/353	**0**/192	**54**/353	**81**/353
High Rating	**0**/353	**54**/353	**188**/353	**272**/353
Medium Rating	**81**/353	**188**/353	**111**/353	**0**/353
Low Rating	**272**/353	**111**/353	**0**/353	**0**/353
Negligible	**0**/353	**0**/353	**0**/353	**0**/353

Vulnerability Methodology Legend Used | Not Used

Consequence Legend Primary | Cascading | Not Considered

Forest Blocks - Risk

Extreme Wind

Total Number of Assets

353

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Wind Exposure & Terrestrial Resilience

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	100-yr, 3-s gust is more than Category 2
Medium Rating	100-yr, 3-s gust is equal to Category 2
Low Rating	100-yr, 3-s gust is equal to Category 1
Negligible	100-yr, 3-s gust is less than Category 1

Data Sources: ASCE7 Design Wind Speeds.

Vulnerability Rating	Vulnerability Methodology
High Rating	More than 25% of forest block has low terrestrial resilience
Low Rating	Other

Data Sources: The Nature Conservancy (TNC) Resilient Land Mapping Tool

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/353	**0**/353	**0**/353	**0**/353
High Rating	**28**/353	**28**/353	**38**/353	**81**/353
Medium Rating	**167**/353	**167**/353	**198**/353	**272**/353
Low Rating	**158**/353	**158**/353	**117**/353	**0**/353
Negligible	**0**/353	**0**/353	**0**/353	**0**/353

Vulnerability Methodology Legend: **Used** | Not Used

Consequence Legend: **Primary** | Cascading | Not Considered

State Conservation Lands

Total Number of Assets

1,032

Available Asset Characteristics

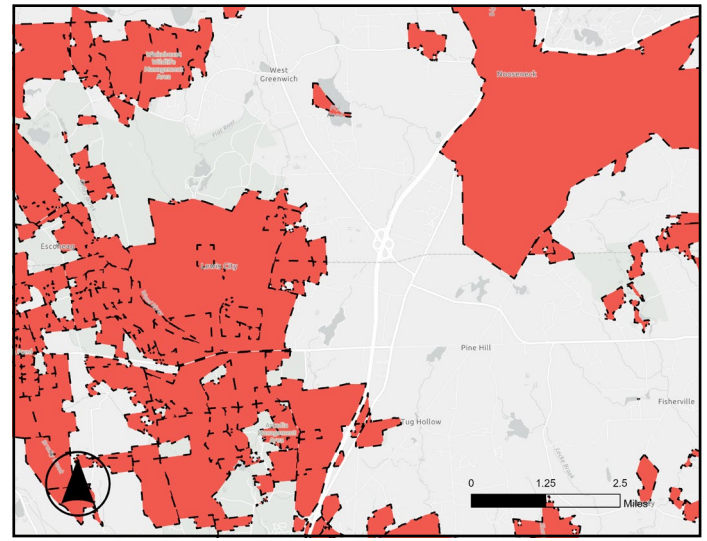
Primary Use Type

Asset – Hazard Pairing

Asset Summary

There are 1,032 state conservation lands throughout the state of Rhode Island and their vulnerability are assessed for extreme heat and wind.

These protected areas, designated by the state of Rhode Island, include various types, including forest habitats, state parks, bikeways, and scenic roadways. These sites are susceptible to damage due to extreme heat and wind.



Example Asset Buffer:
State Conservation Lands

Asset
Buffer

Hazard	% Exposed Under Most Extreme Scenario	Consequence			Vulnerability Source	Assessed Metric	High Risk Indicator(s)
Coastal Flooding	25 %	Health / Wellness	Damage	Disruption	-	-	-
Stormwater Flooding	100 %	Health / Wellness	Damage	Disruption	-	-	-
Riverine Flooding	59 %	Health / Wellness	Damage	Disruption	-	-	-
Extreme Heat	100 %	Health / Wellness	Damage	Disruption	The Nature Conservancy	Terrestrial Resilience	Least Resilient
Extreme Wind	100 %	Health / Wellness	Damage	Disruption	The Nature Conservancy	Terrestrial Resilience	Least Resilient

Consequence Legend Primary | Cascading | Not Considered

State Conservation Lands - Risk

Extreme Heat

Total Number of Assets

1,032

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Extreme Heat Exposure & Terrestrial Resilience

Consequence

Health / Wellness | Damage | **Disruption**

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	More than 14 annual days above 90°F
Medium Rating	Between 7 and 14 annual days above 90°F
Low Rating	Less than 7 annual days above 90°F
Negligible	Not exposed

Data Sources: RIDOH Climate Explorer and NOAA.

Vulnerability Rating	Vulnerability Methodology
High Rating	More than 25% of forest block has low terrestrial resilience
Low Rating	Other

Data Sources: The Nature Conservancy (TNC) Resilient Land Mapping Tool

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/1032	**0**/1032	**195**/1032	**412**/1032
High Rating	**0**/1032	**195**/1032	**472**/1032	**620**/1032
Medium Rating	**412**/1032	**472**/1032	**365**/1032	**0**/1032
Low Rating	**620**/1032	**365**/1032	**0**/1032	**0**/1032
Negligible	**0**/1032	**0**/1032	**0**/1032	**0**/1032

Vulnerability Methodology Legend: Used | Not Used

Consequence Legend: Primary | Cascading | Not Considered

State Conservation Lands - Risk

Extreme Wind

Total Number of Assets

1,032

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Wind Exposure & Terrestrial Resilience

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	100-yr, 3-s gust is more than Category 2
Medium Rating	100-yr, 3-s gust is equal to Category 2
Low Rating	100-yr, 3-s gust is equal to Category 1
Negligible	100-yr, 3-s gust is less than Category 1

Data Sources: ASCE7 Design Wind Speeds.

Vulnerability Rating	Vulnerability Methodology
High Rating	More than 25% of forest block has low terrestrial resilience
Low Rating	Other

Data Sources: The Nature Conservancy (TNC) Resilient Land Mapping Tool

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/1032	**0**/1032	**0**/1032	**0**/1032
High Rating	**217**/1032	**217**/1032	**275**/1032	**412**/1032
Medium Rating	**561**/1032	**561**/1032	**580**/1032	**620**/1032
Low Rating	**254**/1032	**254**/1032	**177**/1032	**0**/1032
Negligible	**0**/1032	**0**/1032	**0**/1032	**0**/1032

Vulnerability Methodology Legend Used | Not Used

Consequence Legend Primary | Cascading | Not Considered

Water Resources

1. Rivers and Streams
2. Streams
3. Lakes and Ponds

Rivers and Streams

Total Number of Assets

1,972

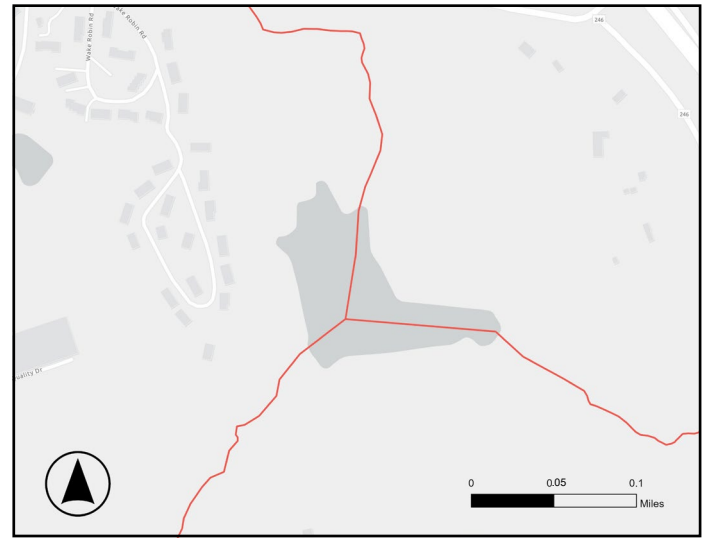
Available Asset Characteristics

Proximity to Algal Blooms and Superfund Sites, Water Temperature, Critical Habitat, Runoff Contamination, & Water Purpose

Asset – Hazard Pairing

Asset Summary

There are 1,972 rivers and streams throughout the state of Rhode Island and their vulnerability are assessed for extreme heat. Warmer water temperatures can increase the likelihood of algal blooms, which may have harmful effects on aquatic ecosystems. This is especially concerning for critically endangered habitats, where even minor disruptions can have significant consequences.



Example Asset Buffer:
Rivers and Streams

Asset
Buffer

Hazard	% Exposed Under Most Extreme Scenario	Consequence			Vulnerability Source	Assessed Metric	High Risk Indicator(s)
Coastal Flooding	16 %	Health / Wellness	Damage	**Disruption**	Engineering Judgment	Hazard Exposure	Saltwater Intrusion
Stormwater Flooding	100 %	**Health / Wellness**	Damage	Disruption	RIDEM	Runoff Contamination	Contamination
Riverine Flooding	65 %	Health / Wellness	Damage	Disruption	-	-	-
Extreme Heat	100 %	**Health / Wellness**	Damage	Disruption	RIDEM	Algal Blooms	History of Cyanobacteria
Extreme Wind	100 %	Health / Wellness	Damage	Disruption	-	-	-

Consequence Legend Primary | Cascading | Not Considered

Rivers and Streams - Risk

Coastal Flooding

Total Number of Assets

1,972

Vulnerability Methodology

Table

Fragility Curves

Assessed Metrics

Coastal Flood Exposure

Consequence

Health / Wellness | Damage | **Disruption**

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Depth of 100-yr flood is more than 2 ft
Medium Rating	Depth of 100-yr flood is between 0.5 and 2 ft
Low Rating	Depth of 100-yr flood is less than 0.5 ft
Not Assessed	Not assessed

Data Sources: URI Coastal STORMTOOLS.

Vulnerability Rating	Vulnerability Methodology
High Rating	Distance from a superfund site is equal to 5,280 ft or more
Low Rating	Distance from a superfund site is less than 5,280 ft

Data Sources: Environmental Protection Agency (EPA).

Risk Assessment and Results

Risk Rating	Current	2035 High SLR	2050 High SLR	2100 High SLR
Very High Rating	**0**/1972	**0**/1972	**0**/1972	**0**/1972
High Rating	**225**/1972	**247**/1972	**247**/1972	**275**/1972
Medium Rating	**29**/1972	**34**/1972	**27**/1972	**23**/1972
Low Rating	**39**/1972	**26**/1972	**21**/1972	**18**/1972
Negligible	**1679**/1972	**1679**/1972	**1677**/1972	**1656**/1972

Vulnerability Methodology Legend

Used | Not Used

Consequence Legend

Primary | Cascading | Not Considered

Rivers and Streams - Risk

Stormwater Flooding

Total Number of Assets

1,972

Vulnerability Methodology

Table

Fragility Curves

Assessed Metrics

Stormwater Rainfall & Distance from a Superfund Site

Consequence

Health / Wellness | Damage | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Rainfall is greater than 10 inches (24-hr 100 yr rainfall)
Medium Rating	Rainfall is between 8 and 10 inches (24-hr 100 yr rainfall)
Low Rating	Rainfall is less than 8 inches (24-hr 100 yr rainfall)
Negligible	Not exposed

Data Sources: National Oceanic and Atmospheric Administration (NOAA), Northeast Regional Climate Center (NRCC), and International Panel on Climate Change (IPCC) AR6.

Vulnerability Rating	Vulnerability Methodology
High Rating	Distance from a superfund site is equal to 5,280 ft or more
Low Rating	Distance from a superfund site is less than 5,280 ft

Data Sources: Environmental Protection Agency (EPA).

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/1972	**97**/1972	**197**/1972	**197**/1972
High Rating	**97**/1972	**1019**/1972	**1774**/1972	**1774**/1972
Medium Rating	**1019**/1972	**855**/1972	**0**/1972	**0**/1972
Low Rating	**856**/1972	**1**/1972	**1**/1972	**1**/1972
Negligible	**0**/1972	**0**/1972	**0**/1972	**0**/1972

Vulnerability Methodology Legend Used | Not Used

Consequence Legend Primary | Cascading | Not Considered

Rivers and Streams - Risk

Extreme Heat

Total Number of Assets

1,972

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Extreme Heat Exposure and Distance from Reported Algal Blooms

Consequence

Health / Wellness | Damage | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	More than 14 annual days above 90°F
Medium Rating	Between 7 and 14 annual days above 90°F
Low Rating	Less than 7 annual days above 90°F
Negligible	Not exposed

Data Sources: RIDOH Climate Explorer and NOAA.

Vulnerability Rating	Vulnerability Methodology
High Rating	Distance from a body of water with reported algal bloom is equal to 5,280 ft or more
Low Rating	Distance from a body of water with reported algal boom is less than 5, 280 ft

Data Sources: Rhode Island Department of Environmental Management (RIDEM).

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/1972	**0**/1972	**246**/1972	**336**/1972
High Rating	**0**/1972	**246**/1972	**1200**/1972	**1635**/1972
Medium Rating	**336**/1972	**1200**/1972	**525**/1972	**0**/1972
Low Rating	**1636**/1972	**526**/1972	**1**/1972	**1**/1972
Negligible	**0**/1972	**0**/1972	**0**/1972	**0**/1972

Vulnerability Methodology Legend Used | Not Used

Consequence Legend Primary | Cascading | Not Considered

Streams

Total Number of Assets

6,816

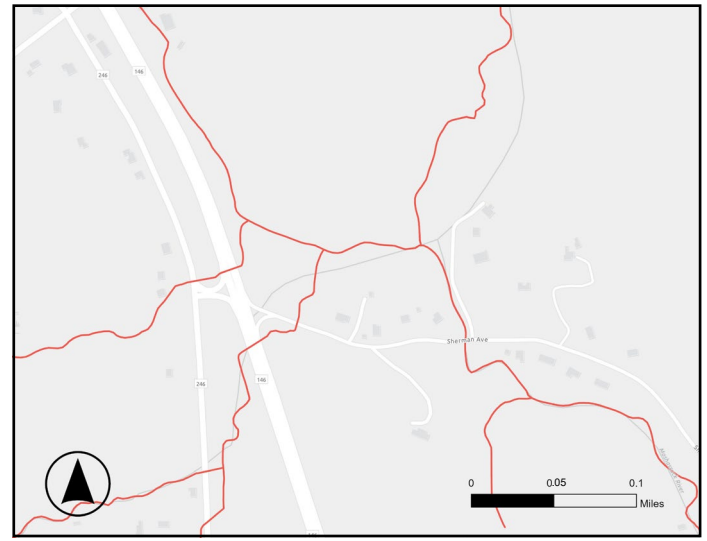
Available Asset Characteristics

Algal Blooms Advisories

Asset – Hazard Pairing

Asset Summary

There are 6,816 streams throughout the state of Rhode Island and their vulnerability are assessed for coastal flooding and extreme heat. Some but not all assets in this dataset are also represented in the "Rivers and Streams" asset. Warmer water temperatures can increase the likelihood of algal blooms, which may have harmful effects on aquatic ecosystems.



Example Asset Buffer:
Streams

Asset
Buffer

Hazard	% Exposed Under Most Extreme Scenario	Consequence			Vulnerability Source	Assessed Metric	High Risk Indicator(s)
Coastal Flooding	11 %	Health / Wellness	**Damage**	**Disruption**	Engineering Judgment	Hazard Exposure	Saltwater Intrusion
Stormwater Flooding	100 %	Health / Wellness	Damage	Disruption	-	-	-
Riverine Flooding	49 %	Health / Wellness	Damage	Disruption	-	-	-
Extreme Heat	100 %	**Health / Wellness**	**Damage**	Disruption	RIDEM	Algal Blooms	History of Cyanobacteria
Extreme Wind	100 %	Health / Wellness	Damage	Disruption	-	-	-

Consequence Legend Primary | Cascading | Not Considered

Streams - Risk

Coastal Flooding

Total Number of Assets

6,816

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Coastal Flood Exposure

Consequence

Health / Wellness | Damage | **Disruption**

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Depth of 100-yr flood is more than 2 ft
Medium Rating	Depth of 100-yr flood is between 0.5 and 2 ft
Low Rating	Depth of 100-yr flood is less than 0.5 ft
Not Assessed	Not assessed

Data Sources: URI Coastal STORMTOOLS.

Vulnerability Rating	Vulnerability Methodology
High Rating	Distance from a superfund site is equal to 5,280 ft or more
Low Rating	Distance from a superfund site is less than 5,280 ft

Data Sources: Environmental Protection Agency (EPA).

Risk Assessment and Results

Risk Rating	Current	2035 High SLR	2050 High SLR	2100 High SLR
Very High Rating	**0**/6816	**0**/6816	**0**/6816	**0**/6816
High Rating	**496**/6816	**538**/6816	**564**/6816	**629**/6816
Medium Rating	**60**/6816	**66**/6816	**63**/6816	**73**/6816
Low Rating	**159**/6816	**111**/6816	**95**/6816	**72**/6816
Negligible	**6101**/6816	**6101**/6816	**6094**/6816	**6042**/6816

Vulnerability Methodology Legend Used | Not Used

Consequence Legend Primary | Cascading | Not Considered

Streams - Risk

Extreme Heat

Total Number of Assets

6,816

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Extreme Heat Exposure and Distance from Reported Algal Blooms

Consequence

Health / Wellness | Damage | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	More than 14 annual days above 90°F
Medium Rating	Between 7 and 14 annual days above 90°F
Low Rating	Less than 7 annual days above 90°F
Negligible	Not exposed

Data Sources: RIDOH Climate Explorer and NOAA.

Vulnerability Rating	Vulnerability Methodology
High Rating	Distance from a body of water with reported algal bloom is equal to 5,280 ft or more
Low Rating	Distance from a body of water with reported algal boom is less than 5, 280 ft

Data Sources: Rhode Island Department of Environmental Management (RIDEM).

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/6816	**0**/6816	**592**/6816	**872**/6816
High Rating	**0**/6816	**592**/6816	**4076**/6816	**5943**/6816
Medium Rating	**872**/6816	**4076**/6816	**2147**/6816	**0**/6816
Low Rating	**5944**/6816	**2148**/6816	**1**/6816	**1**/6816
Negligible	**0**/6816	**0**/6816	**0**/6816	**0**/6816

Vulnerability Methodology Legend Used | Not Used

Consequence Legend Primary | Cascading | Not Considered

Lakes and Ponds

Total Number of Assets

3,160

Available Asset Characteristics

Water Temperature, Contamination, Critical Habitat, Presence of Dam, Runoff Contamination, Algal Bloom Advisories, & Size

Asset – Hazard Pairing

Asset Summary

There are 3,160 lakes ands ponds throughout the state of Rhode Island and their vulnerability are assessed for stormwater and extreme heat. Warmer water temperatures can increase the likelihood of algal blooms, which may have harmful effects on aquatic ecosystems. This is especially concerning for critically endangered habitats, where even minor disruptions can have significant consequences.



Example Asset Buffer:
Lakes and Ponds – Lincoln, RI

Asset
Buffer

Hazard	% Exposed Under Most Extreme Scenario	Consequence			Vulnerability Source	Assessed Metric	High Risk Indicator(s)
Coastal Flooding	17 %	Health / Wellness	Damage	Disruption	-	-	-
Stormwater Flooding	100 %	**Health / Wellness**	**Damage**	Disruption	RIDEM	Runoff Contamination	Contamination
Riverine Flooding	44 %	Health / Wellness	Damage	Disruption	-	-	-
Extreme Heat	100 %	**Health / Wellness**	**Damage**	Disruption	RIDEM	Algal Blooms	History of Cyanobacteria
Extreme Wind	100 %	Health / Wellness	Damage	Disruption	-	-	-

Consequence Legend Primary | Cascading | Not Considered

Lakes and Ponds - Risk

Stormwater Flooding

Total Number of Assets

3,160

Vulnerability Methodology

Table

Fragility Curves

Assessed Metrics

Stormwater Rainfall & Distance from a Superfund Site

Consequence

Health / Wellness | Damage | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Rainfall is greater than 10 inches (24-hr 100 yr rainfall)
Medium Rating	Rainfall is between 8 and 10 inches (24-hr 100 yr rainfall)
Low Rating	Rainfall is less than 8 inches (24-hr 100 yr rainfall)
Negligible	Not exposed

Data Sources: National Oceanic and Atmospheric Administration (NOAA), Northeast Regional Climate Center (NRCC), and International Panel on Climate Change (IPCC) AR6.

Vulnerability Rating	Vulnerability Methodology
High Rating	Distance from a superfund site is equal to 5,280 ft or more
Low Rating	Distance from a superfund site is less than 5,280 ft

Data Sources: Environmental Protection Agency (EPA).

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/3160	**123**/3160	**271**/3160	**271**/3160
High Rating	**123**/3160	**1038**/3160	**2889**/3160	**2889**/3160
Medium Rating	**1038**/3160	**1999**/3160	**0**/3160	**0**/3160
Low Rating	**1999**/3160	**0**/3160	**0**/3160	**0**/3160
Negligible	**0**/3160	**0**/3160	**0**/3160	**0**/3160

Vulnerability Methodology Legend: Used | Not Used

Consequence Legend: Primary | Cascading | Not Considered

Lakes and Ponds - Risk

Extreme Heat

Total Number of Assets

3,160

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Extreme Heat Exposure & Reported Algal Bloom Advisories

Consequence

Health / Wellness | Damage | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	More than 14 annual days above 90°F
Medium Rating	Between 7 and 14 annual days above 90°F
Low Rating	Less than 7 annual days above 90°F
Negligible	Not exposed

Data Sources: RIDOH Climate Explorer and NOAA.

Vulnerability Rating	Vulnerability Methodology
High Rating	One or more algal bloom advisories reported
Low Rating	No algal bloom advisories reported

Data Sources: Rhode Island Department of Environmental Management (RIDEM).

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/3160	**0**/3160	**21**/3160	**37**/3160
High Rating	**0**/3160	**21**/3160	**1516**/3160	**3123**/3160
Medium Rating	**37**/3160	**1516**/3160	**1623**/3160	**0**/3160
Low Rating	**3123**/3160	**1623**/3160	**0**/3160	**0**/3160
Negligible	**0**/3160	**0**/3160	**0**/3160	**0**/3160

Vulnerability Methodology Legend: Used | Not Used

Consequence Legend: Primary | Cascading | Not Considered

C.3. Community Resilience Structures

Asset Results

Community Resilience Structures

1. Public Housing
2. Municipal Buildings
3. Schools
4. Food Markets

Public Housing

Public Housing

Total Number of Assets

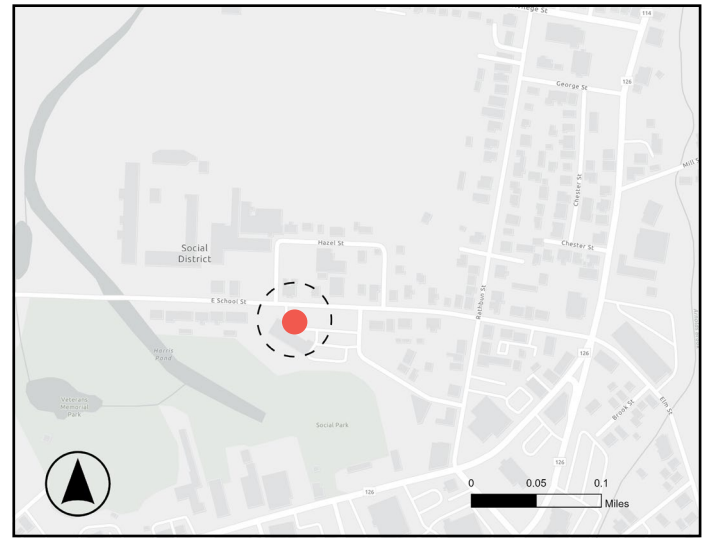
799

Available Asset Characteristics

Owner, Age, Number of Units, & Occupancy Class

Asset – Hazard Pairing





Example Asset Buffer:
St German Manor – Woonsocket, RI

Asset
Buffer

Asset Summary

There are 799 public housing buildings throughout the state of Rhode Island and their vulnerability are assessed for all five hazards.

Housing is considered vulnerable to flooding, extreme wind, and extreme heat. Flooding and extreme wind can physically damage the house, leading to repair costs and subsequent downtime. Extreme heat can lead to unsafe conditions for occupants, reducing the thermal comfort.

Public Housing is evaluated as FEMA Occupancy Class: RES1 or RES3 (based on total units)

Hazard	% Exposed Under Most Extreme Scenario	Consequence			Vulnerability Source	Assessed Metric	High Risk Indicator(s)
Coastal Flooding	4 %	Health / Wellness	**Damage**	**Disruption**	Hazus Flood Fragilities	Occupancy Class	High Damage
Stormwater Flooding	100 %	Health / Wellness	**Damage**	**Disruption**	Hazus Flood Fragilities	Occupancy Class	Occupancy Class, Located in a Depression
Riverine Flooding	3 %	Health / Wellness	**Damage**	**Disruption**	Hazus Flood Fragilities	Occupancy Class	Relatively Vulnerable Occupancy Class
Extreme Heat	100 %	**Health / Wellness**	Damage	**Disruption**	NOAA	Heat Index Classification	Heat Index exceeding Tolerable Conditions
Extreme Wind	100 %	Health / Wellness	**Damage**	**Disruption**	Hazus Wind Fragilities	Building Typology	High Damage

Consequence Legend Primary | Cascading | Not Considered

Public Housing - Risk

Coastal Flooding

Total Number of Assets

799

Vulnerability Methodology

Table

Fragility Curves

Assessed Metrics

Coastal Flood Depth, Occupancy Class, & Number of Units

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Risk Rating	Risk Methodology
Very High Rating	> 30% damage to the 100-yr flood
High Rating	10-30% damage to the 100-yr flood
Medium Rating	<10 % damage to the 100-yr flood
Low Rating	Exposure damage to the 100-yr flood
Negligible	Not exposed

Data Sources: URI Coastal STORMTOOLs and Hazus Flood Fragilities*

* Occupancy code RES1-1SWB used for single-family, semi-detached, and row-house. Occupancy code RES3A used for walk-up and estates.

Risk Assessment and Results

Risk Rating	Current	2035 High SLR	2050 High SLR	2100 High SLR
Very High Rating	**0**/799	**0**/799	**4**/799	**11**/799
High Rating	**7**/799	**7**/799	**3**/799	**15**/799
Medium Rating	**0**/799	**0**/799	**0**/799	**0**/799
Low Rating	**11**/799	**11**/799	**11**/799	**5**/799
Negligible	**781**/799	**781**/799	**781**/799	**768**/799

Vulnerability Methodology Legend: **Used** | Not Used

Consequence Legend: **Primary** | Cascading | Not Considered

Public Housing - Risk

Stormwater Flooding

Total Number of Assets

799

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Stormwater Rainfall, Occupancy Class, & Location in a Land Depression

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Rainfall is greater than 10 inches (24-hr 100 yr rainfall)
Medium Rating	Rainfall is between 8 and 10 inches (24-hr 100 yr rainfall)
Low Rating	Rainfall is less than 8 inches (24-hr 100 yr rainfall)
Negligible	Not exposed

Data Sources: National Oceanic and Atmospheric Administration (NOAA), Northeast Regional Climate Center (NRCC), and International Panel on Climate Change (IPCC) AR6.

Vulnerability Rating	Vulnerability Methodology
High Rating	Located in a depression or built before 1975
Low Rating	Not located is a depression and built after 1975

Data Sources: SCALGO (Location in a Depression).

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/799	**371**/799	**553**/799	**553**/799
High Rating	**371**/799	**307**/799	**246**/799	**246**/799
Medium Rating	**307**/799	**121**/799	**0**/799	**0**/799
Low Rating	**121**/799	**0**/799	**0**/799	**0**/799
Negligible	**0**/799	**0**/799	**0**/799	**0**/799

Vulnerability Methodology Legend: **Used** | Not Used

Consequence Legend: **Primary** | Cascading | Not Considered

Public Housing - Risk

Riverine Flooding

Total Number of Assets

799

Vulnerability Methodology

Table

Fragility Curves

Assessed Metrics

Riverine Flood Exposure & Occupancy Class

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Asset is in both the 100-year and 500-year floodplain
Medium Rating	Asset is in the 500-year but not the 100-year floodplain
Low Rating	Asset is not in the 100-year or 500-year floodplain
Not Assessed	Not assessed

Data Sources: FEMA FIRM.

Vulnerability Rating	Vulnerability Methodology
High Rating	House built prior to 1975
Low Rating	House built after 1975

Data Sources: URI Environmental Data Center and RIGIS

*Results are presented only for the current, because only present-day data on riverine flooding was available.

Risk Assessment and Results

Risk Rating	Current*
Very High Rating	**5**/799
High Rating	**16**/799
Medium Rating	**2**/799
Low Rating	**0**/799
Negligible	**776**/799

Vulnerability Methodology Legend: **Used** | Not Used

Consequence Legend: **Primary** | Cascading | Not Considered

Public Housing - Risk

Extreme Heat

Total Number of Assets

799

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Extreme Heat Exposure & Heat Index Classification

Consequence

Health / Wellness | Damage | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	1- or 5-yr = Extreme Danger (>123F)
Medium Rating	1-y r = Danger (>103 F)
Low Rating	1-yr < Danger (<103 F)
Negligible	Not exposed

Data Sources: NASA Earth Exchange GDDP, NOAA Heat Index Classifications

Vulnerability Rating	Vulnerability Methodology
High Rating	House built prior to 1975
Low Rating	House built after 1975

Data Sources: SCALGO (Location in a Depression).

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/799	**0**/799	**0**/799	**495**/799
High Rating	**0**/799	**402**/799	**402**/799	**304**/799
Medium Rating	**495**/799	**291**/799	**291**/799	**0**/799
Low Rating	**304**/799	**106**/799	**106**/799	**0**/799
Negligible	**0**/799	**0**/799	**0**/799	**0**/799

Vulnerability Methodology Legend Used | Not Used

Consequence Legend Primary | Cascading | Not Considered

Public Housing - Risk

Extreme Wind

Total Number of Assets

799

Vulnerability Methodology

Table

Fragility Curves

Assessed Metrics

Wind Exposure & Building Typology

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Risk Rating	Risk Methodology
Very High Rating	> 50% Damage, 700-yr 3-s gust
High Rating	30 - 50% Damage, 700-yr 3-s gust
Medium Rating	10 - 30% Damage, 700-yr 3-s gust
Low Rating	< 10% Damage, 700-yr 3-s gust
Negligible	Not exposed

Data Sources: ASCE7 Hazard Tool, International Panel on Climate Change (IPCC) AR5, and Hazus Wind Fragilities.*

* Hazus wind fragility WSF2 with hip roof, no secondary water resistance, 6d nails, no shutters or impact resistant glazing, and shingle roof assumed. Straps included for houses built after 2013. Open Terrain, damage state 4.

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**42**/799	**182**/799	**286**/799	**782**/799
High Rating	**244**/799	**600**/799	**496**/799	**17**/799
Medium Rating	**513**/799	**17**/799	**17**/799	**0**/799
Low Rating	**0**/799	**0**/799	**0**/799	**0**/799
Negligible	**0**/799	**0**/799	**0**/799	**0**/799

Vulnerability Methodology Legend

Used | Not Used

Consequence Legend

Primary | Cascading | Not Considered

Municipal Buildings

1. City and Town Halls
2. Public Libraries

City and Town Halls

Total Number of Assets

39

Available Asset Characteristics

Type of Municipal Building & Year of Establishment

Asset – Hazard Pairing





Example Asset Buffer:
Newport City Hall – Newport, RI

Asset
Buffer

Asset Summary

There are 39 city and town halls throughout the state of Rhode Island and their vulnerability are assessed for all five hazards.

City and town halls are considered vulnerable to flooding, extreme wind, and extreme heat. Flooding and extreme wind can physically damage the building, leading to repair costs and subsequent downtime. Extreme heat can lead to unsafe conditions for occupants, reducing the usage of the city and town hall.

Cities and Town Halls are evaluated as FEMA Occupancy Class: GOV1

Hazard	% Exposed Under Most Extreme Scenario	Consequence			Vulnerability Source	Assessed Metric	High Risk Indicator(s)
Coastal Flooding	4 %	Health / Wellness	**Damage**	Disruption	Hazus Flood Fragilities	Occupancy Class	High Damage
Stormwater Flooding	100 %	Health / Wellness	**Damage**	Disruption	Hazus Flood Fragilities	Occupancy Class	Occupancy Class, Located in a Depression
Riverine Flooding	3 %	Health / Wellness	**Damage**	Disruption	Hazus Flood Fragilities	Occupancy Class	Relatively Vulnerable Occupancy Class
Extreme Heat	100 %	**Health / Wellness**	Damage	Disruption	NOAA	Heat Index Classification	Heat Index exceeding Tolerable Conditions
Extreme Wind	100 %	Health / Wellness	**Damage**	Disruption	Hazus Wind Fragilities	Building Typology	High Damage

Consequence Legend **Primary** Cascading Not Considered

City and Town Halls - Risk

Coastal Flooding

Total Number of Assets

39

Vulnerability Methodology

Table

Fragility Curves

Assessed Metrics

Coastal Flood Depth & Occupancy Class

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Risk Rating	Risk Methodology
Very High Rating	> 30% damage to the 100-yr flood
High Rating	10-30% damage to the 100-yr flood
Medium Rating	<10 % damage to the 100-yr flood
Low Rating	Exposure damage to the 100-yr flood
Negligible	Not exposed

Data Sources: URI Coastal STORMTOOLs and Hazus Flood Fragilities*

* Occupancy code GOV1 assumed at-grade

Risk Assessment and Results

Risk Rating	Current	2035 High SLR	2050 High SLR	2100 High SLR
Very High Rating	**2**/39	**2**/39	**2**/39	**2**/39
High Rating	**0**/39	**0**/39	**0**/39	**1**/39
Medium Rating	**0**/39	**0**/39	**0**/39	**0**/39
Low Rating	**2**/39	**2**/39	**2**/39	**1**/39
Negligible	**35**/39	**35**/39	**35**/39	**35**/39

Vulnerability Methodology Legend

Used | Not Used

Consequence Legend

Primary | Cascading | Not Considered

City and Town Halls - Risk

Stormwater Flooding

Total Number of Assets

39

Vulnerability Methodology

Table

Fragility Curves

Assessed Metrics

Stormwater Rainfall, Occupancy Class, & Location in a Land Depression

Consequence

Health / Wellness | **Damage** | **Disruption**

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Rainfall is greater than 10 inches (24-hr 100 yr rainfall)
Medium Rating	Rainfall is between 8 and 10 inches (24-hr 100 yr rainfall)
Low Rating	Rainfall is less than 8 inches (24-hr 100 yr rainfall)
Negligible	Not exposed

Data Sources: National Oceanic and Atmospheric Administration (NOAA), Northeast Regional Climate Center (NRCC), and International Panel on Climate Change (IPCC) AR6.

Vulnerability Rating	Vulnerability Methodology
High Rating	Located in a depression
Low Rating	Not located is a depression

Data Sources: SCALGO (Location in a Depression).

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/39	**11**/39	**25**/39	**25**/39
High Rating	**11**/39	**19**/39	**14**/39	**14**/39
Medium Rating	**19**/39	**9**/39	**0**/39	**0**/39
Low Rating	**9**/39	**0**/39	**0**/39	**0**/39
Negligible	**0**/39	**0**/39	**0**/39	**0**/39

Vulnerability Methodology Legend Used | Not Used

Consequence Legend Primary | Cascading | Not Considered

City and Town Halls - Risk

Riverine Flooding

Total Number of Assets

39

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Riverine Flood Exposure & Occupancy Class

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Asset is in both the 100-year and 500-year floodplain
Medium Rating	Asset is in the 500-year but not the 100-year floodplain
Low Rating	Asset is not in the 100-year or 500-year floodplain
Negligible	Not exposed

Data Sources: FEMA FIRM.

Vulnerability Rating	Vulnerability Methodology
High Rating	-
Low Rating	All assets assumed to be equal vulnerability

*Results are presented only for the current, because only present-day data on riverine flooding was available.

Risk Assessment and Results

Risk Rating	Current*
Very High Rating	**0**/39
High Rating	**2**/39
Medium Rating	**0**/39
Low Rating	**0**/39
Negligible	**37**/39

Vulnerability Methodology Legend: Used | Not Used

Consequence Legend: Primary | Cascading | Not Considered

City and Town Halls - Risk

Extreme Heat

Total Number of Assets

39

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Extreme Heat Exposure & Heat Index Classification

Consequence

Health / Wellness | Damage | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	1- or 5-yr = Extreme Danger (>123F)
Medium Rating	1-y r = Danger (>103 F)
Low Rating	1-yr < Danger (<103 F)
Negligible	Not exposed

Data Sources: NASA Earth Exchange GDDP, NOAA Heat Index Classifications

Vulnerability Rating	Vulnerability Methodology
High Rating	-
Low Rating	All assets assumed to be equal vulnerability

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/39	**0**/39	**0**/39	**0**/39
High Rating	**0**/39	**24**/39	**24**/39	**39**/39
Medium Rating	**0**/39	**15**/39	**15**/39	**0**/39
Low Rating	**39**/39	**0**/39	**0**/39	**0**/39
Negligible	**0**/39	**0**/39	**0**/39	**0**/39

Vulnerability Methodology Legend: Used | Not Used

Consequence Legend: Primary | Cascading | Not Considered

City and Town Halls - Risk

Extreme Wind

Total Number of Assets

39

Vulnerability Methodology

Table

Fragility Curves

Assessed Metrics

Wind Exposure & Building Typology

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Risk Rating	Risk Methodology
Very High Rating	> 50% Damage, 700-yr 3-s gust
High Rating	30 - 50% Damage, 700-yr 3-s gust
Medium Rating	10 - 30% Damage, 700-yr 3-s gust
Low Rating	< 10% Damage, 700-yr 3-s gust
Negligible	Not exposed

Data Sources: ASCE7 Hazard Tool, International Panel on Climate Change (IPCC) AR5, and Hazus Wind Fragilities.*

* Hazus wind fragility MLRM1 with built-up roof, medium window area, no shutters, and missile environment A assumed. Open Terrain, damage state 4.

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/39	**0**/39	**0**/39	**0**/39
High Rating	**0**/39	**0**/39	**0**/39	**0**/39
Medium Rating	**16**/39	**16**/39	**16**/39	**16**/39
Low Rating	**23**/39	**23**/39	**23**/39	**23**/39
Negligible	**0**/39	**0**/39	**0**/39	**0**/39

Vulnerability Methodology Legend

Used | Not Used

Consequence Legend

Primary | Cascading | Not Considered

Public Libraries

Total Number of Assets

71

Available Asset Characteristics

Size & weeks open

Asset – Hazard Pairing





Example Asset Buffer:
Rodger's Free Library - Bristol, RI

Asset
Buffer

Asset Summary

There are 71 libraries throughout the state of Rhode Island and their vulnerability are assessed for all five hazards.

Libraries are considered vulnerable to flooding, extreme wind, and extreme heat. Flooding and extreme wind can physically damage the library, leading to repair costs and subsequent downtime. Extreme heat can lead to unsafe conditions for occupants, reducing the usage of the library.

Public Libraries are evaluated as FEMA Occupancy Class: EDU1

Hazard	% Exposed Under Most Extreme Scenario	Consequence			Vulnerability Source	Assessed Metric	High Risk Indicator(s)
Coastal Flooding	12 %	Health / Wellness	**Damage**	Disruption	Hazus Flood Fragilities	Occupancy Class	High Damage
Stormwater Flooding	100 %	Health / Wellness	**Damage**	Disruption	Hazus Flood Fragilities	Occupancy Class	Occupancy Class, Located in a Depression
Riverine Flooding	7 %	Health / Wellness	**Damage**	Disruption	Hazus Flood Fragilities	Occupancy Class	Relatively Vulnerable Occupancy Class
Extreme Heat	100 %	**Health / Wellness**	Damage	Disruption	NOAA	Heat Index Classification	Heat Index exceeding Tolerable Conditions
Extreme Wind	100 %	Health / Wellness	**Damage**	Disruption	Hazus Wind Fragilities	Building Typology	High Damage

Consequence Legend Primary | Cascading | Not Considered

Public Libraries - Risk

Coastal Flooding

Total Number of Assets

71

Vulnerability Methodology

Table

Fragility Curves

Assessed Metrics

Coastal Flood Depth & Occupancy Class

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Risk Rating	Risk Methodology
Very High Rating	> 30% damage to the 100-yr flood
High Rating	10-30% damage to the 100-yr flood
Medium Rating	<10 % damage to the 100-yr flood
Low Rating	Exposure damage to the 100-yr flood
Negligible	Not exposed

Data Sources: URI Coastal STORMTOOLs and Hazus Flood Fragilities*

* Occupancy code EDU1 assumed at-grade

Risk Assessment and Results

Risk Rating	Current	2035 High SLR	2050 High SLR	2100 High SLR
Very High Rating	**1**/71	**2**/71	**2**/71	**3**/71
High Rating	**2**/71	**1**/71	**2**/71	**3**/71
Medium Rating	**0**/71	**0**/71	**1**/71	**1**/71
Low Rating	**3**/71	**3**/71	**1**/71	**1**/71
Negligible	**65**/71	**65**/71	**65**/71	**63**/71

Vulnerability Methodology Legend — **Used** | Not Used

Consequence Legend — **Primary** | Cascading | Not Considered

Public Libraries - Risk

Stormwater Flooding

Total Number of Assets

71

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Stormwater Rainfall, Occupancy Class, & Location in a Land Depression

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Rainfall is greater than 10 inches (24-hr 100 yr rainfall)
Medium Rating	Rainfall is between 8 and 10 inches (24-hr 100 yr rainfall)
Low Rating	Rainfall is less than 8 inches (24-hr 100 yr rainfall)
Negligible	Not exposed

Data Sources: National Oceanic and Atmospheric Administration (NOAA), Northeast Regional Climate Center (NRCC), and International Panel on Climate Change (IPCC) AR6.

Vulnerability Rating	Vulnerability Methodology
High Rating	Located in a depression
Low Rating	Not located is a depression

Data Sources: SCALGO (Location in a Depression).

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/71	**22**/71	**41**/71	**41**/71
High Rating	**22**/71	**34**/71	**30**/71	**30**/71
Medium Rating	**34**/71	**15**/71	**0**/71	**0**/71
Low Rating	**15**/71	**0**/71	**0**/71	**0**/71
Negligible	**0**/71	**0**/71	**0**/71	**0**/71

Vulnerability Methodology Legend Used | Not Used

Consequence Legend Primary | Cascading | Not Considered

Public Libraries - Risk

Riverine Flooding

Total Number of Assets

71

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Riverine Flood Exposure & Occupancy Class

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Asset is in both the 100-year and 500-year floodplain
Medium Rating	Asset is in the 500-year but not the 100-year floodplain
Low Rating	Asset is not in the 100-year or 500-year floodplain
Negligible	Not exposed

Data Sources: FEMA FIRM.

Vulnerability Rating	Vulnerability Methodology
High Rating	-
Low Rating	All assets assumed to be equal vulnerability

*Results are presented only for the current, because only present-day data on riverine flooding was available.

Risk Assessment and Results

Risk Rating	Current*
Very High Rating	**0**/71
High Rating	**3**/71
Medium Rating	**2**/71
Low Rating	**0**/71
Negligible	**66**/71

Vulnerability Methodology Legend: **Used** | Not Used

Consequence Legend: **Primary** | Cascading | Not Considered

Public Libraries - Risk

Extreme Heat

Total Number of Assets

71

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Extreme Heat Exposure & Heat Index Classification

Consequence

Health / Wellness | Damage | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	1- or 5-yr = Extreme Danger (>123F)
Medium Rating	1-y r = Danger (>103 F)
Low Rating	1-yr < Danger (<103 F)
Negligible	Not exposed

Data Sources: NASA Earth Exchange GDDP, NOAA Heat Index Classifications

Vulnerability Rating	Vulnerability Methodology
High Rating	-
Low Rating	All assets assumed to be equal vulnerability

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/71	**0**/71	**0**/71	**0**/71
High Rating	**0**/71	**0**/71	**0**/71	**71**/71
Medium Rating	**0**/71	**50**/71	**50**/71	**0**/71
Low Rating	**71**/71	**21**/71	**21**/71	**0**/71
Negligible	**0**/71	**0**/71	**0**/71	**0**/71

Vulnerability Methodology Legend Used | Not Used

Consequence Legend Primary | Cascading | Not Considered

Public Libraries - Risk

Extreme Wind

Total Number of Assets

71

Vulnerability Methodology

Table

Fragility Curves

Assessed Metrics

Wind Exposure & Building Typology

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Risk Rating	Risk Methodology
Very High Rating	> 50% Damage, 700-yr 3-s gust
High Rating	30 - 50% Damage, 700-yr 3-s gust
Medium Rating	10 - 30% Damage, 700-yr 3-s gust
Low Rating	< 10% Damage, 700-yr 3-s gust
Negligible	Not exposed

Data Sources: ASCE7 Hazard Tool, International Panel on Climate Change (IPCC) AR5, and Hazus Wind Fragilities.*

* Hazus wind fragility MLRM1 with built-up roof, medium window area, no shutters, and missile environment A assumed. Open Terrain, damage state 4.

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/71	**0**/71	**0**/71	**0**/71
High Rating	**0**/71	**0**/71	**0**/71	**0**/71
Medium Rating	**37**/71	**37**/71	**37**/71	**37**/71
Low Rating	**34**/71	**34**/71	**34**/71	**34**/71
Negligible	**0**/71	**0**/71	**0**/71	**0**/71

Vulnerability Methodology Legend

Used | Not Used

Consequence Legend

Primary | Cascading | Not Considered

Schools

1. PreK-12 Schools
2. Colleges and Universities

PreK-12 Schools

Total Number of Assets

552

Available Asset Characteristics

Type of School, Age, Replacement Value, Enrollment, Functional Capacity, & Utilization

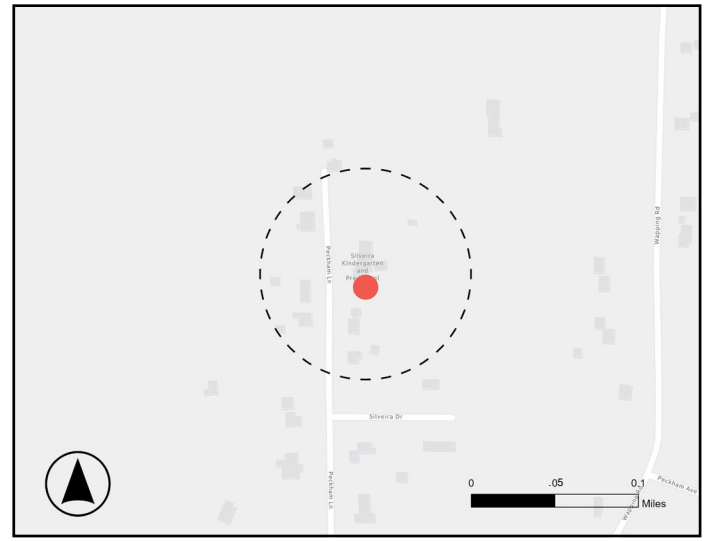
Asset – Hazard Pairing

Asset Summary

There are 552 pre-k schools throughout the state of Rhode Island and their vulnerability are assessed for all five hazards.

Schools are considered vulnerable to flooding, extreme wind, and extreme heat. Flooding and extreme wind can physically damage the school, leading to repair costs and subsequent downtime. Extreme heat can lead to unsafe conditions for occupants, reducing the usage of the school.

PreK-12 Schools are evaluated as FEMA Occupancy Class: EDU1



Example Asset Buffer:
Silveira Kindergarten and Nursery School – Middletown, RI

Asset
Buffer

Hazard	% Exposed Under Most Extreme Scenario	Consequence			Vulnerability Source	Assessed Metric	High Risk Indicator(s)
Coastal Flooding	10 %	Health / Wellness	**Damage**	**Disruption**	Hazus Flood Fragilities	Occupancy Class	High Damage
Stormwater Flooding	100 %	Health / Wellness	**Damage**	**Disruption**	Hazus Flood Fragilities	Occupancy Class	Occupancy Class, Located in a Depression
Riverine Flooding	16 %	Health / Wellness	**Damage**	**Disruption**	Hazus Flood Fragilities	Occupancy Class	Relatively Vulnerable Occupancy Class
Extreme Heat	100 %	**Health / Wellness**	Damage	**Disruption**	NOAA	Heat Index Classification	Heat Index exceeding Tolerable Conditions
Extreme Wind	100 %	Health / Wellness	**Damage**	**Disruption**	Hazus Wind Fragilities	Building Typology	High Damage

Consequence Legend Primary | Cascading | Not Considered

PreK-12 Schools - Risk

Coastal Flooding

Total Number of Assets

552

Vulnerability Methodology

Table

Fragility Curves

Assessed Metrics

Coastal Flood Depth & Occupancy Class

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Risk Rating	Risk Methodology
Very High Rating	> 30% damage to the 100-yr flood
High Rating	10-30% damage to the 100-yr flood
Medium Rating	<10 % damage to the 100-yr flood
Low Rating	Exposure damage to the 100-yr flood
Negligible	Not exposed

Data Sources: URI Coastal STORMTOOLs and Hazus Flood Fragilities*

* Occupancy code EDU1 assumed at-grade

Risk Assessment and Results

Risk Rating	Current	2035 High SLR	2050 High SLR	2100 High SLR
Very High Rating	**14**/552	**15**/552	**19**/552	**34**/552
High Rating	**17**/552	**18**/552	**18**/552	**12**/552
Medium Rating	**1**/552	**4**/552	**4**/552	**6**/552
Low Rating	**16**/552	**11**/552	**8**/552	**2**/552
Negligible	**504**/552	**504**/552	**503**/552	**498**/552

Vulnerability Methodology Legend Used | Not Used

Consequence Legend Primary | Cascading | Not Considered

PreK-12 Schools - Risk

Stormwater Flooding

Total Number of Assets

552

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Stormwater Rainfall, Occupancy Class, & Location in a Land Depression

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Rainfall is greater than 10 inches (24-hr 100 yr rainfall)
Medium Rating	Rainfall is between 8 and 10 inches (24-hr 100 yr rainfall)
Low Rating	Rainfall is less than 8 inches (24-hr 100 yr rainfall)
Negligible	Not exposed

Data Sources: National Oceanic and Atmospheric Administration (NOAA), Northeast Regional Climate Center (NRCC), and International Panel on Climate Change (IPCC) AR6.

Vulnerability Rating	Vulnerability Methodology
High Rating	Located in a depression
Low Rating	Not located is a depression

Data Sources: SCALGO (Location in a Depression).

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/552	**298**/552	**521**/552	**521**/552
High Rating	**298**/552	**245**/552	**31**/552	**31**/552
Medium Rating	**245**/552	**9**/552	**0**/552	**0**/552
Low Rating	**9**/552	**0**/552	**0**/552	**0**/552
Negligible	**0**/552	**0**/552	**0**/552	**0**/552

Vulnerability Methodology Legend: **Used** | Not Used

Consequence Legend: **Primary** | Cascading | Not Considered

PreK-12 Schools - Risk

Riverine Flooding

Total Number of Assets

552

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Riverine Flood Exposure & Occupancy Class

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Asset is in both the 100-year and 500-year floodplain
Medium Rating	Asset is in the 500-year but not the 100-year floodplain
Low Rating	Asset is not in the 100-year or 500-year floodplain
Negligible	Not exposed

Data Sources: FEMA FIRM.

Vulnerability Rating	Vulnerability Methodology
High Rating	-
Low Rating	All assets assumed to be equal vulnerability

*Results are presented only for the current, because only present-day data on riverine flooding was available.

Risk Assessment and Results

Risk Rating	Current*
Very High Rating	**0**/552
High Rating	**59**/552
Medium Rating	**28**/552
Low Rating	**0**/552
Negligible	**465**/552

Vulnerability Methodology Legend: **Used** | Not Used

Consequence Legend: **Primary** | Cascading | Not Considered

PreK-12 Schools - Risk

Extreme Heat

Total Number of Assets

552

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Extreme Heat Exposure & Heat Index Classification

Consequence

Health / Wellness | Damage | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	1- or 5-yr = Extreme Danger (>123F)
Medium Rating	1-y r = Danger (>103 F)
Low Rating	1-yr < Danger (<103 F)
Negligible	Not exposed

Data Sources: NASA Earth Exchange GDDP, NOAA Heat Index Classifications

Vulnerability Rating	Vulnerability Methodology
High Rating	-
Low Rating	All assets assumed to be equal vulnerability

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/552	**0**/552	**0**/552	**0**/552
High Rating	**0**/552	**0**/552	**0**/552	**552**/552
Medium Rating	**0**/552	**112**/552	**112**/552	**0**/552
Low Rating	**552**/552	**440**/552	**440**/552	**0**/552
Negligible	**0**/552	**0**/552	**0**/552	**0**/552

Vulnerability Methodology Legend Used | Not Used

Consequence Legend Primary | Cascading | Not Considered

PreK-12 Schools - Risk

Extreme Wind

Total Number of Assets

552

Vulnerability Methodology

Table

Fragility Curves

Assessed Metrics

Wind Exposure & Building Typology

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Risk Rating	Risk Methodology
Very High Rating	> 50% Damage, 700-yr 3-s gust
High Rating	30 - 50% Damage, 700-yr 3-s gust
Medium Rating	10 - 30% Damage, 700-yr 3-s gust
Low Rating	< 10% Damage, 700-yr 3-s gust
Negligible	Not exposed

Data Sources: ASCE7 Hazard Tool, International Panel on Climate Change (IPCC) AR5, and Hazus Wind Fragilities.*

* Hazus wind fragility MLRM1 with built-up roof, medium window area, no shutters, and missile environment A assumed. Open Terrain, damage state 4.

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/552	**0**/552	**0**/552	**0**/552
High Rating	**0**/552	**0**/552	**0**/552	**552**/552
Medium Rating	**0**/552	**440**/552	**440**/552	**0**/552
Low Rating	**552**/552	**112**/552	**112**/552	**0**/552
Negligible	**0**/552	**0**/552	**0**/552	**0**/552

Vulnerability Methodology Legend — **Used** | Not Used

Consequence Legend — **Primary** | Cascading | Not Considered

Colleges and Universities

Total Number of Assets

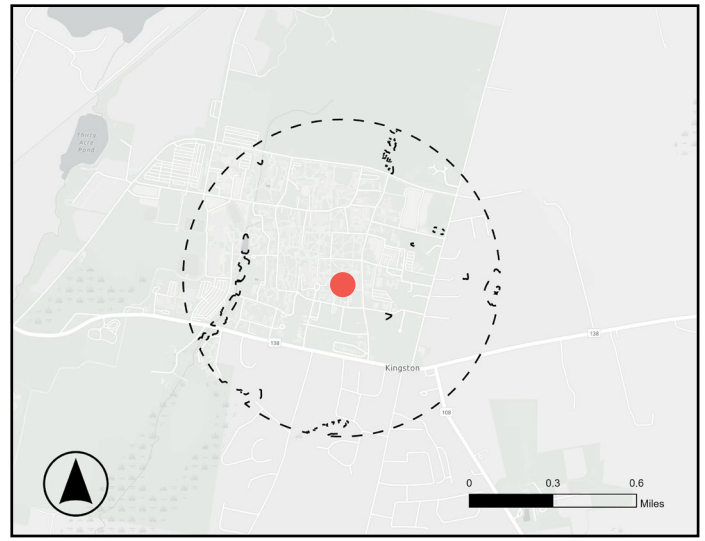
16

Available Asset Characteristics

Type of School (State/Private)

Asset – Hazard Pairing





Example Asset Buffer:
University of Rhode Island – Kingston, RI

Asset
Buffer

Asset Summary

There are 16 colleges and universities throughout the state of Rhode Island and their vulnerability are assessed for all five hazards.

Colleges and universities are considered vulnerable to flooding, extreme wind, and extreme heat. Flooding and extreme wind can physically damage the campus, leading to repair costs and subsequent downtime. Extreme heat can lead to unsafe conditions for occupants, reducing the usage of the campus.

Colleges and Universities are evaluated as FEMA Occupancy Class: EDU2

Hazard	% Exposed Under Most Extreme Scenario	Consequence			Vulnerability Source	Assessed Metric	High Risk Indicator(s)
Coastal Flooding	50 %	Health / Wellness	**Damage**	Disruption	Hazus Flood Fragilities	Occupancy Class	High Damage
Stormwater Flooding	100 %	Health / Wellness	**Damage**	Disruption	Hazus Flood Fragilities	Occupancy Class	Occupancy Class, Located in a Depression
Riverine Flooding	13 %	Health / Wellness	**Damage**	Disruption	Hazus Flood Fragilities	Occupancy Class	Relatively Vulnerable Occupancy Class
Extreme Heat	100 %	**Health / Wellness**	Damage	Disruption	NOAA	Heat Index Classification	Heat Index exceeding Tolerable Conditions
Extreme Wind	100 %	Health / Wellness	**Damage**	Disruption	Hazus Wind Fragilities	Building Typology	High Damage

Consequence Legend Primary | Cascading | Not Considered

Colleges and Universities - Risk

Coastal Flooding

Total Number of Assets

16

Vulnerability Methodology

Table

Fragility Curves

Assessed Metrics

Coastal Flood Depth & Occupancy Class

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Risk Rating	Risk Methodology
Very High Rating	> 30% damage to the 100-yr flood
High Rating	10-30% damage to the 100-yr flood
Medium Rating	<10 % damage to the 100-yr flood
Low Rating	Exposure damage to the 100-yr flood
Negligible	Not exposed

Data Sources: URI Coastal STORMTOOLs and Hazus Flood Fragilities*

* Occupancy code EDU2 assumed at-grade

Risk Assessment and Results

Risk Rating	Current	2035 High SLR	2050 High SLR	2100 High SLR
Very High Rating	**8**/16	**8**/16	**8**/16	**8**/16
High Rating	**0**/16	**0**/16	**0**/16	**0**/16
Medium Rating	**0**/16	**0**/16	**0**/16	**0**/16
Low Rating	**0**/16	**0**/16	**0**/16	**0**/16
Negligible	**8**/16	**8**/16	**8**/16	**8**/16

Vulnerability Methodology Legend — **Used** | Not Used

Consequence Legend — **Primary** | Cascading | Not Considered

Colleges and Universities - Risk

Stormwater Flooding

Total Number of Assets

16

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Stormwater Rainfall, Occupancy Class, & Location in a Land Depression

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Rainfall is greater than 10 inches (24-hr 100 yr rainfall)
Medium Rating	Rainfall is between 8 and 10 inches (24-hr 100 yr rainfall)
Low Rating	Rainfall is less than 8 inches (24-hr 100 yr rainfall)
Negligible	Not exposed

Data Sources: National Oceanic and Atmospheric Administration (NOAA), Northeast Regional Climate Center (NRCC), and International Panel on Climate Change (IPCC) AR6.

Vulnerability Rating	Vulnerability Methodology
High Rating	Located in a depression
Low Rating	Not located is a depression

Data Sources: SCALGO (Location in a Depression).

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/16	**9**/16	**16**/16	**16**/16
High Rating	**9**/16	**7**/16	**0**/16	**0**/16
Medium Rating	**7**/16	**0**/16	**0**/16	**0**/16
Low Rating	**0**/16	**0**/16	**0**/16	**0**/16
Negligible	**0**/16	**0**/16	**0**/16	**0**/16

Vulnerability Methodology Legend: Used | Not Used

Consequence Legend: Primary | Cascading | Not Considered

Colleges and Universities - Risk

Riverine Flooding

Total Number of Assets

16

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Riverine Flood Exposure & Occupancy Class

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Asset is in both the 100-year and 500-year floodplain
Medium Rating	Asset is in the 500-year but not the 100-year floodplain
Low Rating	Asset is not in the 100-year or 500-year floodplain
Not Assessed	Not assessed

Data Sources: FEMA FIRM.

Vulnerability Rating	Vulnerability Methodology
High Rating	-
Low Rating	All assets assumed to be equal vulnerability

*Results are presented only for the current, because only present-day data on riverine flooding was available.

Risk Assessment and Results

Risk Rating	Current*
Very High Rating	**0**/16
High Rating	**2**/16
Medium Rating	**0**/16
Low Rating	**0**/16
Negligible	**14**/16

Vulnerability Methodology Legend: **Used** | Not Used

Consequence Legend: **Primary** | Cascading | Not Considered

Colleges and Universities - Risk

Extreme Heat

Total Number of Assets

16

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Extreme Heat Exposure & Heat Index Classification

Consequence

Health / Wellness | Damage | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	1- or 5-yr = Extreme Danger (>123F)
Medium Rating	1-y r = Danger (>103 F)
Low Rating	1-yr < Danger (<103 F)
Negligible	Not exposed

Data Sources: NASA Earth Exchange GDDP, NOAA Heat Index Classifications

Vulnerability Rating	Vulnerability Methodology
High Rating	-
Low Rating	All assets assumed to be equal vulnerability

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/16	**0**/16	**0**/16	**0**/16
High Rating	**0**/16	**0**/16	**0**/16	**16**/16
Medium Rating	**0**/16	**12**/16	**12**/16	**0**/16
Low Rating	**16**/16	**4**/16	**4**/16	**0**/16
Negligible	**0**/16	**0**/16	**0**/16	**0**/16

Vulnerability Methodology Legend Used | Not Used

Consequence Legend Primary | Cascading | Not Considered

Colleges and Universities - Risk

Extreme Wind

Total Number of Assets

16

Vulnerability Methodology

Table

Fragility Curves

Assessed Metrics

Wind Exposure & Building Typology

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Risk Rating	Risk Methodology
Very High Rating	> 50% Damage, 700-yr 3-s gust
High Rating	30 - 50% Damage, 700-yr 3-s gust
Medium Rating	10 - 30% Damage, 700-yr 3-s gust
Low Rating	< 10% Damage, 700-yr 3-s gust
Negligible	Not exposed

Data Sources: ASCE7 Hazard Tool, International Panel on Climate Change (IPCC) AR5, and Hazus Wind Fragilities.*

* Hazus wind fragility MLRM1 with built-up roof, medium window area, no shutters, and missile environment A assumed. Open Terrain, damage state 4.

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/16	**0**/16	**0**/16	**0**/16
High Rating	**0**/16	**0**/16	**0**/16	**0**/16
Medium Rating	**9**/16	**9**/16	**9**/16	**9**/16
Low Rating	**7**/16	**7**/16	**7**/16	**7**/16
Negligible	**0**/16	**0**/16	**0**/16	**0**/16

Vulnerability Methodology Legend — **Used** | Not Used

Consequence Legend — **Primary** | Cascading | Not Considered

Food Markets

Food Markets

Total Number of Assets

470

Available Asset Characteristics

Type of Market (Profit/Not for Profit), & Number of Registers

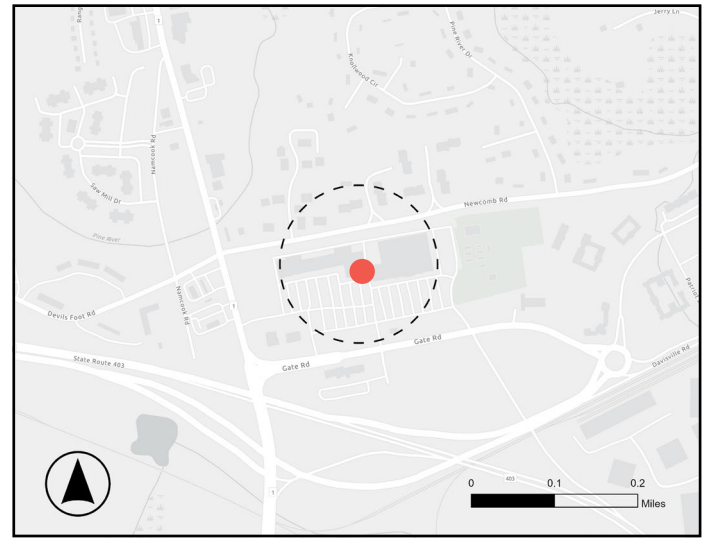
Asset – Hazard Pairing

Asset Summary

There are 470 food markets throughout the state of Rhode Island and their vulnerability are assessed for all five hazards.

Food markets are considered vulnerable to flooding, extreme wind, and extreme heat. Flooding and extreme wind can physically damage the market, leading to repair costs and subsequent downtime. Extreme heat can lead to unsafe conditions for occupants, reducing the usage of the market.

Food Markets are evaluated as FEMA Occupancy Class: IND3



Example Asset Buffer:
Dave's Fresh Market of Quonset – North Kingstown, RI

Asset
Buffer

Hazard	% Exposed Under Most Extreme Scenario	Consequence			Vulnerability Source	Assessed Metric	High Risk Indicator(s)
Coastal Flooding	10 %	Health / Wellness	**Damage**	**Disruption**	Hazus Flood Fragilities	Occupancy Class	High Damage
Stormwater Flooding	100 %	Health / Wellness	**Damage**	**Disruption**	Hazus Flood Fragilities	Occupancy Class	Occupancy Class, Located in a Depression
Riverine Flooding	12 %	Health / Wellness	**Damage**	**Disruption**	Hazus Flood Fragilities	Occupancy Class	Relatively Vulnerable Occupancy Class
Extreme Heat	100 %	**Health / Wellness**	Damage	**Disruption**	NOAA	Heat Index Classification	Heat Index exceeding Tolerable Conditions
Extreme Wind	100 %	Health / Wellness	**Damage**	**Disruption**	Hazus Wind Fragilities	Building Typology	High Damage

Consequence Legend Primary | Cascading | Not Considered

Food Markets - Risk

Coastal Flooding

Total Number of Assets

470

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Coastal Flood Depth & Occupancy Class

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Risk Rating	Risk Methodology
Very High Rating	> 30% damage to the 100-yr flood
High Rating	10-30% damage to the 100-yr flood
Medium Rating	<10 % damage to the 100-yr flood
Low Rating	Exposure damage to the 100-yr flood
Negligible	Not exposed

Data Sources: URI Coastal STORMTOOLs and Hazus Flood Fragilities*

* Occupancy code IND3 assumed at-grade

Risk Assessment and Results

Risk Rating	Current	2035 High SLR	2050 High SLR	2100 High SLR
Very High Rating	**19**/470	**22**/470	**26**/470	**34**/470
High Rating	**8**/470	**11**/470	**9**/470	**7**/470
Medium Rating	**1**/470	**3**/470	**3**/470	**5**/470
Low Rating	**14**/470	**6**/470	**4**/470	**2**/470
Negligible	**428**/470	**428**/470	**428**/470	**422**/470

Vulnerability Methodology Legend Used | Not Used

Consequence Legend Primary | Cascading | Not Considered

Food Markets - Risk

Stormwater Flooding

Total Number of Assets

470

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Stormwater Rainfall, Occupancy Class, & Location in a Land Depression

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Rainfall is greater than 10 inches (24-hr 100 yr rainfall)
Medium Rating	Rainfall is between 8 and 10 inches (24-hr 100 yr rainfall)
Low Rating	Rainfall is less than 8 inches (24-hr 100 yr rainfall)
Negligible	Not exposed

Data Sources: National Oceanic and Atmospheric Administration (NOAA), Northeast Regional Climate Center (NRCC), and International Panel on Climate Change (IPCC) AR6.

Vulnerability Rating	Vulnerability Methodology
High Rating	Located in a depression
Low Rating	Not located is a depression

Data Sources: SCALGO (Location in a Depression).

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/470	**128**/470	**217**/470	**217**/470
High Rating	**128**/470	**257**/470	**253**/470	**253**/470
Medium Rating	**257**/470	**85**/470	**0**/470	**0**/470
Low Rating	**85**/470	**0**/470	**0**/470	**0**/470
Negligible	**0**/470	**0**/470	**0**/470	**0**/470

Vulnerability Methodology Legend Used | Not Used

Consequence Legend Primary | Cascading | Not Considered

Food Markets - Risk

Riverine Flooding

Total Number of Assets

470

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Riverine Flood Exposure & Occupancy Class

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Asset is in both the 100-year and 500-year floodplain
Medium Rating	Asset is in the 500-year but not the 100-year floodplain
Low Rating	Asset is not in the 100-year or 500-year floodplain
Negligible	Not exposed

Data Sources: FEMA FIRM.

Vulnerability Rating	Vulnerability Methodology
High Rating	-
Low Rating	All assets assumed to be equal vulnerability

*Results are presented only for the current, because only present-day data on riverine flooding was available.

Risk Assessment and Results

Risk Rating	Current*
Very High Rating	**0**/470
High Rating	**41**/470
Medium Rating	**17**/470
Low Rating	**0**/470
Negligible	**412**/470

Vulnerability Methodology Legend: **Used** | Not Used

Consequence Legend: **Primary** | Cascading | Not Considered

Food Markets - Risk

Extreme Heat

Total Number of Assets

470

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Extreme Heat Exposure & Heat Index Classification

Consequence

Health / Wellness | Damage | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	1- or 5-yr = Extreme Danger (>123F)
Medium Rating	1-y r = Danger (>103 F)
Low Rating	1-yr < Danger (<103 F)
Negligible	Not exposed

Data Sources: NASA Earth Exchange GDDP, NOAA Heat Index Classifications

Vulnerability Rating	Vulnerability Methodology
High Rating	-
Low Rating	All assets assumed to be equal vulnerability

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/470	**0**/470	**0**/470	**0**/470
High Rating	**0**/470	**376**/470	**376**/470	**470**/470
Medium Rating	**0**/470	**94**/470	**94**/470	**0**/470
Low Rating	**470**/470	**0**/470	**0**/470	**0**/470
Negligible	**0**/470	**0**/470	**0**/470	**0**/470

Vulnerability Methodology Legend: Used | Not Used

Consequence Legend: Primary | Cascading | Not Considered

Food Markets - Risk

Extreme Wind

Total Number of Assets

470

Vulnerability Methodology

Table

Fragility Curves

Assessed Metrics

Wind Exposure & Building Typology

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Risk Rating	Risk Methodology
Very High Rating	> 50% Damage, 700-yr 3-s gust
High Rating	30 - 50% Damage, 700-yr 3-s gust
Medium Rating	10 - 30% Damage, 700-yr 3-s gust
Low Rating	< 10% Damage, 700-yr 3-s gust
Negligible	Not exposed

Data Sources: ASCE7 Hazard Tool, International Panel on Climate Change (IPCC) AR5, and Hazus Wind Fragilities.*

* Hazus wind fragility MLRM1 with built-up roof, medium window area, no shutters, and missile environment A assumed. Open Terrain, damage state 4.

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/470	**0**/470	**0**/470	**0**/470
High Rating	**0**/470	**0**/470	**0**/470	**0**/470
Medium Rating	**296**/470	**296**/470	**296**/470	**296**/470
Low Rating	**174**/470	**174**/470	**174**/470	**174**/470
Negligible	**0**/470	**0**/470	**0**/470	**0**/470

Vulnerability Methodology Legend

Used | Not Used

Consequence Legend

Primary | Cascading | Not Considered

C.4. Emergency Preparedness Structures

Asset Results

Emergency Preparedness Structures

1. Emergency Services
2. Evacuation Routes and Emergency Shelters

Emergency Services

1. Hospitals
2. Fire Stations
3. Police Stations

Hospitals

Total Number of Assets

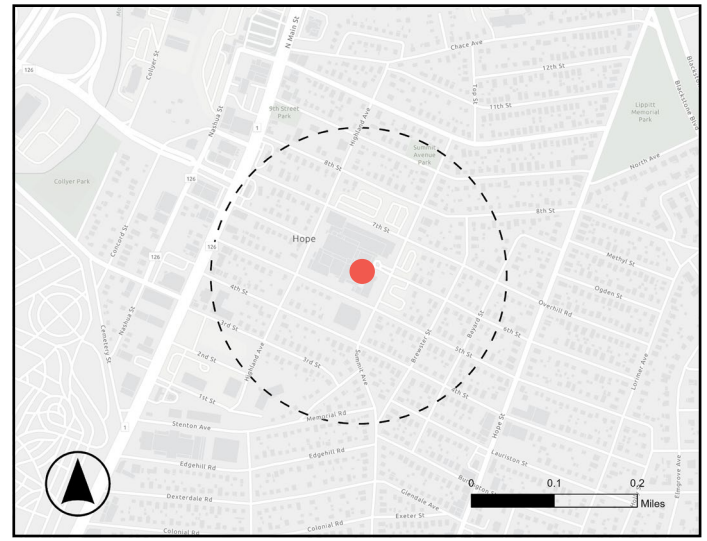
17

Available Asset Characteristics

Number of Beds

Asset – Hazard Pairing





Example Asset Buffer:
The Miriam Hospital – Providence, RI

Asset
Buffer

Asset Summary

There are 17 hospitals throughout the state of Rhode Island and their vulnerability are assessed for all five hazards.

Hospitals are considered vulnerable to flooding, extreme wind, and extreme heat. Flooding and extreme wind can physically damage the hospitals, leading to repair costs and subsequent downtime. Extreme heat can lead to unsafe conditions for local population, increasing demand on the hospital.

Hospitals are evaluated as FEMA Occupancy Class: COM6

Hazard	% Exposed Under Most Extreme Scenario	Consequence			Vulnerability Source	Assessed Metric	High Risk Indicator(s)
Coastal Flooding	24 %	Health / Wellness	**Damage**	Disruption	Hazus Flood Fragilities	Occupancy Class	High Damage
Stormwater Flooding	100 %	Health / Wellness	**Damage**	Disruption	Hazus Flood Fragilities	Occupancy Class	Occupancy Class, Located in a Depression
Riverine Flooding	18 %	Health / Wellness	**Damage**	Disruption	Hazus Flood Fragilities	Occupancy Class	Relatively Vulnerable Occupancy Class
Extreme Heat	100 %	**Health / Wellness**	Damage	Disruption	NOAA	Heat Index Classification	Heat Index exceeding Tolerable Conditions
Extreme Wind	100 %	Health / Wellness	**Damage**	Disruption	Hazus Wind Fragilities	Building Typology	High Damage

Consequence Legend Primary | Cascading | Not Considered

Hospitals - Risk

Coastal Flooding

Total Number of Assets

17

Vulnerability Methodology

Table

Fragility Curves

Assessed Metrics

Coastal Flood Depth & Occupancy Class

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Risk Rating	Risk Methodology
Very High Rating	> 30% damage to the 100-yr flood
High Rating	10-30% damage to the 100-yr flood
Medium Rating	<10 % damage to the 100-yr flood
Low Rating	Exposure damage to the 100-yr flood
Negligible	Not exposed

Data Sources: URI Coastal STORMTOOLs and Hazus Flood Fragilities*

* Occupancy code COM6 assumed at-grade

Risk Assessment and Results

Risk Rating	Current	2035 High SLR	2050 High SLR	2100 High SLR
Very High Rating	**1**/17	**1**/17	**1**/17	**1**/17
High Rating	**0**/17	**0**/17	**2**/17	**2**/17
Medium Rating	**2**/17	**2**/17	**0**/17	**1**/17
Low Rating	**1**/17	**1**/17	**1**/17	**0**/17
Negligible	**13**/17	**13**/17	**13**/17	**13**/17

Vulnerability Methodology Legend — **Used** | Not Used

Consequence Legend — **Primary** | Cascading | Not Considered

Hospitals - Risk

Stormwater Flooding

Total Number of Assets

17

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Stormwater Rainfall, Occupancy Class, & Location in a Land Depression

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Rainfall is greater than 10 inches (24-hr 100 yr rainfall)
Medium Rating	Rainfall is between 8 and 10 inches (24-hr 100 yr rainfall)
Low Rating	Rainfall is less than 8 inches (24-hr 100 yr rainfall)
Negligible	Not exposed

Data Sources: National Oceanic and Atmospheric Administration (NOAA), Northeast Regional Climate Center (NRCC), and International Panel on Climate Change (IPCC) AR6.

Vulnerability Rating	Vulnerability Methodology
High Rating	Located in a depression
Low Rating	Not located is a depression

Data Sources: SCALGO (Location in a Depression).

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/17	**13**/17	**17**/17	**17**/17
High Rating	**13**/17	**4**/17	**0**/17	**0**/17
Medium Rating	**4**/17	**0**/17	**0**/17	**0**/17
Low Rating	**0**/17	**0**/17	**0**/17	**0**/17
Negligible	**0**/17	**0**/17	**0**/17	**0**/17

Vulnerability Methodology Legend — Used | Not Used

Consequence Legend — Primary | Cascading | Not Considered

Hospitals - Risk

Riverine Flooding

Total Number of Assets

17

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Riverine Flood Exposure & Occupancy Class

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Asset is in both the 100-year and 500-year floodplain
Medium Rating	Asset is in the 500-year but not the 100-year floodplain
Low Rating	Asset is not in the 100-year or 500-year floodplain
Negligible	Not exposed

Data Sources: FEMA FIRM.

Vulnerability Rating	Vulnerability Methodology
High Rating	-
Low Rating	All assets assumed to be equal vulnerability

*Results are presented only for the current, because only present-day data on riverine flooding was available.

Risk Assessment and Results

Risk Rating	Current*
Very High Rating	**0**/17
High Rating	**3**/17
Medium Rating	**0**/17
Low Rating	**0**/17
Negligible	**14**/17

Vulnerability Methodology Legend: **Used** | Not Used

Consequence Legend: **Primary** | Cascading | Not Considered

Hospitals - Risk

Extreme Heat

Total Number of Assets

17

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Extreme Heat Exposure & Heat Index Classification

Consequence

Health / Wellness | Damage | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	1- or 5-yr = Extreme Danger (>123F)
Medium Rating	1-y r = Danger (>103 F)
Low Rating	1-yr < Danger (<103 F)
Negligible	Not exposed

Data Sources: NASA Earth Exchange GDDP, NOAA Heat Index Classifications

Vulnerability Rating	Vulnerability Methodology
High Rating	-
Low Rating	All assets assumed to be low vulnerability

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/17	**0**/17	**0**/17	**0**/17
High Rating	**0**/17	**0**/17	**0**/17	**17**/17
Medium Rating	**0**/17	**14**/17	**14**/17	**0**/17
Low Rating	**17**/17	**3**/17	**3**/17	**0**/17
Negligible	**0**/17	**0**/17	**0**/17	**0**/17

Vulnerability Methodology Legend: Used | Not Used

Consequence Legend: Primary | Cascading | Not Considered

Hospitals - Risk

Extreme Wind

Total Number of Assets

17

Vulnerability Methodology

Table

Fragility Curves

Assessed Metrics

Wind Exposure & Building Typology

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Risk Rating	Risk Methodology
Very High Rating	> 50% Damage, 700-yr 3-s gust
High Rating	30 - 50% Damage, 700-yr 3-s gust
Medium Rating	10 - 30% Damage, 700-yr 3-s gust
Low Rating	< 10% Damage, 700-yr 3-s gust
Negligible	Not exposed

Data Sources: ASCE7 Hazard Tool, International Panel on Climate Change (IPCC) AR5, and Hazus Wind Fragilities.*

* Hazus wind fragility CECBL with built-up roof, medium window area, no shutters, and missile environment A assumed. Open Terrain, damage state 4.

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/17	**0**/17	**0**/17	**0**/17
High Rating	**0**/17	**0**/17	**0**/17	**0**/17
Medium Rating	**13**/17	**13**/17	**13**/17	**13**/17
Low Rating	**4**/17	**4**/17	**4**/17	**4**/17
Negligible	**0**/17	**0**/17	**0**/17	**0**/17

Vulnerability Methodology Legend

Used | Not Used

Consequence Legend

Primary | Cascading | Not Considered

Fire Stations

Total Number of Assets

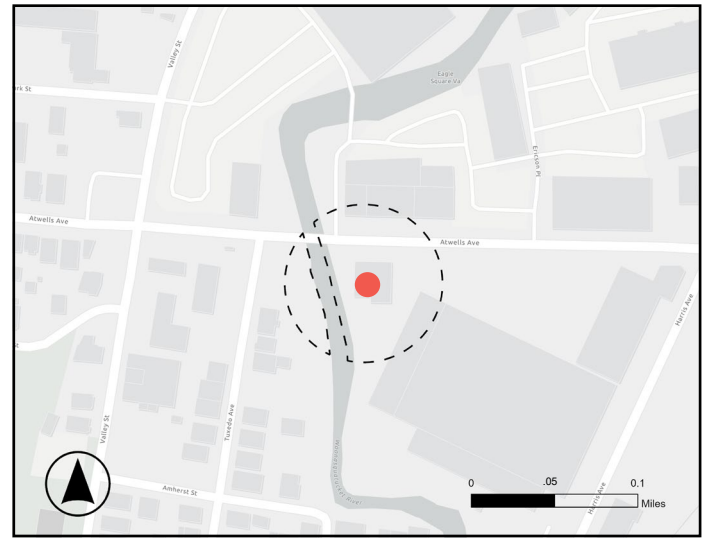
173

Available Asset Characteristics

N/A

Asset – Hazard Pairing





Example Asset Buffer:
Providence Fire Department – Providence, RI

Asset
Buffer

Asset Summary

There are 173 fire stations throughout the state of Rhode Island and their vulnerability are assessed for all five hazards.

Fire stations are considered vulnerable to flooding, extreme wind, and extreme heat. Flooding and extreme wind can physically damage the station, leading to repair costs and subsequent downtime. Extreme heat can lead to unsafe conditions for occupants, reducing the usage of the station.

Fire Stations are evaluated as FEMA Occupancy Class: GOV2

Hazard	% Exposed Under Most Extreme Scenario	Consequence			Vulnerability Source	Assessed Metric	High Risk Indicator(s)
Coastal Flooding	19 %	Health / Wellness	**Damage**	Disruption	Hazus Flood Fragilities	Occupancy Class	High Damage
Stormwater Flooding	100 %	Health / Wellness	**Damage**	Disruption	Hazus Flood Fragilities	Occupancy Class	Occupancy Class, Located in a Depression
Riverine Flooding	16 %	Health / Wellness	**Damage**	Disruption	Hazus Flood Fragilities	Occupancy Class	Relatively Vulnerable Occupancy Class
Extreme Heat	100 %	**Health / Wellness**	Damage	Disruption	NOAA	Heat Index Classification	Heat Index exceeding Tolerable Conditions
Extreme Wind	100 %	Health / Wellness	**Damage**	Disruption	Hazus Wind Fragilities	Building Typology	High Damage

Consequence Legend Primary | Cascading | Not Considered

Fire Stations - Risk

Coastal Flooding

Total Number of Assets

173

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Coastal Flood Depth & Occupancy Class

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Risk Rating	Risk Methodology
Very High Rating	> 30% damage to the 100-yr flood
High Rating	10-30% damage to the 100-yr flood
Medium Rating	<10 % damage to the 100-yr flood
Low Rating	Exposure damage to the 100-yr flood
Negligible	Not exposed

Data Sources: URI Coastal STORMTOOLs and Hazus Flood Fragilities*

* Occupancy code GOV2 assumed at-grade

Risk Assessment and Results

Risk Rating	Current	2035 High SLR	2050 High SLR	2100 High SLR
Very High Rating	**2**/173	**3**/173	**5**/173	**10**/173
High Rating	**3**/173	**3**/173	**4**/173	**5**/173
Medium Rating	**4**/173	**4**/173	**4**/173	**2**/173
Low Rating	**7**/173	**6**/173	**3**/173	**2**/173
Negligible	**157**/173	**157**/173	**157**/173	**154**/173

Vulnerability Methodology Legend Used | Not Used

Consequence Legend Primary | Cascading | Not Considered

Fire Stations - Risk

Stormwater Flooding

Total Number of Assets

173

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Stormwater Rainfall, Occupancy Class, & Location in a Land Depression

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Rainfall is greater than 10 inches (24-hr 100 yr rainfall)
Medium Rating	Rainfall is between 8 and 10 inches (24-hr 100 yr rainfall)
Low Rating	Rainfall is less than 8 inches (24-hr 100 yr rainfall)
Negligible	Not exposed

Data Sources: National Oceanic and Atmospheric Administration (NOAA), Northeast Regional Climate Center (NRCC), and International Panel on Climate Change (IPCC) AR6.

Vulnerability Rating	Vulnerability Methodology
High Rating	Located in a depression
Low Rating	Not located is a depression

Data Sources: SCALGO (Location in a Depression).

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/173	**58**/173	**131**/173	**131**/173
High Rating	**58**/173	**96**/173	**42**/173	**42**/173
Medium Rating	**96**/173	**19**/173	**0**/173	**0**/173
Low Rating	**19**/173	**0**/173	**0**/173	**0**/173
Negligible	**0**/173	**0**/173	**0**/173	**0**/173

Vulnerability Methodology Legend: Used | Not Used

Consequence Legend: Primary | Cascading | Not Considered

Fire Stations - Risk

Riverine Flooding

Total Number of Assets

173

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Riverine Flood Exposure & Occupancy Class

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Asset is in both the 100-year and 500-year floodplain
Medium Rating	Asset is in the 500-year but not the 100-year floodplain
Low Rating	Asset is not in the 100-year or 500-year floodplain
Negligible	Not exposed

Data Sources: FEMA FIRM.

Vulnerability Rating	Vulnerability Methodology
High Rating	-
Low Rating	All assets assumed to be equal vulnerability

*Results are presented only for the current, because only present-day data on riverine flooding was available.

Risk Assessment and Results

Risk Rating	Current*
Very High Rating	**0**/173
High Rating	**15**/173
Medium Rating	**13**/173
Low Rating	**0**/173
Negligible	**145**/173

Vulnerability Methodology Legend: **Used** | Not Used

Consequence Legend: **Primary** | Cascading | Not Considered

Fire Stations - Risk

Extreme Heat

Total Number of Assets

173

Vulnerability Methodology

Table

Fragility Curves

Assessed Metrics

Extreme Heat Exposure & Heat Index Classification

Consequence

Health / Wellness | Damage | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	1- or 5-yr = Extreme Danger (>123F)
Medium Rating	1-y r = Danger (>103 F)
Low Rating	1-yr < Danger (<103 F)
Negligible	Not exposed

Data Sources: NASA Earth Exchange GDDP, NOAA Heat Index Classifications

Vulnerability Rating	Vulnerability Methodology
High Rating	-
Low Rating	All assets assumed to be low vulnerability

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/173	**0**/173	**0**/173	**0**/173
High Rating	**0**/173	**0**/173	**0**/173	**173**/173
Medium Rating	**0**/173	**127**/173	**127**/173	**0**/173
Low Rating	**173**/173	**46**/173	**46**/173	**0**/173
Negligible	**0**/173	**0**/173	**0**/173	**0**/173

Vulnerability Methodology Legend Used | Not Used

Consequence Legend Primary | Cascading | Not Considered

Fire Stations - Risk

Extreme Wind

Total Number of Assets

173

Vulnerability Methodology

Table

Fragility Curves

Assessed Metrics

Wind Exposure & Building Typology

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Risk Rating	Risk Methodology
Very High Rating	> 50% Damage, 700-yr 3-s gust
High Rating	30 - 50% Damage, 700-yr 3-s gust
Medium Rating	10 - 30% Damage, 700-yr 3-s gust
Low Rating	< 10% Damage, 700-yr 3-s gust
Negligible	Not exposed

Data Sources: ASCE7 Hazard Tool, International Panel on Climate Change (IPCC) AR5, and Hazus Wind Fragilities.*

* Hazus wind fragility CECBL with built-up roof, medium window area, no shutters, and missile environment A assumed. Open Terrain, damage state 4.

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/173	**0**/173	**0**/173	**0**/173
High Rating	**0**/173	**0**/173	**0**/173	**0**/173
Medium Rating	**81**/173	**81**/173	**81**/173	**81**/173
Low Rating	**92**/173	**92**/173	**92**/173	**92**/173
Negligible	**0**/173	**0**/173	**0**/173	**0**/173

Vulnerability Methodology Legend

Used | Not Used

Consequence Legend

Primary | Cascading | Not Considered

Police Stations

Total Number of Assets

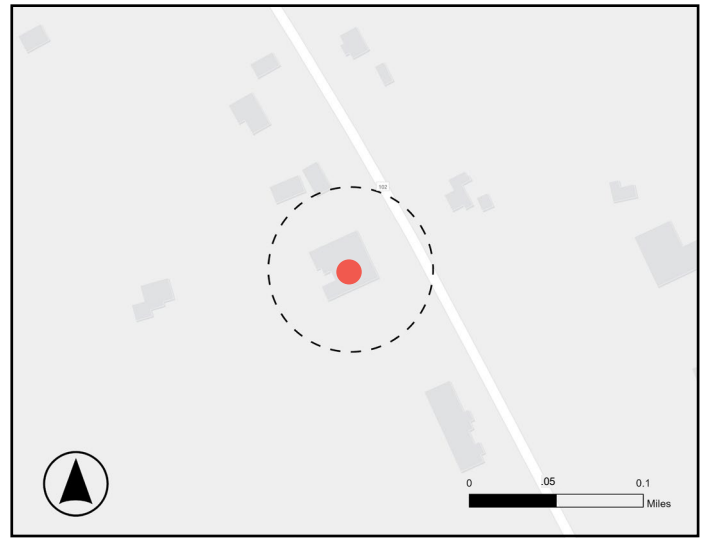
68

Available Asset Characteristics

N/A

Asset – Hazard Pairing





Example Asset Buffer:
Scituate Police Department – Scituate, RI

Asset
Buffer

Asset Summary

There are 68 police stations throughout the state of Rhode Island and their vulnerability are assessed for all five hazards.

Police stations are considered vulnerable to flooding, extreme wind, and extreme heat. Flooding and extreme wind can physically damage the station, leading to repair costs and subsequent downtime. Extreme heat can lead to unsafe conditions for occupants, reducing the usage of the station.

Police Stations are evaluated as FEMA Occupancy Class: GOV2

Hazard	% Exposed Under Most Extreme Scenario	Consequence			Vulnerability Source	Assessed Metric	High Risk Indicator(s)
Coastal Flooding	15 %	Health / Wellness	**Damage**	Disruption	Hazus Flood Fragilities	Occupancy Class	High Damage
Stormwater Flooding	100 %	Health / Wellness	**Damage**	Disruption	Hazus Flood Fragilities	Occupancy Class	Occupancy Class, Located in a Depression
Riverine Flooding	21 %	Health / Wellness	**Damage**	Disruption	Hazus Flood Fragilities	Occupancy Class	Relatively Vulnerable Occupancy Class
Extreme Heat	100 %	**Health / Wellness**	Damage	Disruption	NOAA	Heat Index Classification	Heat Index exceeding Tolerable Conditions
Extreme Wind	100 %	Health / Wellness	**Damage**	Disruption	Hazus Wind Fragilities	Building Typology	High Damage

Consequence Legend Primary | Cascading | Not Considered

Police Stations - Risk

Coastal Flooding

Total Number of Assets

68

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Coastal Flood Depth & Occupancy Class.

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Risk Rating	Risk Methodology
Very High Rating	> 30% damage to the 100-yr flood
High Rating	10-30% damage to the 100-yr flood
Medium Rating	<10 % damage to the 100-yr flood
Low Rating	Exposure damage to the 100-yr flood
Negligible	Not exposed

Data Sources: URI Coastal STORMTOOLs and Hazus Flood Fragilities*

* Occupancy code GOV2 assumed at-grade

Risk Assessment and Results

Risk Rating	Current	2035 High SLR	2050 High SLR	2100 High SLR
Very High Rating	**0**/68	**0**/68	**0**/68	**3**/68
High Rating	**2**/68	**2**/68	**4**/68	**3**/68
Medium Rating	**2**/68	**3**/68	**2**/68	**2**/68
Low Rating	**4**/68	**3**/68	**3**/68	**2**/68
Negligible	**60**/68	**60**/68	**59**/68	**58**/68

Vulnerability Methodology Legend Used | Not Used

Consequence Legend Primary | Cascading | Not Considered

Police Stations - Risk

Stormwater Flooding

Total Number of Assets

68

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Stormwater Rainfall, Occupancy Class, & Location in a Land Depression

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Rainfall is greater than 10 inches (24-hr 100 yr rainfall)
Medium Rating	Rainfall is between 8 and 10 inches (24-hr 100 yr rainfall)
Low Rating	Rainfall is less than 8 inches (24-hr 100 yr rainfall)
Negligible	Not exposed

Data Sources: National Oceanic and Atmospheric Administration (NOAA), Northeast Regional Climate Center (NRCC), and International Panel on Climate Change (IPCC) AR6.

Vulnerability Rating	Vulnerability Methodology
High Rating	Located in a depression
Low Rating	Not located is a depression

Data Sources: SCALGO (Location in a Depression).

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/68	**35**/68	**59**/68	**59**/68
High Rating	**35**/68	**27**/68	**9**/68	**9**/68
Medium Rating	**27**/68	**6**/68	**0**/68	**0**/68
Low Rating	**6**/68	**0**/68	**0**/68	**0**/68
Negligible	**0**/68	**0**/68	**0**/68	**0**/68

Vulnerability Methodology Legend: **Used** | Not Used

Consequence Legend: **Primary** | Cascading | Not Considered

Police Stations - Risk

Riverine Flooding

Total Number of Assets

68

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Riverine Flood Exposure & Occupancy Class

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Asset is in both the 100-year and 500-year floodplain
Medium Rating	Asset is in the 500-year but not the 100-year floodplain
Low Rating	Asset is not in the 100-year or 500-year floodplain
Negligible	Not exposed

Data Sources: FEMA FIRM.

Vulnerability Rating	Vulnerability Methodology
High Rating	-
Low Rating	All assets assumed to be equal vulnerability

*Results are presented only for the current, because only present-day data on riverine flooding was available.

Risk Assessment and Results

Risk Rating	Current*
Very High Rating	0/68
High Rating	**9**/68
Medium Rating	**5**/68
Low Rating	**0**/68
Negligible	**54**/68

Vulnerability Methodology Legend: **Used** | Not Used

Consequence Legend: **Primary** | Cascading | Not Considered

Police Stations - Risk

Extreme Heat

Total Number of Assets

68

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Extreme Heat Exposure & Heat Index Classification

Consequence

Health / Wellness | Damage | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	1- or 5-yr = Extreme Danger (>123F)
Medium Rating	1-y r = Danger (>103 F)
Low Rating	1-yr < Danger (<103 F)
Negligible	Not exposed

Data Sources: NASA Earth Exchange GDDP, NOAA Heat Index Classifications

Vulnerability Rating	Vulnerability Methodology
High Rating	-
Low Rating	All assets assumed to be equal vulnerability

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/68	**0**/68	**0**/68	**0**/68
High Rating	**0**/68	**0**/68	**0**/68	**68**/68
Medium Rating	**0**/68	**46**/68	**46**/68	**0**/68
Low Rating	**68**/68	**22**/68	**22**/68	**0**/68
Negligible	**0**/68	**0**/68	**0**/68	**0**/68

Vulnerability Methodology Legend Used | Not Used

Consequence Legend Primary | Cascading | Not Considered

Police Stations - Risk

Extreme Wind

Total Number of Assets

68

Vulnerability Methodology

Table

Fragility Curves

Assessed Metrics

Wind Exposure & Building Typology

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Risk Rating	Risk Methodology
Very High Rating	> 50% Damage, 700-yr 3-s gust
High Rating	30 - 50% Damage, 700-yr 3-s gust
Medium Rating	10 - 30% Damage, 700-yr 3-s gust
Low Rating	< 10% Damage, 700-yr 3-s gust
Negligible	Not exposed

Data Sources: ASCE7 Hazard Tool, International Panel on Climate Change (IPCC) AR5, and Hazus Wind Fragilities.*

* Hazus wind fragility CECBL with built-up roof, medium window area, no shutters, and missile environment A assumed. Open Terrain, damage state 4.

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/68	**0**/68	**0**/68	**0**/68
High Rating	**0**/68	**0**/68	**0**/68	**0**/68
Medium Rating	**38**/68	**38**/68	**38**/68	**38**/68
Low Rating	**30**/68	**30**/68	**30**/68	**30**/68
Negligible	**0**/68	**0**/68	**0**/68	**0**/68

Vulnerability Methodology Legend — **Used** | Not Used

Consequence Legend — **Primary** | Cascading | Not Considered

Evacuation Routes and Emergency Shelters

1. Evacuation Routes
2. Emergency Shelters

Evacuation Routes

Total Number of Assets

4,065 ½ mile segments

Available Asset Characteristics

Route Name, Pavement Condition (Sensitivity), & Route Density (Adaptive Capacity)

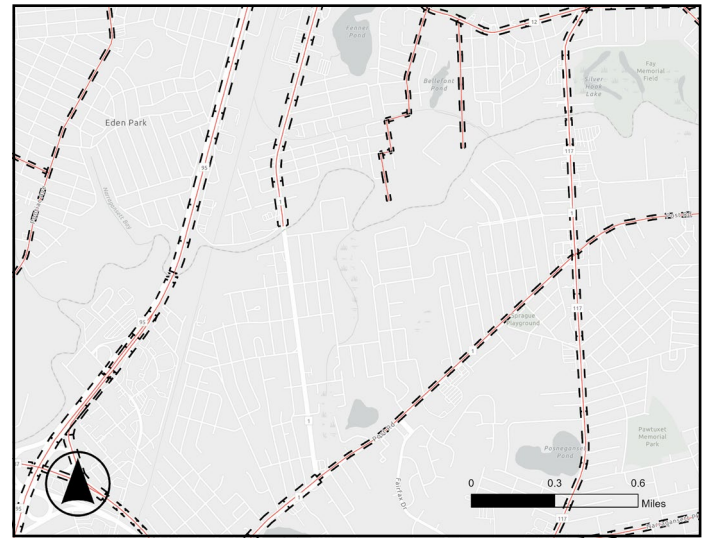
Asset – Hazard Pairing



Asset Summary

There are over 2,000 miles of evacuation routes throughout the state of Rhode Island and their vulnerability are assessed for coastal flooding, stormwater flooding, and riverine flooding.

Flooding of evacuation routes can lead to significant delays and inability to use the routes in times of need.



Example Asset Buffer:
Evacuation Routes

Asset
Buffer

Hazard	% Exposed Under Most Extreme Scenario	Consequence			Vulnerability Source	Assessed Metric	High Risk Indicator(s)
Coastal Flooding	20 %	Health / Wellness	Damage	Disruption	RIDOT RIP	Sensitivity	Poor Condition
Stormwater Flooding	100 %	Health / Wellness	Damage	Disruption	RIDOT RIP	Sensitivity	Poor Condition, Located in a Depression
Riverine Flooding	18 %	Health / Wellness	Damage	Disruption	RIDOT RIP	Sensitivity	Poor Condition
Extreme Heat	100 %	Health / Wellness	Damage	Disruption	-	-	-
Extreme Wind	100 %	Health / Wellness	Damage	Disruption	-	-	-

Consequence Legend Primary | Cascading | Not Considered

Evacuation Routes - Risk

Coastal Flooding

Total Number of Assets

4,065 half-mile segments

Vulnerability Methodology

Table

Fragility Curves

Assessed Metrics

Depth of Coastal Flooding & Pavement Condition.

Consequence

Health / Wellness | Damage | **Disruption**

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Depth of coastal flooding is more than 2 ft
Medium Rating	Depth of coastal flooding is between 0.5 and 2 ft
Low Rating	Depth of coastal flooding is less than 0.5 ft
Not Assessed	Not assessed

Data Sources: University of Rhode Island (URI) Coastal STORMTOOLs.

Vulnerability Rating	Vulnerability Methodology
High Rating	Poor, fair, or no information on pavement condition
Low Rating	Excellent or good pavement condition

Data Sources: Rhode Island Department of Transportation Resilience Improvement Plan (RIDOT), 2024.

Risk Assessment and Results

Risk Rating	Current	2035 High SLR	2050 High SLR	2100 High SLR
Very High Rating	**262**/4065	**273**/4065	**312**/4065	**423**/4065
High Rating	**198**/4065	**216**/4065	**254**/4065	**305**/4065
Medium Rating	**81**/4065	**87**/4065	**71**/4065	**66**/4065
Low Rating	**163**/4065	**128**/4065	**70**/4065	**19**/4065
Negligible	**3361**/4065	**3361**/4065	**3358**/4065	**3252**/4065

Vulnerability Methodology Legend Used | Not Used

Consequence Legend Primary | Cascading | Not Considered

Evacuation Routes - Risk

Stormwater Flooding

Total Number of Assets

4,065 half-mile segments

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Stormwater Rainfall, Pavement Condition, & Location in a Land Depression

Consequence

Health / Wellness | **Damage** | **Disruption**

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Rainfall is greater than 10 inches (24-hr 100 yr rainfall)
Medium Rating	Rainfall is between 8 and 10 inches (24-hr 100 yr rainfall)
Low Rating	Rainfall is less than 8 inches (24-hr 100 yr rainfall)
Negligible	Not exposed

Data Sources: National Oceanic and Atmospheric Administration (NOAA), Northeast Regional Climate Center (NRCC), and International Panel on Climate Change (IPCC) AR6.

Vulnerability Rating	Vulnerability Methodology
High Rating	Located in a depression or poor, fair, or no condition
Low Rating	Not located is a depression and good condition

Data Sources: SCALGO (Location in a Depression).

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/4065	**551**/4065	**3667**/4065	**3667**/4065
High Rating	**551**/4065	**3163**/4065	**398**/4065	**398**/4065
Medium Rating	**3163**/4065	**351**/4065	**0**/4065	**0**/4065
Low Rating	**351**/4065	**0**/4065	**0**/4065	**0**/4065
Negligible	**0**/4065	**0**/4065	**0**/4065	**0**/4065

Vulnerability Methodology Legend: Used | Not Used

Consequence Legend: Primary | Cascading | Not Considered

Evacuation Routes - Risk

Riverine Flooding

Total Number of Assets

4,065 half-mile segments

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Riverine Flood Exposure

Consequence

Health / Wellness | Damage | **Disruption**

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Asset is in both the 100-year and 500-year floodplain
Medium Rating	Asset is in the 500-year but not the 100-year floodplain
Low Rating	Asset is not in the 100-year or 500-year floodplain
Negligible	Not exposed

Data Sources: FEMA FIRM.

Vulnerability Rating	Vulnerability Methodology
High Rating	Poor, fair, or no information on pavement condition
Low Rating	Excellent or good pavement condition

Data Sources: Rhode Island Department of Transportation Resilience Improvement Plan (RIDOT), 2024.

*Results are presented only for the current, because only present-day data on riverine flooding was available.

Risk Assessment and Results

Risk Rating	Current*
Very High Rating	**286**/4065
High Rating	**326**/4065
Medium Rating	**115**/4065
Low Rating	**0**/4065
Negligible	**3338**/4065

Vulnerability Methodology Legend: Used | Not Used

Consequence Legend: Primary | Cascading | Not Considered

Emergency Shelters

Total Number of Assets

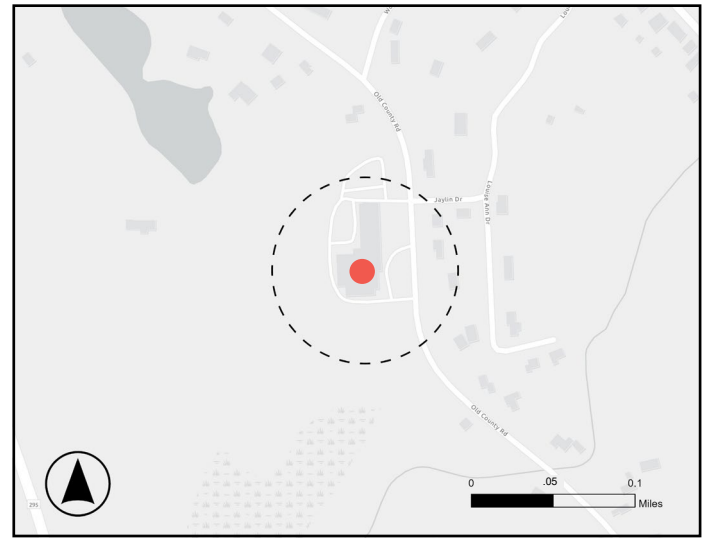
192

Available Asset Characteristics

ADA Compliant,
Wheelchair Accessible, &
Generator Available

Asset – Hazard Pairing





Example Asset Buffer:
Old County Elementary School – Smithfield, RI

Asset
Buffer

Asset Summary

There are 192 emergency shelters throughout the state of Rhode Island and their vulnerability are assessed for all five hazards.

Emergency shelters are considered vulnerable to flooding, extreme wind, and extreme heat. Flooding and extreme wind can physically damage the shelters, leading to repair costs and subsequent downtime. Extreme heat can lead to unsafe conditions for occupants, reducing the usage of the shelter.

Emergency Shelters are evaluated as FEMA Occupancy Class: GOV2

Hazard	% Exposed Under Most Extreme Scenario	Consequence			Vulnerability Source	Assessed Metric	High Risk Indicator(s)
Coastal Flooding	11 %	Health / Wellness	**Damage**	Disruption	Hazus Flood Fragilities	Occupancy Class	High Damage
Stormwater Flooding	100 %	Health / Wellness	**Damage**	Disruption	Hazus Flood Fragilities	Occupancy Class	Occupancy Class, Located in a Depression
Riverine Flooding	18 %	Health / Wellness	**Damage**	Disruption	Hazus Flood Fragilities	Occupancy Class	Relatively Vulnerable Occupancy Class
Extreme Heat	100 %	**Health / Wellness**	Damage	Disruption	NOAA	Heat Index Classification	Heat Index exceeding Tolerable Conditions
Extreme Wind	100 %	Health / Wellness	**Damage**	Disruption	Hazus Wind Fragilities	Building Typology	High Damage

Consequence Legend Primary | Cascading | Not Considered

Emergency Shelters - Risk

Coastal Flooding

Total Number of Assets

192

Vulnerability Methodology

Table

Fragility Curves

Assessed Metrics

Coastal Flood Depth & Occupancy Class

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Risk Rating	Risk Methodology
Very High Rating	> 30% damage to the 100-yr flood
High Rating	10-30% damage to the 100-yr flood
Medium Rating	<10 % damage to the 100-yr flood
Low Rating	Exposure damage to the 100-yr flood
Negligible	Not exposed

Data Sources: URI Coastal STORMTOOLs and Hazus Flood Fragilities*

* Occupancy code GOV2 assumed at-grade

Risk Assessment and Results

Risk Rating	Current	2035 High SLR	2050 High SLR	2100 High SLR
Very High Rating	**5**/192	**6**/192	**8**/192	**11**/192
High Rating	**2**/192	**2**/192	**3**/192	**3**/192
Medium Rating	**3**/192	**4**/192	**2**/192	**5**/192
Low Rating	**8**/192	**6**/192	**5**/192	**3**/192
Negligible	**174**/192	**174**/192	**174**/192	**170**/192

Vulnerability Methodology Legend — Used | Not Used

Consequence Legend — Primary | Cascading | Not Considered

Emergency Shelters - Risk

Stormwater Flooding

Total Number of Assets

192

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Stormwater Rainfall, Occupancy Class, & Location in a Land Depression

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Rainfall is greater than 10 inches (24-hr 100 yr rainfall)
Medium Rating	Rainfall is between 8 and 10 inches (24-hr 100 yr rainfall)
Low Rating	Rainfall is less than 8 inches (24-hr 100 yr rainfall)
Negligible	Not exposed

Data Sources: National Oceanic and Atmospheric Administration (NOAA), Northeast Regional Climate Center (NRCC), and International Panel on Climate Change (IPCC) AR6.

Vulnerability Rating	Vulnerability Methodology
High Rating	Located in a depression
Low Rating	Not located is a depression

Data Sources: SCALGO (Location in a Depression).

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/192	**93**/192	**182**/192	**182**/192
High Rating	**93**/192	**92**/192	**10**/192	**10**/192
Medium Rating	**92**/192	**7**/192	**0**/192	**0**/192
Low Rating	**7**/192	**0**/192	**0**/192	**0**/192
Negligible	**0**/192	**0**/192	**0**/192	**0**/192

Vulnerability Methodology Legend: Used | Not Used

Consequence Legend: Primary | Cascading | Not Considered

Emergency Shelters - Risk

Riverine Flooding

Total Number of Assets

192

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Riverine Flood Exposure & Occupancy Class

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	Asset is in both the 100-year and 500-year floodplain
Medium Rating	Asset is in the 500-year but not the 100-year floodplain
Low Rating	Asset is not in the 100-year or 500-year floodplain
Negligible	Not exposed

Data Sources: FEMA FIRM.

Vulnerability Rating	Vulnerability Methodology
High Rating	-
Low Rating	All assets assumed to be equal vulnerability

*Results are presented only for the current, because only present-day data on riverine flooding was available.

Risk Assessment and Results

Risk Rating	Current*
Very High Rating	**0**/192
High Rating	**23**/192
Medium Rating	**11**/192
Low Rating	**0**/192
Negligible	**158**/192

Vulnerability Methodology Legend: **Used** | Not Used

Consequence Legend: **Primary** | Cascading | Not Considered

Emergency Shelters - Risk

Extreme Heat

Total Number of Assets

192

Vulnerability Methodology

Table | Fragility Curves

Assessed Metrics

Extreme Heat Exposure, Heat Index Classification & Access to a Generator

Consequence

Health / Wellness | Damage | Disruption

Exposure and Vulnerability Assessment Inputs

Exposure Rating	Exposure Methodology
High Rating	1- or 5-yr = Extreme Danger (>123F)
Medium Rating	1-y r = Danger (>103 F)
Low Rating	1-yr < Danger (<103 F)
Negligible	Not exposed

Data Sources: NASA Earth Exchange GDDP, NOAA Heat Index Classifications

Vulnerability Rating	Vulnerability Methodology
High Rating	No access to a generator
Low Rating	Access to a generator or no information

Data Sources: Rhode Island Department of Emergency Management Agency (RIEMA)

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/192	**0**/192	**0**/192	**145**/192
High Rating	**0**/192	**96**/192	**96**/192	**47**/192
Medium Rating	**145**/192	**82**/192	**82**/192	**0**/192
Low Rating	**47**/192	**14**/192	**14**/192	**0**/192
Negligible	**0**/192	**0**/192	**0**/192	**0**/192

Vulnerability Methodology Legend Used | Not Used

Consequence Legend Primary | Cascading | Not Considered

Emergency Shelters - Risk

Extreme Wind

Total Number of Assets

192

Vulnerability Methodology

Table

Fragility Curves

Assessed Metrics

Wind Exposure & Building Typology

Consequence

Health / Wellness | **Damage** | Disruption

Exposure and Vulnerability Assessment Inputs

Risk Rating	Risk Methodology
Very High Rating	> 50% Damage, 700-yr 3-s gust
High Rating	30 - 50% Damage, 700-yr 3-s gust
Medium Rating	10 - 30% Damage, 700-yr 3-s gust
Low Rating	< 10% Damage, 700-yr 3-s gust
Negligible	Not exposed

Data Sources: ASCE7 Hazard Tool, International Panel on Climate Change (IPCC) AR5, and Hazus Wind Fragilities.*

* Hazus wind fragility CECBL with built-up roof, medium window area, no shutters, and missile environment A assumed. Open Terrain, damage state 4.

Risk Assessment and Results

Risk Rating	Current	2035 RCP 8.5	2050 RCP 8.5	2100 RCP 8.5
Very High Rating	**0**/192	**0**/192	**0**/192	**0**/192
High Rating	**0**/192	**0**/192	**0**/192	**0**/192
Medium Rating	**96**/192	**96**/192	**96**/192	**96**/192
Low Rating	**96**/192	**96**/192	**96**/192	**96**/192
Negligible	**0**/192	**0**/192	**0**/192	**0**/192

Vulnerability Methodology Legend

Used | Not Used

Consequence Legend

Primary | Cascading | Not Considered

Chapter 4
Priority Assets List Summary

Prioritization Approach Qualification

Interpreting and Understanding the Limits of Prioritization

The Prioritization Approach used in this Plan is intended to provide a practical and actionable structure for advancing resilience at the State level. Inclusion or relative ranking of specific assets should not be interpreted as an indication that assets not identified are of lesser importance or value. Rather, the framework supports decision-making and phased implementation within the context of this Plan.

Prioritization within complex, interdependent systems is inherently challenging. There is no single definitive method for ranking assets, as infrastructure, communities, and ecological systems function as an interconnected network. Disruptions in one sector or geography can produce cascading effects across others. No asset operates in isolation, and any prioritization approach necessarily simplifies the dynamic relationships that influence statewide resilience.

This complexity is most evident in the State's natural systems, which underpin the State's built, community, and cultural infrastructure. Degradation of natural systems can result in widespread and systemic impacts, while healthy ecosystems provide essential buffering functions that reduce hazard risks. **Accordingly, this Plan affirms that protecting, managing, and restoring natural systems is not ancillary to resilience efforts but central to them.** Continued investment in assessing, conserving, and restoring these systems is essential to long-term statewide resilience, including benefits not fully reflected in this asset-based prioritization approach but captured within this Plan's Actions and recommended Solutions.

To support effective action within this context, the assets considered through this effort can be considered within a tiered prioritization structure. This approach enables near-term decision-making while maintaining a comprehensive understanding of the broader natural and built systems that form the foundation of resilience.

- **Shortlist of Priority Assets**
  Assets identified for immediate evaluation and action through the prioritization process described herein.
- **Additional Priority Assets (Including Initiative Alignment and Regional Technical Assistance Packages Assets)**
  Assets identified by State communities that are ongoing or positioned to advance to subsequent phases. Additional outreach and analysis should confirm vulnerabilities and support progression into planning and design, as appropriate.
- **All Vulnerable Assets**
  The full set of assets evaluated through the Vulnerability Assessment. These assets should continue to undergo analysis and stakeholder engagement to validate and refine risk understanding over time.

Priority Assets List Development

Feedback Process

The Priority Assets List is the result of a comprehensive vulnerability assessment, prioritization process, and integration of statewide feedback. The Prioritization Approach utilized was developed specifically for the scope of this Plan. The Priority Assets List reflected herein does not include all vulnerable assets, nor does it reflect broader prioritization initiatives. A comprehensive database of all at-risk assets evaluated through this process has been provided to the State to support future work and enable continued prioritization efforts beyond the scope of this initiative.

Review Process

The Priority Assets List was created through input gathered from multiple engagement streams, including community forums and municipal stakeholder working sessions. Platforms for feedback included virtual and in-person meetings, email, Miro, and Mentimeter. After each meeting outlined to the right, participants were given time to review and provide feedback on the list. The official review period ran from Friday, October 3 through Friday, October 24. Regional Resilience Coordinators contacted municipalities within their networks to solicit feedback. Stakeholders provided input via email and follow-up calls. For further information on the community engagement process, refer to Chapter 1: Community Engagement Summary Report.

Additional Priority Assets

The list reflected herein represents an additive approach: new assets were added as they were identified, and assets were only removed upon direct request from stakeholders actively engaged with them.

Some assets were determined to be more local in scale. These are included in a separate list titled **"Additional Priority Assets"** and should be targeted for future local climate adaptation and resilience planning efforts. While certain solutions outlined in this Plan may apply to these sites, dedicated solutions were not developed as part of this Plan.

A Priority Assets Shortlist was presented and discussed with the following audiences at the events listed below:

Municipal Stakeholders:

Stakeholder Working Session 5 (October 3rd, 2025)
Stakeholder Working Session 6 (October 24th, 2025)

Community Members:

Community Forum 4 (October 22nd, 2025)
Frontline Community Forum (October 29th, 2025)

State Agencies & Partners:

RI Resilience Partner Group (October 9th, 2025)
Resilience EC4 Subgroup (October 10th, 2025)
EC4 Directors & Governor's Office Briefing (October 21st, 2025)
Climate Change Impacts Commission (October 23rd, 2025)

Summary of Changes

Based on Stakeholder Feedback

- **Newport Bridge** was added to *Road & Bridge Flood Mitigation*.
- **East Greenwich Sewered Areas** was added to *Sewer & Stormwater Infrastructure Solutions*.
- **Three Wastewater Treatment Facilities** were added to *Wastewater Treatment Facilities Hardening Solutions*:
  - Bristol Wastewater Treatment Facility
  - West Warwick Regional Wastewater Treatment Facility
  - Jamestown Wastewater Treatment Facility
- **Scituate Reservoir** was added to *Drinking Water & Reservoir Resilience*.
- **Bristol County Coastal Wetlands** were added to *Beach & Wetland System Restoration*.
- **Everready Fire Station** and **Chepachet Fire Department** were added to *Public Safety Building Solutions*.
- **Three additional schools**, also listed as emergency shelters, were added to *School & Public Safety Building Solutions*:
  - Western Hills Middle School
  - Vincent J. Gallagher Middle School
  - Old County Elementary School
  - Mt. Hope High School
- **Guiteras School** was removed based on feedback that it will no longer be used as a school. Solutions developed in this Plan may still be relevant to this site.
- **17 Additional Priority Assets** shared by stakeholders are included in an 'Additional Priority Assets' List but not mapped to the 10 solutions in this Plan.
- **Similarly three solutions** were removed; priority assets mapped to these solutions will remain referenced as priorities but will not be explored for solution development within this Plan:
  - Fox Point Hurricane Barrier Alignment
  - Advancing Providence Station Resilience Measures
  - Furthering Regional Flood Planning Efforts

Regional Technical Assistance Packages

Regional Resilience Coordinators

Overview

In June of 2025, Rhode Island Department of Environmental Management hired three Regional Resilience Coordinators to support the Chief Resilience Officer and local resilience efforts statewide as part of the agency's growing resilience team. These coordinators, covering three distinct regions (Coastal, Inland, and Urban), provide technical assistance to municipalities and communities for advancing their resilience priorities. Assistance areas delivered include community engagement & outreach; municipal resilience planning & project identification; background research & case studies; grant writing & proposal development; project management; communications on funding & assistance opportunities; and data analysis & mapping.

To define local resilience needs and establish workplans, coordinators held introductory meetings with municipalities in their regions to establish Resilience Technical Assistance Packages (RTAPs) with cities and towns. Building upon findings of local Municipal Resilience Program (MRP) Summary of Findings reports, Hazard Mitigation Plans (HMPs), and Comprehensive Plans, these RTAPs identify each municipality's top three resilience priorities for 2026, which span from needed flood and heat reduction solutions on-the-ground to local resilience ordinance development, planning, and funding mechanism needs. The RTAPs then identify coordinator assistance areas that can help to advance these efforts, establishing how the coordinator will support the municipality over the course of the next year.

Statewide Partnerships & Collaboration

In addition to the RTAP process, Regional Resilience Coordinators provide ongoing technical assistance for the state's Municipal Resilience Program (MRP) through completing annual update meetings to review municipalities' MRP identified resilience actions, to establish local resilience work completed to date and projects in need of support. Coordinators also support municipal application development for MRP Action Grants. In partnership with Department of Health and the Executive Office of Health & Human Services, in the coming year Regional Resilience Coordinators will be also be broadening their support to Health Equity Zone (HEZ) Collaboratives. Beyond these inter-agency collaborations, coordinators partner with numerous local and regional organizations and workgroups to advance resilience priorities across the state.

Regional Technical Assistance Packages (RTAPs) & Resilient Rhody 2025

To support the *Resilient Rhody 2025* priority asset identification process, coordinators compiled all 2026 priority resilience actions named by municipalities in their RTAPs for inclusion within this report. While RTAP assets listed do not necessarily reflect highest risk assets as named in the state's vulnerability assessment, they do reflect projects with strong municipal buy in, existing project development (vulnerability assessments and/or designs in progress), and ability to move forward within the next calendar year. This list of RTAP actions serves as supplemental list of local short-term resilience priorities to further inform the state's *Resilient Rhody* actions and Priority Asset List.

T **Asset idented through Technical Assistance Packages**

Shortlist of Adaptation & Resilience Solutions

Addressing Priority Assets' Risk

Critical Infrastructure & Facilities

1. **Road & Bridge Flood Mitigation Solutions** with a focus on evacuation routes
2. **Resilient Port Infrastructure Solutions**
3. **Energy Resilience Solutions** with a focus on Washington County and Block Island
4. **Sewer & Stormwater Infrastructure Solutions**
5. **Wastewater Treatment Facilities Hardening**
6. **Drinking Water & Reservoir Resilience**

Natural Systems

7. **Beach & Wetland System Restoration**
8. **River and Stream Restoration** with a focus on the Moshassuck River

Community Resilience & Emergency Preparedness Structures

9. **School & Public Safety Building Solutions** with a focus on hardening and relocation opportunities
10. **Hospital Flood & Energy Resilience Solutions**

These **10 solutions were developed and costed as outlined in Chapter 5: Climate Adaptation & Resilience Solutions based on the priority assets identified herein** while remaining flexible to accommodate additional assets as needed.

Shortlist of Adaptation & Resilience Solutions

Addressing Priority Assets' Risk

E **Asset identified as a priority through engagement**

T **Asset identified through Technical Assistance Packages**

Project	Assets	Municipality
1. Road & Bridge Flood Mitigation (Evacuation Focused)	E Newport Bridge	Jamestown, Newport
	E Route114 Corridor	East Providence, Bristol, Warren, Barrington
	I-95 in Cranston	Cranston
2. Resilient Port Infrastructure Solutions	E Block Island - Port of Galilee Ferry Connectivity	New Shoreham, Narragansett
	Port of Providence Infrastructure	Providence
3. Energy Resilience Solutions with a focus on Washington County and Block Island	E Block Island Energy Resilience (Transmission Lines & BIPC Connectivity)	New Shoreham
	Washington County Transmission Lines	Multiple
4. Sewer & Stormwater Infrastructure Solutions	E Pawtucket Combined Sewer & Stormwater Infrastructure	Pawtucket
	E Westerly Stormwater Infrastructure	Westerly
	E Providence Sewer Overflows Mitigation	Providence
	E East Providence Sewered Area	East Providence
	West Warwick Sewered Areas	West Warwick
	E East Greenwich Sewered Areas	East Greenwich

Shortlist of Adaptation & Resilience Solutions

Addressing Priority Assets' Risk

E **Asset identified as a priority through engagement**

T **Asset idented through Technical Assistance Packages**

Project	Assets	Municipality
5. Wastewater Treatment Facility Hardening	E Westerly Wastewater Treatment Facility	Westerly
	Cranston Wastewater Treatment Facility	Cranston
	Bucklin Point Wastewater Treatment Facility	East Providence
	E Bristol Wastewater Treatment Facility	Bristol
	E West Warwick Regional Wastewater Treatment Facility	West Warwick
	E Jamestown Wastewater Treatment Facility	Jamestown
6. Drinking Water & Reservoir Resilience	E Scituate Reservoir	Scituate
	Gardiner Pond Reservoir	Newport- Middletown
	E Easton Pond Reservoir & Dam	Newport- Middletown
	Nelson Pond Reservoir	Newport- Middletown
	Green End Pond Reservoir	Newport-Middletown
	T North and South Pond Reservoir	Jamestown
7. Beach & Wetland System Restoration	E Washington County Coastal Wetlands	Narragansett, North Kingstown, Westerly, Charlestown
	E Salt Pond Region Beaches and Barriers	Charlestown, Narragansett, South Kingstown, Westerly
	Napatree Barrier Beach	Westerly
	E Newport County Coastal Wetlands	Newport, Portsmouth, Middletown, Little Compton, Tiverton, Jamestown
	E Bristol County Coastal Wetlands	Bristol, Warren, Barrington
8. River & Stream Restoration	E Moshassuck River	Lincoln, Providence, Pawtucket, Central Falls

Shortlist of Adaptation & Resilience Solutions

Addressing Priority Assets' Risk

E **Asset identified as a priority through engagement**

T **Asset idented through Technical Assistance Packages**

Project	Assets	Municipality
9. Hospital Flood & Energy Resilience Solutions	Rhode Island Hospital	Providence
	Landmark Medical Center (Woonsocket Hospital)	Woonsocket
	South County Hospital	South Kingstown
10. School & Public Safety Building Solutions — **Public Safety Buildings** E	Narragansett Public Safety Building	Narragansett
	North Scituate Fire Department	Scituate
	Everready Fire Station	Bristol
	Chepachet Fire Department	Glocester
Schools E	Barrington High School	Barrington
	Nayatt School	Barrington
	Sowams Elementary School	Barrington
	Mt. Hope High School	Bristol
	Western Hills Middle School	Cranston
	Cranston High School West	Cranston
	Vincent J. Gallagher Middle School	Smithfield
	Old County Road Elementary School	Smithfield

Initiative Alignment

Addressing Priority Assets' Risk

E **Asset identified as a priority through engagement**

T **Asset identified through Technical Assistance Packages**

The following assets were part of the initial Priority Assets Shortlist. However, this Plan acknowledges that ongoing initiatives are already targeting these locations. To avoid duplicating efforts, solutions for these assets will not be developed within this Plan. These assets remain priority areas, and this Plan supports projects at these locations through strategic alignment and recommends dedicated efforts moving forward.

Project		Assets	Municipality
Fox Point Hurricane Barrier Alignment	E	Fox Point Hurricane Barrier	Providence
Advancing Providence Station Resilience Measures	E	Providence Station	Providence
Furthering Regional Flood Planning Efforts	E	Barrington Coastal Flooding	Barrington
	E	Westerly Riverine Flooding	Westerly
	E	Woonasquatucket Corridor	Providence
	E	Pawtuxet Corridor	Cranston, Warwick
	T	Market to Metacom	Warren
	E	North Kingstown & Wickford Commercial District	North Kingstown, Wickford
	E	Silver Creek	Bristol
	E	Richmond Riverine Flooding	Richmond

Additional Priority Assets

Identified by Stakeholders

The following list includes additional assets identified through the engagement process that should be prioritized for future local climate adaptation and resilience planning efforts. While some solutions developed in this Plan may be applicable to these sites, dedicated solutions were not created as part of this Plan.

Project	Assets	Municipality
Roads and Bridges	Corn Neck Road	New Shoreham
	Creek Bridge	Charlestown
	Poppasquash Road	Bristol
	North Road	Jamestown
	Roads and Bridges in Richmond	Richmond
	Colt State Park Bridges and Roads	Bristol
Hardened Structures	Charlestown Breachway & Inlet Structures	Charlestown
	Bristol Harbor Seawalls	Bristol
Public Transportation	Providence Ferry – Bristol – Prudence Island – Portsmouth	Providence, Portsmouth, Bristol
Stormwater Infrastructure	Shoreline Sewer Main on Ferry Road	Bristol
Waste Management Facility	New Shoreham Transfer Station	New Shoreham

Additional Priority Assets

Identified by Stakeholders

The following list includes additional assets identified through the engagement process that should be prioritized for future local climate adaptation and resilience planning efforts. While some solutions developed in this Plan may be applicable to these sites, dedicated solutions were not created as part of this Plan.

Project	Assets	Municipality
Conservation Lands	Portsmouth Park and Island Park	Portsmouth
	Big River Management Area	West Greenwich
Rivers and Streams	Blackstone Canal and River	Lincoln
	Wood-Pawcatuck River	Washington County
	Pawtuxet River	Kent and Providence Counties
Housing	Warwick Housing Authority	Warwick
	Island Park and Portsmouth Park Housing	Portsmouth
	Wickford Housing	North Kingstown
	Silver Creek Nursing Home	Bristol

RTAP Priority Assets

Identified through Regional Technical Assistance Packages

To support the Resilient Rhody 2025 priority asset identification process, coordinators compiled all 2026 priority resilience actions named by municipalities in their RTAPs for inclusion within this report. While RTAP assets listed do not necessarily reflect highest risk assets as named in the state's vulnerability assessment, they do reflect projects with strong municipal buy in, existing project development (vulnerability assessments and/or designs in progress), and ability to move forward within the next calendar year. This list of RTAP actions serves as supplemental list of local short-term resilience priorities to further inform the state's Resilient Rhody actions and Priority Asset List.

Project	Assets	Municipality
Road & Bridge Flood Mitigation	Spring Lake Road	Burrillville
	Charlestown Breachway Road	Charlestown
	Maple Valley & Franklin Road	Coventry
	Cedar Heights	East Greenwich
	Mount Tom Bridge	Exeter
	Resilience of Unpaved Roads	Foster
	Long Entry Road at Cooper Road	Glocester
	Joe Sarle Road	Glocester
	Farnum Road	Glocester
	Collins Road & West Collins Road Culvert	Hopkinton
	Canonchet Road	Hopkinton
	Beavertail Road at Mackerel Cove	Jamestown
	Lower River Road	Lincoln
	William Sisson Road	Little Compton
	Swamp Road	Little Compton

RTAP Priority Assets

Identified through Regional Technical Assistance Packages

To support the Resilient Rhody 2025 priority asset identification process, coordinators compiled all 2026 priority resilience actions named by municipalities in their RTAPs for inclusion within this report. While RTAP assets listed do not necessarily reflect highest risk assets as named in the state's vulnerability assessment, they do reflect projects with strong municipal buy in, existing project development (vulnerability assessments and/or designs in progress), and ability to move forward within the next calendar year. This list of RTAP actions serves as supplemental list of local short-term resilience priorities to further inform the state's Resilient Rhody actions and Priority Asset List.

Project	Assets	Municipality
Road & Bridge Flood Mitigation	Harbour Island Causeway	Narragansett
	Wellington (Culvert / Bridge)	North Providence
	Old Stone Bridge structural improvements	Portsmouth
	Hillsdale Road	Richmond
	Doray Drive	Scituate
	Spencer Street	Smithfield
	Julian Street	Smithfield
	Saugatucket Culvert	South Kingstown
	3 Rod Way	Tiverton
	Hudson Pond Bridge	West Greenwich
	Hazard Road	West Greenwich
	Kelley Brook Bridge	West Greenwich
Road & Bridge / Beach & Wetland	Old Stone Bridge structural improvements	Portsmouth
Hardened Structures	Harrisville & Mill Pond Dams	Burrillville
	East Greenwich Wastewater Treatment Facility	East Greenwich
	Turner Reservoir	East Providence

RTAP Priority Assets

Identified through Regional Technical Assistance Packages

To support the Resilient Rhody 2025 priority asset identification process, coordinators compiled all 2026 priority resilience actions named by municipalities in their RTAPs for inclusion within this report. While RTAP assets listed do not necessarily reflect highest risk assets as named in the state's vulnerability assessment, they do reflect projects with strong municipal buy in, existing project development (vulnerability assessments and/or designs in progress), and ability to move forward within the next calendar year. This list of RTAP actions serves as supplemental list of local short-term resilience priorities to further inform the state's Resilient Rhody actions and Priority Asset List.

Project	Assets	Municipality
Hardened Structures	Handy Pond Dam	Lincoln
	Town Beach Sea Wall Revetment	North Kingstown
Stormwater Infrastructure	Citywide Stormwater Vulnerability Assessment	Central Falls
	Dexter Plaza	Central Falls
	Jenks Park	Central Falls
	River Street	Central Falls
	Ledge Street	Central Falls
	Sacred Heart	Central Falls
	Pine Street	Central Falls
	Garden Street	Cranston
	Pond View Ave Road	Cranston
	Tomahawk Trail & Iroquois Trail Culvert	Cranston
	Meshanticut Brook	Cranston
	Oaklawn Ave	Cranston
	Fletcher Ave	Cranston

RTAP Priority Assets

Identified through Regional Technical Assistance Packages

To support the Resilient Rhody 2025 priority asset identification process, coordinators compiled all 2026 priority resilience actions named by municipalities in their RTAPs for inclusion within this report. While RTAP assets listed do not necessarily reflect highest risk assets as named in the state's vulnerability assessment, they do reflect projects with strong municipal buy in, existing project development (vulnerability assessments and/or designs in progress), and ability to move forward within the next calendar year. This list of RTAP actions serves as supplemental list of local short-term resilience priorities to further inform the state's Resilient Rhody actions and Priority Asset List.

Project	Assets	Municipality
Stormwater Infrastructure	Elmwood Ave	Cranston
	Ashton Mill	Cumberland
	Valley Falls	Cumberland
	Abbott Run	Cumberland
	Valley Street	Cumberland
	Angell Road	Cumberland
	Theater Road	Cumberland
	Anne and Hope Way	Cumberland
	Anne Street	Cumberland
	Roma Street	East Providence
	Grosvenor Street	East Providence
	Apulia Street	East Providence
	Appian Way	East Providence
	Edmund Street	East Providence
	Hartford Ave	Johnston
	Atwood Ave	Johnston

RTAP Priority Assets

Identified through Regional Technical Assistance Packages

To support the Resilient Rhody 2025 priority asset identification process, coordinators compiled all 2026 priority resilience actions named by municipalities in their RTAPs for inclusion within this report. While RTAP assets listed do not necessarily reflect highest risk assets as named in the state's vulnerability assessment, they do reflect projects with strong municipal buy in, existing project development (vulnerability assessments and/or designs in progress), and ability to move forward within the next calendar year. This list of RTAP actions serves as supplemental list of local short-term resilience priorities to further inform the state's Resilient Rhody actions and Priority Asset List.

Project	Assets	Municipality
Stormwater Infrastructure	Warren Ave	Johnston
	Salina Ave	Johnston
	Foxtail Detention Pond	Johnston
	Front Street	Lincoln
	Smithfield Ave	Lincoln
	Wendell Street	North Providence
	Link Street	North Providence
	Deer Run/West Farm Road	Smithfield
	Hilldale & Highview	Smithfield
	Bell Block Budling Redesign Using BMPs	South Kingstown
	Maintenance of Stormwater Infrastructure	Warren
	Pawtuxet Park	Warwick
	Culvert Assessments and Improvements	Warwick
	Main Street Green Infrastructure	Westerly
	Main Street Park	Woonsocket
	Worrel Street	Woonsocket

RTAP Priority Assets

Identified through Regional Technical Assistance Packages

To support the Resilient Rhody 2025 priority asset identification process, coordinators compiled all 2026 priority resilience actions named by municipalities in their RTAPs for inclusion within this report. While RTAP assets listed do not necessarily reflect highest risk assets as named in the state's vulnerability assessment, they do reflect projects with strong municipal buy in, existing project development (vulnerability assessments and/or designs in progress), and ability to move forward within the next calendar year. This list of RTAP actions serves as supplemental list of local short-term resilience priorities to further inform the state's Resilient Rhody actions and Priority Asset List.

Project	Assets	Municipality
Sewer & Stormwater Infrastructure	Green infrastructure and priority town TMDL projects	Middletown
	Prescott Hall neighborhood and Elizabeth Brook Watershed	Newport
	Stormwater Sewer Study	Providence
Sewer Infrastructure	Townwide Septic Systems	Charlestown
	Sanitary Sewer Overflow	Pawtucket
	Hope Village Sewer Assessment	Scituate
Wastewater Infrastructure	New London Turnpike	West Warwick
Wastewater Treatment Facility	Sewer/Wastewater Treatment Plant	Warren
Waste Management	Riverside Sewer Treatment Plant	East Providence
Waste Management / Beach & Wetland	Erosion at West Beach Revetment - Block Island Transfer Station	New Shoreham
Drinking Water & Reservoir	Wilson's Reservoir	Burrillville
	Nasonville Public Water & Brownfield Sites	Burrillville
	Chepachet Public Water	Glocester
	North Pond and South Pond Reservoir	Jamestown
	Jamestown Drinking Water Supply	Jamestown

RTAP Priority Assets

Identified through Regional Technical Assistance Packages

To support the Resilient Rhody 2025 priority asset identification process, coordinators compiled all 2026 priority resilience actions named by municipalities in their RTAPs for inclusion within this report. While RTAP assets listed do not necessarily reflect highest risk assets as named in the state's vulnerability assessment, they do reflect projects with strong municipal buy in, existing project development (vulnerability assessments and/or designs in progress), and ability to move forward within the next calendar year. This list of RTAP actions serves as supplemental list of local short-term resilience priorities to further inform the state's Resilient Rhody actions and Priority Asset List.

Project	Assets	Municipality
Drinking Water & Reservoir	Aquidneck Island Drinking Water Reservoirs (in collaboration w/ Newport)	Middletown
	Crookfall Brook Watershed	North Smithfield
Drinking Water & Reservoir / Beach & Wetland	Easton's Beach and Easton's Pond	Newport
Flood Resilience Planning	Common Fence Point and Island Park	Portsmouth
Beach & Wetland	Charlestown Breachway	Charlestown
	Briar Point Beach	Coventry
	Charlestown Breachway	Charlestown
	Briar Point Beach	Coventry
	Coastline Pedestrian Walkway	East Greenwich
	India Point Park	Providence
	Town Beach	South Kingstown
	Oakland Beach	Warwick
	End of Road Retrofits	Warwick
	Westerly Coastal Erosion & Dune Restoration	Westerly
Beach & Wetland / Road & Bridge	Corn Neck Road Coastal Corridor	New Shoreham

RTAP Priority Assets

Identified through Regional Technical Assistance Packages

To support the Resilient Rhody 2025 priority asset identification process, coordinators compiled all 2026 priority resilience actions named by municipalities in their RTAPs for inclusion within this report. While RTAP assets listed do not necessarily reflect highest risk assets as named in the state's vulnerability assessment, they do reflect projects with strong municipal buy in, existing project development (vulnerability assessments and/or designs in progress), and ability to move forward within the next calendar year. This list of RTAP actions serves as supplemental list of local short-term resilience priorities to further inform the state's Resilient Rhody actions and Priority Asset List.

Project	Assets	Municipality
Inland Water Area / Rivers & Streams	Barrington River	Barrington
	Leahy Pond	Bristol
	Bellfield Ave	Johnston
	Assapumpset Brook	Johnston
	Mortan Ave	Johnston
	Blackstone River and Canal	Lincoln, Providence
	Cherry Brook Watershed	North Smithfield
	Woonasquatucket River Watershed	North Smithfield
	Moshassuck River Restoration	Pawtucket
	Waterplace Park	Providence
Conservation Lands	Arnold Park & Police Station	Coventry
	Wenscott Reservoir Nature Reserve	North Providence
	Richmond Heritage Trail	Richmond
	Big River Management Area	West Greenwich

RTAP Priority Assets

Identified through Regional Technical Assistance Packages

To support the Resilient Rhody 2025 priority asset identification process, coordinators compiled all 2026 priority resilience actions named by municipalities in their RTAPs for inclusion within this report. While RTAP assets listed do not necessarily reflect highest risk assets as named in the state's vulnerability assessment, they do reflect projects with strong municipal buy in, existing project development (vulnerability assessments and/or designs in progress), and ability to move forward within the next calendar year. This list of RTAP actions serves as supplemental list of local short-term resilience priorities to further inform the state's Resilient Rhody actions and Priority Asset List.

Project	Assets	Municipality
Forest Management	Reed Street Orchard	Central Falls
	Townwide Tree Maintenance	Foster
Community Engagement	Community Resilience Outreach	Hopkinton
	Community Outreach and Education - Stormwater and Mitigation	North Kingstown
Funding & Financing Mechanisms	Hurricane Preparedness and Non-Federal Disaster Relief	Barrington
	Stormwater Enterprise Fund	Barrington
	Low Impact Development Incentives	Cumberland
	Establish Stormwater Utility District	Middletown
Housing	Brownfield Remediation & Housing	Foster

RTAP Priority Assets

Identified through Regional Technical Assistance Packages

To support the Resilient Rhody 2025 priority asset identification process, coordinators compiled all 2026 priority resilience actions named by municipalities in their RTAPs for inclusion within this report. While RTAP assets listed do not necessarily reflect highest risk assets as named in the state's vulnerability assessment, they do reflect projects with strong municipal buy in, existing project development (vulnerability assessments and/or designs in progress), and ability to move forward within the next calendar year. This list of RTAP actions serves as supplemental list of local short-term resilience priorities to further inform the state's Resilient Rhody actions and Priority Asset List.

Project	Assets	Municipality
Ordinance Development	Low Impact Development Ordinances	Central Falls
	Forestry Ordinances	Central Falls
	Local Stormwater Standards	Coventry
	Reviewing Local Impacts of State Environmental Review Changes	Narragansett
	Municipal Resilience Ordinance Development	Narragansett
	Townwide Tree Planting/Impervious Lot Coverage Requirements	North Kingstown
	Stormwater Best Management Practice Ordinances	North Providence
	Urban Forestry and Low Impact Development Ordinance Research	Pawtucket
Public Safety Building	Hurricane Preparedness and Non-Federal Disaster Relief	Barrington
	Stormwater Enterprise Fund	Barrington
	Low Impact Development Incentives	Cumberland
	Establish Stormwater Utility District	Middletown
	Emergency Operations Center	Glocester

RTAP Priority Assets

Identified through Regional Technical Assistance Packages

To support the Resilient Rhody 2025 priority asset identification process, coordinators compiled all 2026 priority resilience actions named by municipalities in their RTAPs for inclusion within this report. While RTAP assets listed do not necessarily reflect highest risk assets as named in the state's vulnerability assessment, they do reflect projects with strong municipal buy in, existing project development (vulnerability assessments and/or designs in progress), and ability to move forward within the next calendar year. This list of RTAP actions serves as supplemental list of local short-term resilience priorities to further inform the state's Resilient Rhody actions and Priority Asset List.

Project	Assets	Municipality
Public Safety Buildings	Back-Up Generators for Municipal Facilities	Little Compton
	Relocate Fire Station #1 into the North End	Newport
	Portsmouth's old High School gymnasium - establish as certified Red Cross Shelter & install generator power	Portsmouth
	Establish Island-wide Emergency Operations Center across all three Aquidneck Island municipalities	Portsmouth
	Recreation Centers and Fire Stations	Providence
	DPW & Transfer Station Stormwater Management	Richmond
	Fire Station Generators	Scituate
	Civic Center Generators	West Warwick
Resilience Planning	Flood Mapping Project	Barrington
	Inventory of Drainage Infrastructure	Bristol
	Comprehensive Plan - Hazard Mitigation Chapter	Bristol
	Centennial Street Flood Vulnerability Study	Burrillville
	Mowry Street/Harrisville Main Street Flood Vulnerability Study	Burrillville
	Comprehensive Plan	Central Falls
	Groundwater Analyses	Charlestown

RTAP Priority Assets

Identified through Regional Technical Assistance Packages

To support the Resilient Rhody 2025 priority asset identification process, coordinators compiled all 2026 priority resilience actions named by municipalities in their RTAPs for inclusion within this report. While RTAP assets listed do not necessarily reflect highest risk assets as named in the state's vulnerability assessment, they do reflect projects with strong municipal buy in, existing project development (vulnerability assessments and/or designs in progress), and ability to move forward within the next calendar year. This list of RTAP actions serves as supplemental list of local short-term resilience priorities to further inform the state's Resilient Rhody actions and Priority Asset List.

Project	Assets	Municipality
Resilience Planning	Comprehensive Plan - Hazard Mitigation Chapter	Cumberland
	Town Resilience Staff Position	East Greenwich
	Dam Emergency Action Plans & Inundation Study	Exeter
	Updated Emergency Operations Plan	Exeter
	Dam Ownership Identification	Glocester
	Dam Emergency Action Plans	Glocester
	Hazard Mitigation Plan Updates	Johnston
	Stormwater Vulnerability Assessment	Johnston
	Town Commons Resiliency	Little Compton
	New Harbor Commercial District	New Shoreham
	Providence Tree Plan	Providence
	Providence Tree Plan	Providence
	Dam Management Plan	Smithfield
	Saugatucket Watershed Study	South Kingstown
	Drought Vulnerability Assessment	Tiverton

RTAP Priority Assets

Identified through Regional Technical Assistance Packages

To support the Resilient Rhody 2025 priority asset identification process, coordinators compiled all 2026 priority resilience actions named by municipalities in their RTAPs for inclusion within this report. While RTAP assets listed do not necessarily reflect highest risk assets as named in the state's vulnerability assessment, they do reflect projects with strong municipal buy in, existing project development (vulnerability assessments and/or designs in progress), and ability to move forward within the next calendar year. This list of RTAP actions serves as supplemental list of local short-term resilience priorities to further inform the state's Resilient Rhody actions and Priority Asset List.

Project	Assets	Municipality
Resilience Planning	Hydrology and Drainage Study	Tiverton
	Market to Metacom	Warren
	Stormwater Management Plan	West Greenwich
	Stormwater Infrastructure Maps	West Warwick
	Tidal Flood Planning	Westerly

Resilient Rhody 2025
Priority Assets List

The Priority Assets List is the result of a comprehensive vulnerability assessment, prioritization process, and integration of statewide feedback.

Priority Assets List to Inform Solution Development
46 Assets

Priority Assets for Alignment
10 Assets

Additional Priority Assets
20 Assets

Asset or Solution Type	Asset	Municipality
Road & Bridge Flood Mitigation (Evacuation Focused)	Newport Bridge	Jamestown, Newport
	Route 114 Corridor	East Providence, Bristol, Warren, Barrington
	I-95 in Cranston	Cranston
Resilient Port Infrastructure Solutions	Block Island - Port of Galilee Ferry Connectivity	New Shoreham, Narragansett
	Port of Providence Infrastructure	Providence
Energy Resilience Solutions with a focus on Washington County and Block Island	Block Island Energy Resilience (Transmission Lines & BIPC Connectivity)	New Shoreham
	Washington County Transmission Lines	Multiple
Sewer & Stormwater Infrastructure Solutions	Pawtucket Combined Sewer & Stormwater Infrastructure	Pawtucket
	Westerly Stormwater Infrastructure	Westerly
	Providence Sewer Overflows Mitigation	Providence
	East Providence Sewered Area	East Providence
	West Warwick Sewered Areas	West Warwick
	East Greenwich Sewered Areas	East Greenwich
Wastewater Treatment Facility Hardening	Westerly Wastewater Treatment Facility	Westerly
	Cranston Wastewater Treatment Facility	Cranston
	Bucklin Point Wastewater Treatment Facility	East Providence
	Bristol Wastewater Treatment Facility	Bristol
	West Warwick Regional Wastewater Treatment Facility	West Warwick
	Jamestown Wastewater Treatment Facility	Jamestown
Drinking Water & Reservoir Resilience	Scituate Reservoir	Scituate
	Gardiner Pond Reservoir	Newport- Middletown
	Easton Pond Reservoir & Dam	Newport- Middletown
	Nelson Pond Reservoir	Newport- Middletown
	Green End Pond Reservoir	Newport-Middletown
	North and South Pond Reservoir	Jamestown
Beach & Wetland System Restoration	Washington County Coastal Wetlands	Narragansett, North Kingstown, Westerly, Charlestown
	Salt Pond Region Beaches and Barriers	Charlestown, Narragansett, South Kingstown, Westerly
	Napatree Barrier Beach	Westerly
	Newport County Coastal Wetlands	Newport, Portsmouth, Middletown, Little Compton, Tiverton, Jamestown
	Bristol County Coastal Wetlands	Bristol, Warren, Barrington
River & Stream Restoration with a focus on the Moshassuck River	Moshassuck River	Lincoln, Providence, Pawtucket, Central Falls
Hospital Flood & Energy Resilience Solutions	Rhode Island Hospital	Providence
	Landmark Medical Center (Woonsocket Hospital)	Woonsocket
	South County Hospital	South Kingstown
School & Public Safety Building Solutions	Narragansett Public Safety Building	Narragansett
	North Scituate Fire Department	Scituate
	Everready Fire Station	Bristol
	Chepachet Fire Department	Glocester
	Barrington High School	Barrington
	Nayatt School	Barrington
	Sowams Elementary School	Barrington
	Mt. Hope High School	Bristol
	Western Hills Middle School	Cranston
	Cranston High School West	Cranston
	Vincent J. Gallagher Middle School	Smithfield
	Old County Road Elementary School	Smithfield
Fox Point Hurricane Barrier Alignment	Fox Point Hurricane Barrier	Providence
Advancing Providence Station Resilience Measures	Providence Station	Providence
Furthering Regional Flood Planning Efforts	Barrington Coastal Flooding	Barrington
	Westerly Riverine Flooding	Westerly
	Woonasquatucket Corridor	Providence
	Pawtuxet Corridor	Cranston, Warwick
	Market to Metacom	Warren
	North Kingstown & Wickford Commercial District	North Kingstown, Wickford
	Silver Creek	Bristol
	Richmond Riverine Flooding	Richmond
Roads and Bridges	Corn Neck Road	New Shoreham
	Creek Bridge	Charlestown
	Poppasquash Road	Bristol
	North Road	Jamestown
	Roads and Bridges in Richmond	Richmond
	Colt State Park Bridges and Roads	Bristol
Hardened Structures	Charlestown Breachway & Inlet Structures	Charlestown
	Bristol Harbor Seawalls	Bristol
Public Transportation	Providence Ferry – Bristol – Prudence Island – Portsmouth	Providence, Portsmouth, Bristol
Stormwater Infrastructure	Shoreline Sewer Main on Ferry Road	Bristol
Waste Management Facility	New Shoreham Transfer Station	New Shoreham
Conservation Lands	Portsmouth Park and Island Park	Portsmouth
	Big River Management Area	West Greenwich
Rivers and Streams	Blackstone Canal	Lincoln
	Wood-Pawcatuck River	Washington County
	Pawtuxet River	Kent and Providence Counties
Housing	Warwick Housing Authority	Warwick
	Island Park and Portsmouth Park Housing	Portsmouth
	Wickford Housing	North Kingstown
	Silver Creek Nursing Home	Bristol

Chapter 5
Climate Adaptation & Resilience Solutions

Introduction

Building resilience against climate hazards demands strategic physical infrastructure improvements. Therefore, to supplement the Chapter 2: Resilient Rhody 2025 Actions, this document presents ten targeted solutions designed to strengthen Rhode Island's resilience.

Intent

This document seeks to serve as both a reference for viable alternatives to address relevant climate risks and a practical guide for municipal planners, state agencies, utilities, and partners to help move projects from risk identification to implementation.

These solutions are tailored to priority assets identified through this Plan's prioritization process, which incorporated a statewide vulnerability assessment and stakeholder input. While grounded in these known priorities, the guidance is intended to be flexible and adaptable to additional assets as needs evolve.

Organization:

Solutions are organized into three categories based on asset type:

- Critical Infrastructure
- Natural Systems
- Community Resilience and Emergency Preparedness

Contents

Each solution described herein includes:

- Strategy guidance
- Cost estimates
- Funding approaches

Continue for guidance on how to read this document.

Climate Adaptation & Resilience Solutions:

- **Road & Bridge Flood Mitigation Solutions** with a focus on evacuation routes
- **Resilient Port Infrastructure Solutions**
- **Energy Resilience Solutions** with a focus on Washington County and Block Island
- **Sewer & Stormwater Infrastructure Solutions**
- **Wastewater Treatment Facilities Hardening**
- **Drinking Water & Reservoir Resilience**
- **Beach & Wetland System Restoration**
- **River & Stream Restoration** with a focus on the Moshassuck River
- **School & Public Safety Building Solutions** with hardening and relocation opportunities
- **Hospital Flood & Energy Resilience Solutions**

This document also supports ongoing initiatives at Providence Station and Fox Point Hurricane Barrier that are essential to Rhode Island's resilience.



Prudence Island © RIDEM

How to Read this Document

Each solution includes the following four sections:

A Priority Assets Summary Pages

- Overview of asset type and climate hazard challenges
- List of at-risk assets and statewide map

B Solution Summary Pages

- Current and future climate risks to asset type being addressed
- Past and ongoing state initiatives
- Steps for Implementation
- Representative Priority Assets with site-specific challenges

C Solution Strategy Pages

- Specific strategy guidance
- Details on strategy mechanisms, innovation level, hazards addressed, and relative cost

D Funding Strategy Pages

- Summary of costs, benefits, and economic impacts of intervention
- Summary of cost of consequence
- Potential state and federal funding sources and mechanisms
- State role in supporting project type



Continue for guidance on how to read each section.

Priority Assets Summary Pages

How to Read this Document

1. Solution Group: Each solution is in one or two of the four asset groups. The highlighted box indicates the asset group. These bars are at the top of every page.

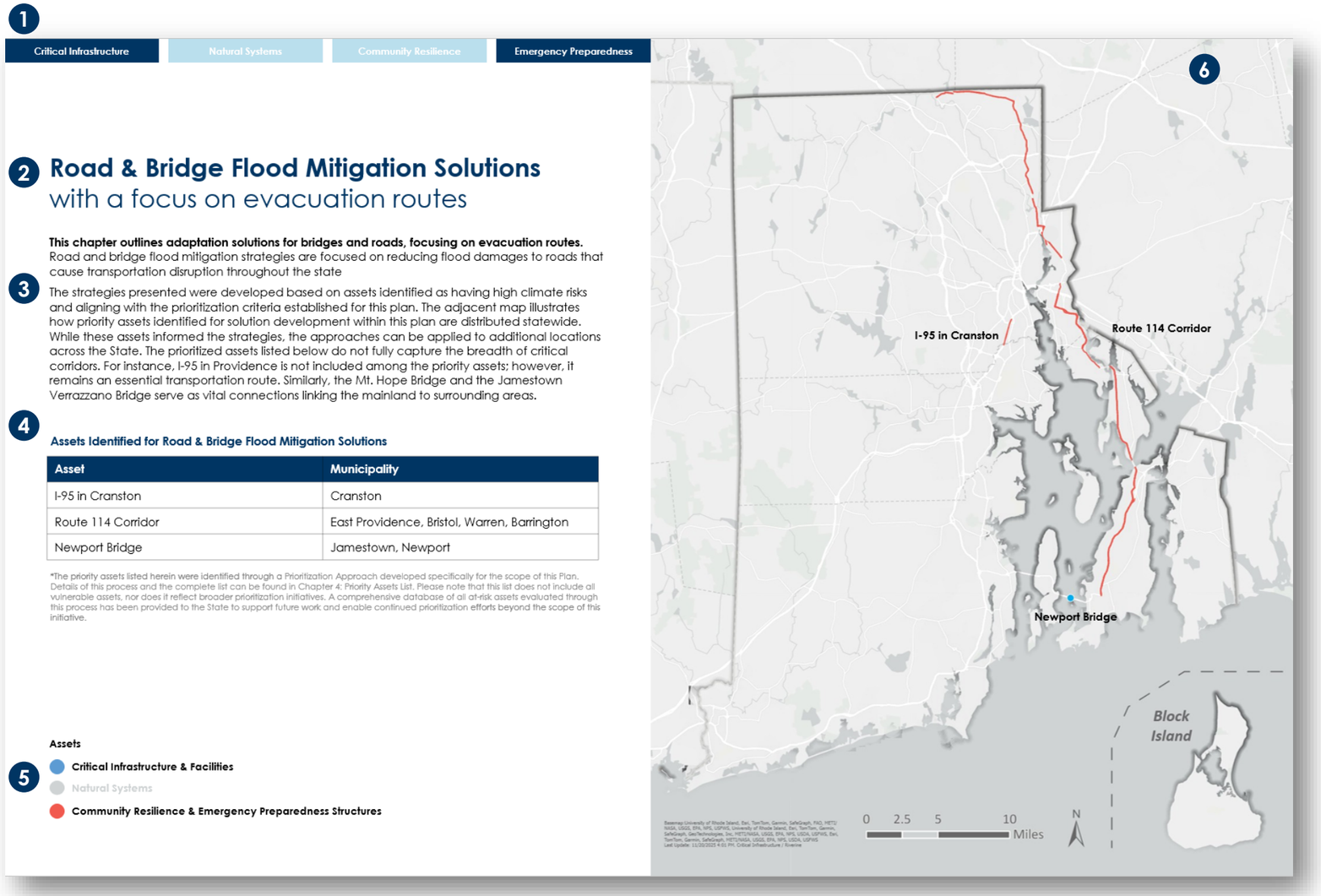
2. Asset-Specific Solution: Each section is organized by solutions for specific asset types.

3. Problem Statement: High-level summary of the solution type with a problem statement that identifies the relevant climate hazards and challenges.

4. Identified Priority Assets: Table of the priority assets identified through Chapter 3: Statewide Climate Vulnerability Assessment (SCV) and the prioritization process. These locations represent the asset types that the solution is designed to address.

5. Map Legend: Legend that highlights the relevant asset categories included in the solution. Asset categories in gray are not represented in the map.

6. Map: Display of the identified assets and their locations within the state.



Solution Summary Pages

How to Read this Document

1. Summary: Narrative summary describing the Rhode Island climate change impacts for the identified assets. Discusses how the solution will address the identified challenges.

2. Ongoing Actions: Summary of the current ongoing Rhode Island activities for the solution and asset types.

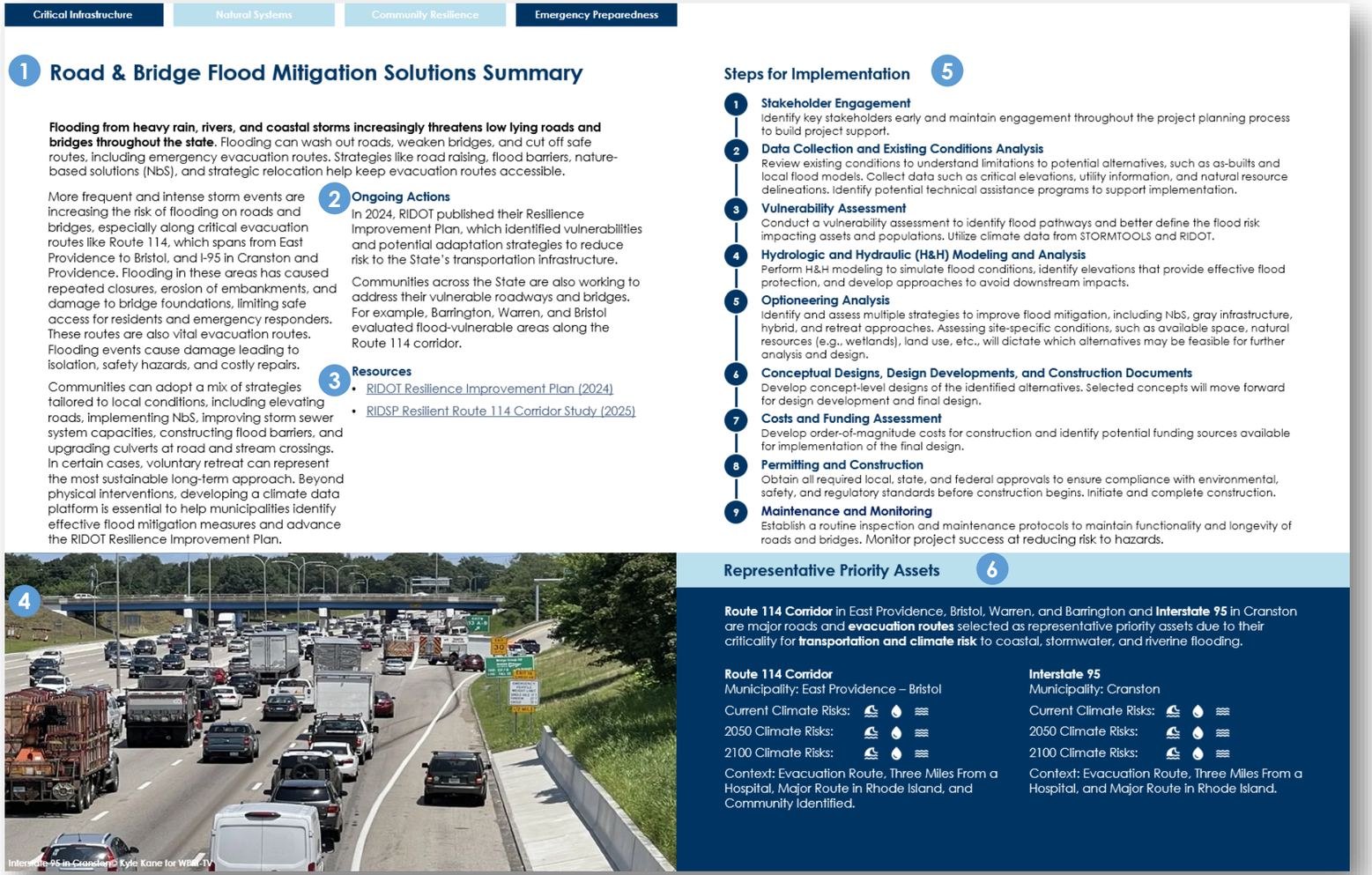
3. Resources: Links to the direct resources covered by the ongoing actions.

4. Precedent Image: Image of one of the representative priority assets.

5. Steps for Implementation: High level list of the necessary steps key players need to take to implement solutions.

6. Representative Priority Assets: One to two assets from the identified priority asset lists are selected as representative priority assets. The solutions developed were specifically created for these assets. Results from Chapter 3: Statewide Climate Vulnerability Assessment (SCV) are included under the climate risks. A symbol represents high or very high climate risk in the identified time horizon, see legend below:

- **Coastal Flooding**
- **Stormwater Flooding**
- **Riverine Flooding**
- **Extreme Heat**
- **Extreme Wind**



Critical Infrastructure | Natural Systems | Community Resilience | Emergency Preparedness

1 Road & Bridge Flood Mitigation Solutions Summary

Flooding from heavy rain, rivers, and coastal storms increasingly threatens low lying roads and bridges throughout the state. Flooding can wash out roads, weaken bridges, and cut off safe routes, including emergency evacuation routes. Strategies like road raising, flood barriers, nature-based solutions (NbS), and strategic relocation help keep evacuation routes accessible.

More frequent and intense storm events are increasing the risk of flooding on roads and bridges, especially along critical evacuation routes like Route 114, which spans from East Providence to Bristol, and I-95 in Cranston and Providence. Flooding in these areas has caused repeated closures, erosion of embankments, and damage to bridge foundations, limiting safe access for residents and emergency responders. These routes are also vital evacuation routes. Flooding events cause damage leading to isolation, safety hazards, and costly repairs.

Communities can adopt a mix of strategies tailored to local conditions, including elevating roads, implementing NbS, improving storm sewer system capacities, constructing flood barriers, and upgrading culverts at road and stream crossings. In certain cases, voluntary retreat can represent the most sustainable long-term approach. Beyond physical interventions, developing a climate data platform is essential to help municipalities identify effective flood mitigation measures and advance the RIDOT Resilience Improvement Plan.

2 Ongoing Actions

In 2024, RIDOT published their Resilience Improvement Plan, which identified vulnerabilities and potential adaptation strategies to reduce risk to the State's transportation infrastructure.

Communities across the State are also working to address their vulnerable roadways and bridges. For example, Barrington, Warren, and Bristol evaluated flood-vulnerable areas along the Route 114 corridor.

3 Resources

- RIDOT Resilience Improvement Plan (2024)
- RIDSP Resilient Route 114 Corridor Study (2025)

Steps for Implementation 5

1. **Stakeholder Engagement**
   Identify key stakeholders early and maintain engagement throughout the project planning process to build project support.
2. **Data Collection and Existing Conditions Analysis**
   Review existing conditions to understand limitations to potential alternatives, such as as-builts and local flood models. Collect data such as critical elevations, utility information, and natural resource delineations. Identify potential technical assistance programs to support implementation.
3. **Vulnerability Assessment**
   Conduct a vulnerability assessment to identify flood pathways and better define the flood risk impacting assets and populations. Utilize climate data from STORMTOOLS and RIDOT.
4. **Hydrologic and Hydraulic (H&H) Modeling and Analysis**
   Perform H&H modeling to simulate flood conditions, identify elevations that provide effective flood protection, and develop approaches to avoid downstream impacts.
5. **Optioneering Analysis**
   Identify and assess multiple strategies to improve flood mitigation, including NbS, gray infrastructure, hybrid, and retreat approaches. Assessing site-specific conditions, such as available space, natural resources (e.g., wetlands), land use, etc., will dictate which alternatives may be feasible for further analysis and design.
6. **Conceptual Designs, Design Developments, and Construction Documents**
   Develop concept-level designs of the identified alternatives. Selected concepts will move forward for design development and final design.
7. **Costs and Funding Assessment**
   Develop order-of-magnitude costs for construction and identify potential funding sources available for implementation of the final design.
8. **Permitting and Construction**
   Obtain all required local, state, and federal approvals to ensure compliance with environmental, safety, and regulatory standards before construction begins. Initiate and complete construction.
9. **Maintenance and Monitoring**
   Establish a routine inspection and maintenance protocols to maintain functionality and longevity of roads and bridges. Monitor project success at reducing risk to hazards.

4

Interstate 95 in Cranston © Kyle Kane for WPRI-TV

Representative Priority Assets 6

Route 114 Corridor in East Providence, Bristol, Warren, and Barrington and **Interstate 95** in Cranston are major roads and **evacuation routes** selected as representative priority assets due to their criticality for **transportation and climate risk** to coastal, stormwater, and riverine flooding.

Route 114 Corridor
Municipality: East Providence – Bristol
Current Climate Risks:
2050 Climate Risks:
2100 Climate Risks:
Context: Evacuation Route, Three Miles From a Hospital, Major Route in Rhode Island, and Community Identified.

Interstate 95
Municipality: Cranston
Current Climate Risks:
2050 Climate Risks:
2100 Climate Risks:
Context: Evacuation Route, Three Miles From a Hospital, and Major Route in Rhode Island.

Strategy Pages

How to Read this Document

1. Summary of Strategies: This page provides examples of solution strategies that work together to address the current climate challenges.

2. Strategy Type: Each strategy section starts with the title of the strategy. There is then supporting narrative that explains the strategy and how it addresses climate challenges.

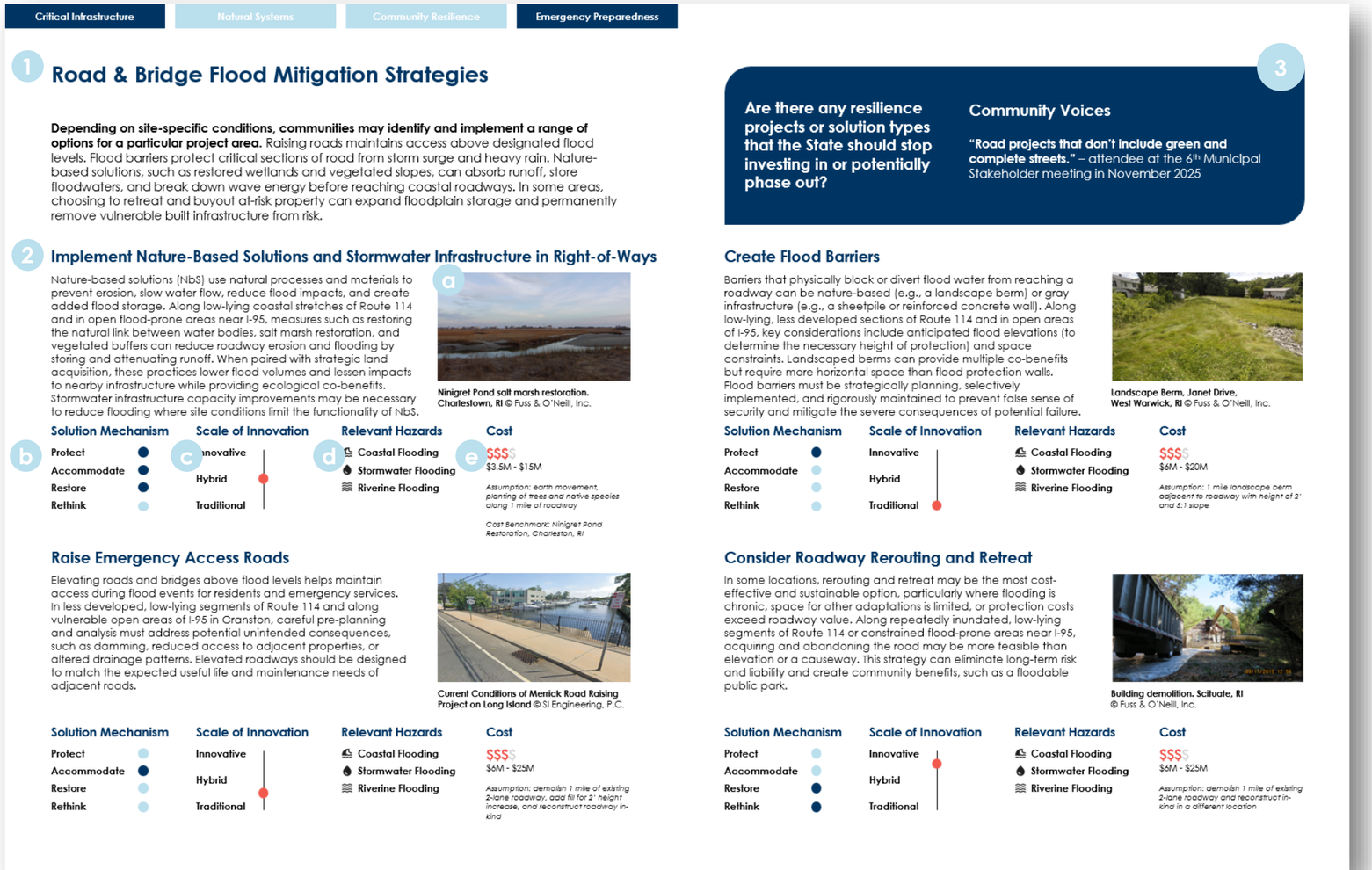
a. Precedent Image: A precedent image shows what strategy implementation looks like or a potential asset where the strategy could be applied.

b. Solution Mechanism: Highlights the relevant solution mechanism.

- **Protect:** Defend vulnerable areas using physical or engineered measures.
- **Accommodate:** Adapt buildings and infrastructure to withstand changing conditions.
- **Restore:** Rehabilitate natural systems to buffer against hazards.
- **Rethink:** Reevaluate planning strategies and support people, infrastructure, and critical assets relocate away from high-risk areas.

c. Scale of Innovation: Ranks the scale of innovation. Traditional represents routine best practice, innovative is a more novel approach, and hybrid is a mixture of the two.

d. Relevant Hazards: Identifies the climate hazards that are mitigated by the strategy. The same icons are used from the prior slide.



e. Cost: Represents the estimated scale of cost.

$: < $1M
$$: $1M – $5M
$$$: $5M – $15M
$$$$: > $15M

Unit metrics and cost assumptions are also included for each solution.

3. Community Voices: Shows a relevant quote or takeaway from the engagement process.

Funding Strategy Pages

How to Read this Document

1. Funding Summary: This page provides a summary of the funding strategy needed to implement the solution.

2. Costs: Provides a summary of the assumptions and the relative cost of the strategy including the specific precedents and assumptions used.

3. Benefits: Provides a summary of the benefits of implementing the solution particularly as they relate to the consequences assessed in the Chapter 3: Statewide Climate Vulnerability Assessment (SCV).

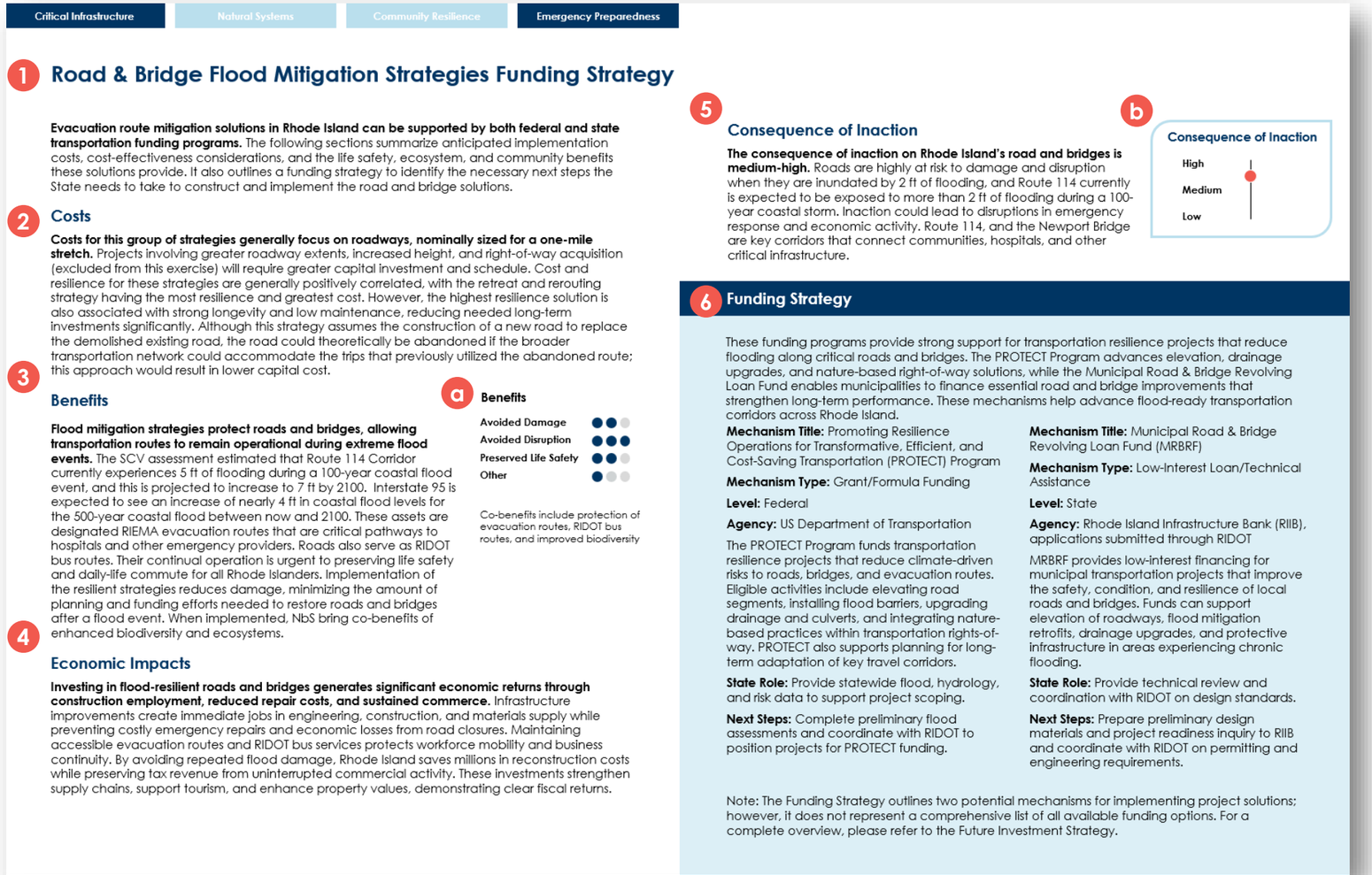
a. Benefit Types: Highlights the relevant benefits associated with the solution

- **Three Dots:** Benefit addresses the primary consequence in the SCV assessment.
- **Two Dots:** Benefit addresses a cascading consequence in SCV assessment, or the benefit was found very significant in literature review research.
- **One Dot:** Benefit identified in the prioritization criteria process or through the literature review research.
- **No Dot:** Benefit not relevant.

4. Economic Impacts: Summary of the impact (jobs, earnings, sales) and fiscal benefit (sales tax and income tax) that would be generated for Rhode Island for the proposed projects.

5. Consequences of Inaction: Description of the consequences that could occur for the asset and State more broadly if action is not taken.

6. Funding Strategy: Description of example potential funding mechanisms, the state's role in implementation and immediate next steps.



b. Consequences of Inaction Scale: Relative consequence of inaction.

- **High:** Severe consequences, including major life safety risks and cascading failures.
- **Medium:** Significant disruptions, economic losses, and potential damage to infrastructure, but no immediate life safety threats.
- **Low:** Minimal impact due to existing redundancies.

Assumptions and Qualifications

Data & Information

This report relies on information provided by others to determine current and future climate conditions for hazard assessment and to develop resilience solutions. Arup does not accept responsibility for the content, including the accuracy and completeness, of such information. Arup emphasizes that the forward-looking projections, forecasts, or estimates, are based upon interpretations or assessments of available information at the time of this project.

Priority Assets, Resilience Strategies & Jurisdiction

The current and future natural hazard exposure and risk of any site is dependent on many factors beyond Arup's control, including uncertainties around existing project sites and their construction details, natural hazards, and climate change.

Any climate resilience strategy includes potential residual risks. The resilience solutions described in this report are not guaranteed nor intended to eliminate all climate risk but are intended to be a tool to reduce climate-related damage and/or disruption. Arup shall not be responsible for damages or impacts associated with the performance of the climate resilience systems.

The realization of the prospective risks is dependent upon the continued validity of the assumptions on which it is based. Actual events frequently do not occur as expected, and the differences may be material. For this reason, Arup bears no responsibility for the realization of any projection, forecast, opinion or estimate. Findings are time-sensitive and relevant only to current conditions at the time of writing.

This plan does not confirm the feasibility or effectiveness of the strategies outlined as they relate to the designated Priority Assets. It provides a framework of specific steps to advance the proposed solutions from initial identification through to potential implementation. All proposed strategies require comprehensive due diligence, stakeholder engagement, detailed planning, design, and costing for each strategy and location identified.

Actions and strategies outlined in this plan may fall under municipal rather than state jurisdiction. Therefore, successful implementation of these actions may require local participation and coordination.

Costing

Cost estimates for each solution type are categorized as Class 5 based on the Association for the Advancement of Cost Engineering International (AACEi) cost estimate classification matrix based on indicative scope and benchmark projects.

The accuracy range for these class 5 cost estimates are assumed to be +100% / -50%.

Benchmark projects are sourced from desktop research and Arup's internal database. Benchmark costs are normalized to Rhode Island cost basis using 2025 City Cost Indices from RSMeans. Benchmark costs are escalated to 2025 cost basis using the Construction Cost Index (CCI) from Engineering News Record (ENR).

Scope assumptions are made based on benchmark projects, proposed scope to be included, and sized relative to other strategies considering possible size of potential future projects. Parametric costing (utilizing a defined quantity and unit rate) is employed where possible. Allowances are estimated to account for scope intended to be included in the project when sufficient detail or context for parametric costing was not available.

Costs for actual projects will vary based on a variety of factors including but not limited to defined extent of scope, project-specific risks, site constraints, environmental scope, construction delivery method, stakeholder engagement, funding mechanisms, existing asset operations and potential downtime, and/or market factors.

Funding

Funding sources were identified in Summer 2025 and represent a point in time assessment. This plan does not guarantee the availability, continuation, or applicability of these sources.

All funding sources should be verified for current availability and applicability before pursuing them.

Due to changing federal priorities in both policy and funding, agencies across state government have been facing challenges in program implementation. As these changes impact agency resources including the state budget, timelines and commitments will shift, as necessary.



Nag Marsh Sunset © Narragansett Bay National Estuarine Research Reserve (NBNERR)

Critical Infrastructure
Adaptation Solutions

Road & Bridge Flood Mitigation Solutions with a focus on evacuation routes

Resilient Port Infrastructure Solutions

Energy Resilience Solutions with a focus on Washington County and Block Island

Sewer & Stormwater Infrastructure Solutions

Wastewater Treatment Facilities Hardening

Drinking Water & Reservoir Resilience

Road & Bridge Flood Mitigation Solutions
with a focus on evacuation routes

This chapter outlines adaptation solutions for bridges and roads, focusing on evacuation routes. Road and bridge flood mitigation strategies are focused on reducing flood damages to roads that cause transportation disruption throughout the state

The strategies presented were developed based on assets identified as having high climate risks and aligning with the prioritization criteria established for this plan. The adjacent map illustrates how priority assets identified for solution development within this plan are distributed statewide. While these assets informed the strategies, the approaches can be applied to additional locations across the State. The prioritized assets listed below do not fully capture the breadth of critical corridors. For instance, I-95 in Providence is not included among the priority assets; however, it remains an essential transportation route. Similarly, the Mt. Hope Bridge and the Jamestown Verrazzano Bridge serve as vital connections linking the mainland to surrounding areas.

Assets Identified for Road & Bridge Flood Mitigation Solutions

Asset	Municipality
I-95 in Cranston	Cranston
Route 114 Corridor	East Providence, Bristol, Warren, Barrington
Newport Bridge	Jamestown, Newport

*The priority assets listed herein were identified through a Prioritization Approach developed specifically for the scope of this Plan. Details of this process and the complete list can be found in Chapter 4: Priority Assets List. Please note that this list does not include all vulnerable assets, nor does it reflect broader prioritization initiatives. A comprehensive database of all at-risk assets evaluated through this process has been provided to the State to support future work and enable continued prioritization efforts beyond the scope of this initiative.



Road & Bridge Flood Mitigation Solutions Summary

Flooding from heavy rain, rivers, and coastal storms increasingly threatens low lying roads and bridges throughout the state. Flooding can wash out roads, weaken bridges, and cut off safe routes, including emergency evacuation routes. Strategies like road raising, flood barriers, nature-based solutions (NbS), and strategic relocation help keep evacuation routes accessible.

More frequent and intense storm events are increasing the risk of flooding on roads and bridges, especially along critical evacuation routes like Route 114, which spans from East Providence to Bristol, and I-95 in Cranston and Providence. Flooding in these areas has caused repeated closures, erosion of embankments, and damage to bridge foundations, limiting safe access for residents and emergency responders. These routes are also vital evacuation routes. Flooding events cause damage leading to isolation, safety hazards, and costly repairs.

Communities can adopt a mix of strategies tailored to local conditions, including elevating roads, implementing NbS, improving storm sewer system capacities, constructing flood barriers, and upgrading culverts at road and stream crossings. In certain cases, voluntary retreat can represent the most sustainable long-term approach. Beyond physical interventions, developing a climate data platform is essential to help municipalities identify effective flood mitigation measures and advance the RIDOT Resilience Improvement Plan.

Ongoing Actions

In 2024, RIDOT published their Resilience Improvement Plan, which identified vulnerabilities and potential adaptation strategies to reduce risk to the State's transportation infrastructure.

Communities across the State are also working to address their vulnerable roadways and bridges. For example, Barrington, Warren, and Bristol evaluated flood-vulnerable areas along the Route 114 corridor.

Resources

- RIDOT Resilience Improvement Plan (2024)
- RIDSP Resilient Route 114 Corridor Study (2025)



Interstate 95 in Cranston© Kyle Kane for WPRI-TV

Steps for Implementation

1. **Stakeholder Engagement**
   Identify key stakeholders early and maintain engagement throughout the project planning process to build project support.
2. **Data Collection and Existing Conditions Analysis**
   Review existing conditions to understand limitations to potential alternatives, such as as-builts and local flood models. Collect data such as critical elevations, utility information, and natural resource delineations. Identify potential technical assistance programs to support implementation.
3. **Vulnerability Assessment**
   Conduct a vulnerability assessment to identify flood pathways and better define the flood risk impacting assets and populations. Utilize climate data from STORMTOOLS and RIDOT.
4. **Hydrologic and Hydraulic (H&H) Modeling and Analysis**
   Perform H&H modeling to simulate flood conditions, identify elevations that provide effective flood protection, and develop approaches to avoid downstream impacts.
5. **Optioneering Analysis**
   Identify and assess multiple strategies to improve flood mitigation, including NbS, gray infrastructure, hybrid, and retreat approaches. Assessing site-specific conditions, such as available space, natural resources (e.g., wetlands), land use, etc., will dictate which alternatives may be feasible for further analysis and design.
6. **Conceptual Designs, Design Developments, and Construction Documents**
   Develop concept-level designs of the identified alternatives. Selected concepts will move forward for design development and final design.
7. **Costs and Funding Assessment**
   Develop order-of-magnitude costs for construction and identify potential funding sources available for implementation of the final design.
8. **Permitting and Construction**
   Obtain all required local, state, and federal approvals to ensure compliance with environmental, safety, and regulatory standards before construction begins. Initiate and complete construction.
9. **Maintenance and Monitoring**
   Establish a routine inspection and maintenance protocols to maintain functionality and longevity of roads and bridges. Monitor project success at reducing risk to hazards.

Representative Priority Assets

Route 114 Corridor in East Providence, Bristol, Warren, and Barrington and **Interstate 95** in Cranston are major roads and **evacuation routes** selected as representative priority assets due to their criticality for **transportation and climate risk** to coastal, stormwater, and riverine flooding.

Route 114 Corridor
Municipality: East Providence – Bristol
Current Climate Risks:
2050 Climate Risks:
2100 Climate Risks:
Context: Evacuation Route, Three Miles From a Hospital, Major Route in Rhode Island, and Community Identified.

Interstate 95
Municipality: Cranston
Current Climate Risks:
2050 Climate Risks:
2100 Climate Risks:
Context: Evacuation Route, Three Miles From a Hospital, and Major Route in Rhode Island.

Road & Bridge Flood Mitigation Strategies

Depending on site-specific conditions, communities may identify and implement a range of options for a particular project area. Raising roads maintains access above designated flood levels. Flood barriers protect critical sections of road from storm surge and heavy rain. Nature-based solutions, such as restored wetlands and vegetated slopes, can absorb runoff, store floodwaters, and break down wave energy before reaching coastal roadways. In some areas, choosing to retreat and buyout at-risk property can expand floodplain storage and permanently remove vulnerable built infrastructure from risk.

Are there any resilience projects or solution types that the State should stop investing in or potentially phase out?

Community Voices

"Road projects that don't include green and complete streets." – attendee at the 6th Municipal Stakeholder meeting in November 2025

Implement Nature-Based Solutions and Stormwater Infrastructure in Right-of-Ways

Nature-based solutions (NbS) use natural processes and materials to prevent erosion, slow water flow, reduce flood impacts, and create added flood storage. Along low-lying coastal stretches of Route 114 and in open flood-prone areas near I-95, measures such as restoring the natural link between water bodies, salt marsh restoration, and vegetated buffers can reduce roadway erosion and flooding by storing and attenuating runoff. When paired with strategic land acquisition, these practices lower flood volumes and lessen impacts to nearby infrastructure while providing ecological co-benefits. Stormwater infrastructure capacity improvements may be necessary to reduce flooding where site conditions limit the functionality of NbS.



Ninigret Pond salt marsh restoration. Charlestown, RI © Fuss & O'Neill, Inc.

Solution Mechanism
- **Protect** ●
- **Accommodate** ●
- **Restore** ●
- **Rethink** ○

Scale of Innovation
- **Innovative**
- **Hybrid** ●
- **Traditional**

Relevant Hazards
- **Coastal Flooding**
- **Stormwater Flooding**
- **Riverine Flooding**

Cost

$$$$
$3.5M - $15M

Assumption: earth movement, planting of trees and native species along 1 mile of roadway

Cost Benchmark: Ninigret Pond Restoration, Charleston, RI

Raise Emergency Access Roads

Elevating roads and bridges above flood levels helps maintain access during flood events for residents and emergency services. In less developed, low-lying segments of Route 114 and along vulnerable open areas of I-95 in Cranston, careful pre-planning and analysis must address potential unintended consequences, such as damming, reduced access to adjacent properties, or altered drainage patterns. Elevated roadways should be designed to match the expected useful life and maintenance needs of adjacent roads.



Current Conditions of Merrick Road Raising Project on Long Island © SI Engineering, P.C.

Solution Mechanism
- **Protect** ○
- **Accommodate** ●
- **Restore** ○
- **Rethink** ○

Scale of Innovation
- **Innovative**
- **Hybrid** ●
- **Traditional**

Relevant Hazards
- **Coastal Flooding**
- **Stormwater Flooding**
- **Riverine Flooding**

Cost

$$$$
$6M - $25M

Assumption: demolish 1 mile of existing 2-lane roadway, add fill for 2' height increase, and reconstruct roadway in-kind

Create Flood Barriers

Barriers that physically block or divert flood water from reaching a roadway can be nature-based (e.g., a landscape berm) or gray infrastructure (e.g., a sheetpile or reinforced concrete wall). Along low-lying, less developed sections of Route 114 and in open areas of I-95, key considerations include anticipated flood elevations (to determine the necessary height of protection) and space constraints. Landscaped berms can provide multiple co-benefits but require more horizontal space than flood protection walls. Flood barriers must be strategically planning, selectively implemented, and rigorously maintained to prevent false sense of security and mitigate the severe consequences of potential failure.



Landscape Berm, Janet Drive, West Warwick, RI © Fuss & O'Neill, Inc.

Solution Mechanism
- **Protect** ●
- **Accommodate** ○
- **Restore** ○
- **Rethink** ○

Scale of Innovation
- **Innovative**
- **Hybrid**
- **Traditional** ●

Relevant Hazards
- **Coastal Flooding**
- **Stormwater Flooding**
- **Riverine Flooding**

Cost

$$$$
$6M - $20M

Assumption: 1 mile landscape berm adjacent to roadway with height of 2' and 5:1 slope

Consider Roadway Rerouting and Retreat

In some locations, rerouting and retreat may be the most cost-effective and sustainable option, particularly where flooding is chronic, space for other adaptations is limited, or protection costs exceed roadway value. Along repeatedly inundated, low-lying segments of Route 114 or constrained flood-prone areas near I-95, acquiring and abandoning the road may be more feasible than elevation or a causeway. This strategy can eliminate long-term risk and liability and create community benefits, such as a floodable public park.



Building demolition. Scituate, RI © Fuss & O'Neill, Inc.

Solution Mechanism
- **Protect** ○
- **Accommodate** ○
- **Restore** ●
- **Rethink** ●

Scale of Innovation
- **Innovative**
- **Hybrid** ●
- **Traditional**

Relevant Hazards
- **Coastal Flooding**
- **Stormwater Flooding**
- **Riverine Flooding**

Cost

$$$$
$6M - $25M

Assumption: demolish 1 mile of existing 2-lane roadway and reconstruct in-kind in a different location

Road & Bridge Flood Mitigation Strategies Funding Strategy

Evacuation route mitigation solutions in Rhode Island can be supported by both federal and state transportation funding programs. The following sections summarize anticipated implementation costs, cost-effectiveness considerations, and the life safety, ecosystem, and community benefits these solutions provide. It also outlines a funding strategy to identify the necessary next steps the State needs to take to construct and implement the road and bridge solutions.

Costs

Costs for this group of strategies generally focus on roadways, nominally sized for a one-mile stretch. Projects involving greater roadway extents, increased height, and right-of-way acquisition (excluded from this exercise) will require greater capital investment and schedule. Cost and resilience for these strategies are generally positively correlated, with the retreat and rerouting strategy having the most resilience and greatest cost. However, the highest resilience solution is also associated with strong longevity and low maintenance, reducing needed long-term investments significantly. Although this strategy assumes the construction of a new road to replace the demolished existing road, the road could theoretically be abandoned if the broader transportation network could accommodate the trips that previously utilized the abandoned route; this approach would result in lower capital cost.

Benefits

Flood mitigation strategies protect roads and bridges, allowing transportation routes to remain operational during extreme flood events. The SCV assessment estimated that Route 114 Corridor currently experiences 5 ft of flooding during a 100-year coastal flood event, and this is projected to increase to 7 ft by 2100. Interstate 95 is expected to see an increase of nearly 4 ft in coastal flood levels for the 500-year coastal flood between now and 2100. These assets are designated RIEMA evacuation routes that are critical pathways to hospitals and other emergency providers. Roads also serve as RIDOT bus routes. Their continual operation is urgent to preserving life safety and daily-life commute for all Rhode Islanders. Implementation of the resilient strategies reduces damage, minimizing the amount of planning and funding efforts needed to restore roads and bridges after a flood event. When implemented, NbS bring co-benefits of enhanced biodiversity and ecosystems.

Benefits

Avoided Damage	●●○
Avoided Disruption	●●●
Preserved Life Safety	●●○
Other	●○○

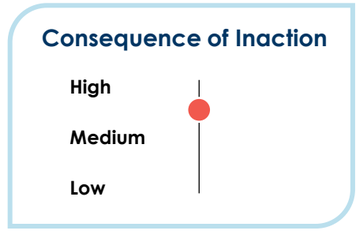
Co-benefits include protection of evacuation routes, RIDOT bus routes, and improved biodiversity

Economic Impacts

Investing in flood-resilient roads and bridges generates significant economic returns through construction employment, reduced repair costs, and sustained commerce. Infrastructure improvements create immediate jobs in engineering, construction, and materials supply while preventing costly emergency repairs and economic losses from road closures. Maintaining accessible evacuation routes and RIDOT bus services protects workforce mobility and business continuity. By avoiding repeated flood damage, Rhode Island saves millions in reconstruction costs while preserving tax revenue from uninterrupted commercial activity. These investments strengthen supply chains, support tourism, and enhance property values, demonstrating clear fiscal returns.

Consequence of Inaction

The consequence of inaction on Rhode Island's road and bridges is medium-high. Roads are highly at risk to damage and disruption when they are inundated by 2 ft of flooding, and Route 114 currently is expected to be exposed to more than 2 ft of flooding during a 100-year coastal storm. Inaction could lead to disruptions in emergency response and economic activity. Route 114, and the Newport Bridge are key corridors that connect communities, hospitals, and other critical infrastructure.



Funding Strategy

These funding programs provide strong support for transportation resilience projects that reduce flooding along critical roads and bridges. The PROTECT Program advances elevation, drainage upgrades, and nature-based right-of-way solutions, while the Municipal Road & Bridge Revolving Loan Fund enables municipalities to finance essential road and bridge improvements that strengthen long-term performance. These mechanisms help advance flood-ready transportation corridors across Rhode Island.

Mechanism Title: Promoting Resilience Operations for Transformative, Efficient, and Cost-Saving Transportation (PROTECT) Program

Mechanism Type: Grant/Formula Funding

Level: Federal

Agency: US Department of Transportation

The PROTECT Program funds transportation resilience projects that reduce climate-driven risks to roads, bridges, and evacuation routes. Eligible activities include elevating road segments, installing flood barriers, upgrading drainage and culverts, and integrating nature-based practices within transportation rights-of-way. PROTECT also supports planning for long-term adaptation of key travel corridors.

State Role: Provide statewide flood, hydrology, and risk data to support project scoping.

Next Steps: Complete preliminary flood assessments and coordinate with RIDOT to position projects for PROTECT funding.

Mechanism Title: Municipal Road & Bridge Revolving Loan Fund (MRBRF)

Mechanism Type: Low-Interest Loan/Technical Assistance

Level: State

Agency: Rhode Island Infrastructure Bank (RIIB), applications submitted through RIDOT

MRBRF provides low-interest financing for municipal transportation projects that improve the safety, condition, and resilience of local roads and bridges. Funds can support elevation of roadways, flood mitigation retrofits, drainage upgrades, and protective infrastructure in areas experiencing chronic flooding.

State Role: Provide technical review and coordination with RIDOT on design standards.

Next Steps: Prepare preliminary design materials and project readiness inquiry to RIIB and coordinate with RIDOT on permitting and engineering requirements.

Note: The Funding Strategy outlines two potential mechanisms for implementing project solutions; however, it does not represent a comprehensive list of all available funding options. For a complete overview, please refer to the Future Investment Strategy.

Resilient Port Infrastructure Solutions

This chapter outlines adaptation solutions for ports and commercial harbors. Resilient port infrastructure strategies are focused on reducing flooding impacts to reduce damage and ensure continual operations of Rhode Island's ports.

The strategies presented were developed based on assets identified as having high climate risks and aligning with the prioritization criteria established for this plan. The adjacent map illustrates how priority assets identified for solution development within this plan are distributed statewide. While these assets informed the strategies, the approaches can be applied to additional locations across the state.

Assets Identified for Resilient Port Infrastructure Solutions

Asset	Municipality
Block Island - Port of Galilee Ferry Connectivity	New Shoreham and Narragansett
Port of Providence Infrastructure	Providence

*The priority assets listed herein were identified through a Prioritization Approach developed specifically for the scope of this Plan. Details of this process and the complete list can be found in Chapter 4: Priority Assets List. Please note that this list does not include all vulnerable assets, nor does it reflect broader prioritization initiatives. A comprehensive database of all at-risk assets evaluated through this process has been provided to the State to support future work and enable continued prioritization efforts beyond the scope of this initiative.



Resilient Port Infrastructure Solutions Summary

Rhode Island ports generate more than $200 million and provide 2,400 jobs for the State, while also providing important non-economic benefits such as mental well-being, social connection, recreation, and cultural identity. However, flooding and extreme wind impacts may cause damage to infrastructure and cascading disruptive impacts to delivery time and other port operations.

Rhode Island ports—like Port of Providence and Port of Galilee—are critical for year-round ferry service, cargo operations, and community access. Frequent flooding and extreme wind events are accelerating infrastructure degradation and causing widespread damage and cascading disruption. Rhode Island ports have experienced hurricane-related damage in the past, notably Hurricane Sandy caused harm to Port of Galilee's facilities and docks in 2012 (URI, 2016).

The port infrastructure solutions outlined herein are tailored to protect port and ferry infrastructure from flooding and extreme wind impacts and allow for incremental accommodating of changing conditions. Additionally, solutions support energy resilience to ensure continual operation of critical equipment, like cargo handling, storage, and security equipment at ports. Strategies follow Rhode Island Coastal Resources Management Council (CRMC) regulatory guidance.

Ongoing Actions

Current projects in the state include a Master Plan at Port of Providence (developed by ProvPort, Inc. and URI), a $15M elevation of port structures at Port of Galilee and Wickford Dock, as well as other climate studies and implementation projects.

Resources

- Clean Marina Program (2022)
- Freight Advisory Committee (2022)
- ProvPort Master Plan (Ongoing)
- Providence Community-Port Collaboration Pilot Project (2017)
- University of Rhode Island (URI) and City of Providence EMA Study (2024)
- Port of Galilee FEMA Project (2024)

Steps for Implementation

1. **Stakeholder Input**
   Conduct engagement with port leadership, operators, and staff to identify current challenges at the port and continue engagement throughout the project. Ensure that solutions align with stakeholder input and other ongoing resilience projects, such as the Port of Galilee FEMA project.
2. **Community Input**
   Conduct community engagement with local businesses and residents early to balance commercial needs with public access. Build off the lessons learned from the ProvPort MPAC and EPA Providence Community – Port Collaboration Project. Utilize the EPA Community-Port Collaboration Toolkit.
3. **Vulnerability Assessment**
   Conduct a vulnerability assessment to identify flood pathways and better define the flood risk impacting port infrastructure and accessibility. Utilize climate data from STORMTOOLS.
4. **Feasibility Planning and Optioneering Analysis**
   Develop a feasibility plan, factoring in near- and long-term adaptation strategies for climate change. Conduct an optioneering analysis to determine the most effective resilience solution.
5. **Conceptual Designs, Design Developments, and Construction Documents**
   Develop concept-level designs for port infrastructure improvements based on community and stakeholder input and feasibility and optioneering analysis. Selected concepts will move forward for design development and final design.
6. **Costs and Funding Assessment**
   Develop order-of-magnitude costs for construction and identify potential funding sources available for implementation of the final design.
7. **Permitting and Construction**
   Procure the necessary permits for all infrastructure and water adjacent improvements, including working with the Rhode Island Coastal Resources Management Council (CRMC) and Army Corps of Engineers (ACOE) for approvals. Initiate and complete construction.
8. **Commissioning, Maintenance, and Monitoring**
   Conduct necessary commissioning of energy systems to ensure functionality. Establish a routine inspection and maintenance protocols for of docks, bulkheads, NbS, and energy system, identifying roles for port operators. Monitor project success at reducing risk to hazards.



Port of Providence © Gridwealth

Representative Priority Assets

The **Port of Galilee** and **Port of Providence**, two key commercial and industrial hubs, are selected as representative priority assets due to their significant **climate risk** for coastal and stormwater flooding and critical role in supporting the **state's economy and operations**, as identified by stakeholders. Port of Galilee also provides ferry service to Block Island.

Port of Galilee and Ferry Service
Municipality: Narragansett

Current Climate Risks:
2050 Climate Risks:
2100 Climate Risks:

Context: Commercial and Industrial Use Types and Stakeholder Identified. Ferry services provides Evacuation Route between mainland and Block Island.

Port of Providence
Municipality: Providence

Current Climate Risks:
2050 Climate Risks:
2100 Climate Risks:

Context: Commercial and Industrial Use Types and Stakeholder Identified.

Resilient Port Infrastructure Solutions Strategies

Together, these strategies protect against flooding, maintain vessel access, ensure continuity of critical operations, and enhance ecological resilience. This layered approach also provides alignment across ports. Currently, there are siloed port resilience projects and a lack of standardization and integration between projects. Statewide resilience standards can be developed from these strategies to help address a lack of standardization across projects and project components.

What's one vulnerable place or asset in your municipality we should not miss?

Community Voices

"Port of Galilee ferry connectivity." – attendee at the 2nd Municipal Meeting in July 2025

Integrate Dock and Pier System Improvements for Accessibility

Upgrade docks and piers with floating systems, reinforced decking, and ADA-compliant gangways to maintain safe and reliable access during tidal changes and after storm events. These improvements allow flexibility for varying water levels and ensure operational continuity for ferries and cargo handling. Follow municipal and State priorities for floating dock design and use hurricane-rated hardware for durability. Regular maintenance includes annual inspections of connections and decking, adjusting gangways, and replacing worn components to extend the design life of 25–40 years. Also incorporate shade structures to provide protection from extreme heat at passenger queueing areas.



Port of Galilee © Town off Narragansett

Solution Mechanism
- Protect
- Accommodate
- Restore
- Rethink

Scale of Innovation
- Innovative
- Hybrid
- Traditional

Relevant Hazards
- Coastal Flooding
- Riverine Flooding
- Extreme Heat

Cost

$$$$
$9M - $35M

Assumption: replace 10 existing fixed piers (each 150'x10') with floating concrete docks with accessible gangways and associated utility works

Cost Benchmark: Port of Galilee – North Facility, Narragansett, RI

Elevate Bulkheads and Flood Barriers

Raise and strengthen bulkheads to withstand sea-level rise while maintaining operational access for ferries and cargo vessels. Improvements include using corrosion-resistant steel or reinforced concrete, adding tie-back anchors for stability, and integrating deployable flood barriers for extreme weather events. Where feasible, hybrid designs combine bulkheads with nature-based elements to reduce wave energy and improve habitat. Maintenance includes annual inspections for cracks, corrosion, and settlement and periodic structural reinforcement. Installing sensors or visual markers can help monitor movement and erosion over time.



Port of Galilee © Pare Corporation

Solution Mechanism
- Protect
- Accommodate
- Restore
- Rethink

Scale of Innovation
- Innovative
- Hybrid
- Traditional

Relevant Hazards
- Coastal Flooding
- Riverine Flooding

Cost

$$$$
$25M - $95M

Assumption: site clearance and demolish of existing pavement, construct new bulkhead 3' above existing one, backfill, install tiebacks (10' spacing) to existing bulkhead, apply corrosion-resistant surfacing, and allowance for miscellaneous equipment and utility modifications

Design Hybrid Nature Based Solutions

Add salt marsh plantings, oyster reefs, and vegetated buffers along low-energy areas of ports to reduce wave energy, limit erosion, and improve water quality. These features work with bulkheads to protect infrastructure while supporting habitat. Such features can be partnered with species conservation and restoration measures to provide additional co-benefits. Design life varies; nature-based components need monitoring for plant health and sediment buildup. Best practices include hybrid designs where bulkheads meet natural edges and alignment with CRMC restoration guidelines.



Port of Quonset © Providence Journal

Solution Mechanism
- Protect
- Accommodate
- Restore
- Rethink

Scale of Innovation
- Innovative
- Hybrid
- Traditional

Relevant Hazards
- Coastal Flooding
- Stormwater Flooding
- Riverine Flooding

Cost

$$$$
$5M - $20M

Assumption: 1 mile of nature-based shoreline (e.g., salt marsh plantings, oyster reef, etc.)

Cost Benchmark: US Army Corps North Atlantic Coast Comprehensive Study

Install Energy and Backup Power Systems

Install elevated backup generators, solar PV, and battery storage to maintain critical port operations during outages. Generators provide immediate power for navigation aids, refrigeration, pumps, and security systems, while solar and battery systems add redundancy and sustainability. Microgrids can isolate essential loads during emergencies. Equipment should be elevated above flood levels and housed in waterproof enclosures, with systems sized for operational load requirements. Implementation should include automatic transfer switches and planning for at least 72 hours of backup power, coordinated with DEM's electrical upgrade priorities.



Exeter Mail solar Farm in Rhode Island
© Laura Paton for Rhode Island Current

Solution Mechanism
- Protect
- Accommodate
- Restore
- Rethink

Scale of Innovation
- Innovative
- Hybrid
- Traditional

Relevant Hazards
- Coastal Flooding
- Stormwater Flooding
- Riverine Flooding
- Extreme Heat
- Extreme Wind

Cost

$$$$
$3M - $15M

Assumption: install new back-up generators, solar PV, and battery storage

Cost Benchmark: Port of Seattle (Pier 69 Solar Project, Fishermen's Terminal Solar Demonstration Project)

Resilient Port Infrastructure Solutions Funding Strategy

Rhode Island's resilient port infrastructure strategy can be advanced through a mix of federal, state, and partnership-based funding that supports both structural upgrades and nature-based solutions. The following sections outline anticipated implementation costs, cost-effectiveness considerations, and the economic and community benefits of these investments. They also outline a few of the major funding mechanisms available, the State's role, and the next steps needed to position priority port assets for funding and construction.

Costs

Port infrastructure projects involving larger areas, increased barrier heights and number of dock improvements will require greater capital investments and increased duration for planning and implementing the strategy. Lower-cost measures, such as installing energy and backup power systems can vary in cost depending on the capacity of power systems installed. Mid-range investments like dock and pier system improvements enhance accessibility and operational continuity; however, total life cycle costs may increase when considering annual maintenance costs. The higher cost strategy, elevating bulkheads and flood barriers offers the most comprehensive protection against flooding and storm surge, significantly reducing vulnerability for critical assets, which could result in long-term savings.

Benefits

Ports are a key economic hub in Rhode Island, providing jobs and industry in shipping, commercial fishing, and recreation. The SCV assessment estimated that the Port of Providence and Galilee currently experience approximately 4.5 ft of flooding during a 100-year coastal flood event, and this is projected to increase to 7 ft of flooding by 2100. Resilient port infrastructure solutions minimize damage and disruption to port operations from extreme floods and winds. This directly protects economic resources for the state and for Rhode Islanders. Life safety is also protected for the operators and visitors at the port. The identified resilient strategies work together to bring additional co-benefits: backup power ensures reliable energy, ADA upgrades improves accessibility, and NbS enhances biodiversity and ecosystems.

Benefits

Avoided Damage	●●●
Avoided Disruption	●●●
Preserved Life Safety	●○○
Other	●○○

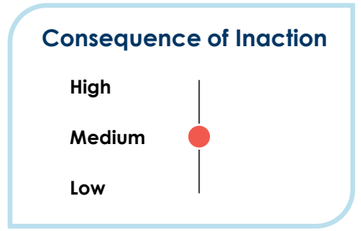
Co-benefits include improved economy, energy resilience, accessibility, and biodiversity.

Economic Impacts

Port resilience investments deliver economic benefits through sustained maritime commerce, protected jobs, and reduced disruption costs. Rhode Island's ports generate revenue and provide jobs in shipping, fishing, and recreation sectors plus the indirect impacts of that activity in supply chain and support industries. Infrastructure hardening prevents costly damage to critical facilities while maintaining ferry services, cargo operations, and supply chain reliability. Construction activities create direct employment in marine engineering and specialized trades. By ensuring operational continuity during climate events, these improvements protect port-dependent businesses, preserve tax revenues, and maintain Rhode Island's competitive position in regional maritime commerce.

Consequence of Inaction

The consequence of inaction on Rhode Island's port infrastructure is medium. Failure to invest in resilient port infrastructure can lead to disruptions in Rhode Island's transportation systems and economy. Communities like Block Island rely on ports for critical transportation needs. Ports also serve as hubs for maritime commerce, jobs, and the state supply chain. At the same time, there are less immediate life safety impacts related to port infrastructure, and resilience interventions are often expensive, reducing cost-effectiveness.



Funding Strategy

These funding mechanisms provide support for resilient port infrastructure solutions. These mechanisms enable both the structural upgrades needed to safeguard commercial and industrial port operations; the nature-based shoreline solutions that reduce erosion, wave energy; and long-term maintenance costs.

Mechanism Title: Port Infrastructure Development Program (PIPD)

Mechanism Type: Competitive Grant

Level: Federal

Agency: US Department of Transportation

PIDP funds port infrastructure projects that enhance safety, efficiency, and climate resilience. Eligible improvements include elevating or strengthening bulkheads, hardening docks and piers, upgrading electrical and backup power systems, modernizing navigation support structures, and improving access and cargo-handling infrastructure.

State Role: Support integration of multi-benefit components to strengthen competitiveness. Coordinate with port operators to align project scopes with statewide resilience priorities.

Next Steps: Develop preliminary designs and cost estimates.

Mechanism Title: Coastal Zone Management (CZM) Program

Mechanism Type: Technical Assistance / Competitive Grant

Level: Federal-State Partnership

Agency: RI Coastal Resources Management Council (CRMC)/ NOAA

The CZM Program funds coastal resilience and shoreline management activities, including hybrid NbS, vegetated buffers, marsh enhancement, erosion control measures, and shoreline stabilization adjacent to port assets. CZM also supports site assessments, engineering design, and permitting steps needed to integrate ecological resilience with port infrastructure upgrades.

State Role: Ensure alignment with Shoreline Change SAMPs and state coastal resilience strategies.

Next Steps: Begin early consultation with CRMC, RIDEM Coastal, and NOAA.

Note: The Funding Strategy outlines two potential mechanisms for implementing project solutions; however, it does not represent a comprehensive list of all available funding options. For a complete overview, please refer to the Future Investment Strategy.

Energy Resilience Solutions with a focus on Washington County and Block Island

This chapter outlines adaptation solutions for electrical transmission lines. Energy resilience strategies are focused on reducing flooding and extreme wind impacts to reduce power outages and ensure the reliable delivery of electricity.

The strategies presented were developed based on assets identified as having high climate risks and aligning with the prioritization criteria established for this plan. The adjacent map illustrates how priority assets identified for solution development within this plan are distributed statewide. While these assets informed the strategies, the approaches can be applied to additional locations across the state.

Assets Identified for Energy Resilience Solutions

Asset	Municipality
Block Island Energy Resilience (Transmission Lines & Block Island Power Company (BIPC) Connectivity)	New Shoreham
Washington County Transmission Lines	Multiple

*The priority assets listed herein were identified through a Prioritization Approach developed specifically for the scope of this Plan. Details of this process and the complete list can be found in Chapter 4: Priority Assets List. Please note that this list does not include all vulnerable assets, nor does it reflect broader prioritization initiatives. A comprehensive database of all at-risk assets evaluated through this process has been provided to the State to support future work and enable continued prioritization efforts beyond the scope of this initiative.



Energy Resilience Solutions Summary

Electrical transmission lines distribute electricity throughout Rhode Island. Damage to these assets from climate impacts can cause power outages throughout the state. Reliable power is necessary for healthcare and everyday life, making energy resilient solutions critical.

Everyday flooding, hurricanes, and Nor'easters can cause direct damage to transmission infrastructure, often resulting in downed power lines. At the same time, extreme heat increases energy demand for cooling systems, straining the electrical grid. Energy assets must be built for future intensified climate conditions to ensure continual reliable power throughout the state.

Transmission lines in areas with limited redundancy, like Block Island, and those at risk to extreme winds, like Washington County, should be prioritized for energy resilience solutions to ensure connectivity. To remove exposure to extreme wind, transmission lines should be constructed underground. To improve redundancy, the number of interconnection points between transmission lines and number of alternative routes should be increased. Vegetation and debris management also needs to be a part of regular maintenance procedures to reduce damage and downtime.

Ongoing Actions

Grid modernization and resilience planning is happening in Rhode Island through state planning efforts. The Rhode Island Energy 2025 ISR plan lays out the utility's strategy for improving reliability through the state.

Resources

- Rhode Island Energy Proposed FY 2025 Electric Infrastructure, Safety, and Reliability Plan (2023)
- Grid Modernization Plan (2022)
- Power Sector Transformation (2017)
- Rhode Island State Energy Plan (2015)

Steps for Implementation

1. **Feasibility Assessment and Stakeholder Engagement**
   Analyze soil conditions for undergrounding, identify high-risk corridors, and evaluate existing assets using data from the Rhode Island Energy 2025 Electric ISR Plan. Identify which assets are at End of Useful Life (EUL) and should be prioritized for retrofit. Coordinate with state and local utilities to determine current and future energy demand.
2. **Land Acquisition and Community Engagement**
   Engage communities to secure right-of-way and ensure equitable benefits. Partner with Health Equity Zone (HEZ) communities for inclusive planning throughout the project.
3. **Route Selection and Engineering Design**
   Select corridors for implementation. Plan trenching, determine optimal locations for additional substations or alternate routes, and set capacity, voltage, and reliability standards. Consider future energy demand in system design.
4. **Costs and Funding Assessment**
   Develop order-of-magnitude costs for construction and identify potential funding sources available for implementation of the final designs.
5. **Construction and Permitting**
   Obtain approvals for projects and source equipment. Excavate for and install conduits, new lines, substations, and interconnection facilities.
6. **Commissioning and Maintenance**
   Perform integrity and load tests. Integrate into existing electricity grid infrastructure. Conduct regular vegetation and debris removal for above ground transmission lines, monitor new assets, and conduct periodic inspections for compliance. Align upgrade and replacement strategy with EUL of existing assets. Consider embodied carbon impacts in the removal of energy assets.



Downed tree on electrical line in Rhode Island © The Providence Journal

Representative Priority Assets

The Block Island Power Company transmission lines are selected as a representative priority asset due to the system's criticality to the **island's operations,** as well as its **climate risk** to coastal flooding, stormwater flooding, and extreme heat. Additional **Washington County Transmission Lines** are selected, because they face **high wind risk**, causing power outages.

Block Island Power Company (BIPC)
Municipality: New Shoreham

Current Climate Risks:
2050 Climate Risks:
2100 Climate Risks:

Context: Electric Utility, Capacity 7.1 MW, and Community Identified.

Washington County Transmission Lines
Municipality: Multiple

Current Climate Risks:
2050 Climate Risks:
2100 Climate Risks:

Context: The County faces some of the highest wind risk in the state.

Energy Resilience Solutions Strategies

Together, these strategies will create energy resilience corridors that strengthen grid reliability, reduce outage risks, and enable rapid restoration after power disruptions. They offer a range of intervention levels to protect against climate hazards, from undergrounding transmission lines to developing new transmission lines and interconnection points. All transmissions lines should develop vegetation management into their maintenance operations to reduce the number of downed powerlines.



Participants at Community Forum 2 © Civic

Community Voices

"Barrington routinely has wind-related power failures. 2,000 properties recently, twice in past month, have a lot of trees and wind related storm damage." – attendee at the 2nd Municipal Stakeholder Meeting in July 2025

Expand Right-Of-Way (ROW) Area and Vegetation Management

Expand right-of-way (ROW) and vegetation and debris management to 65-100 feet (20-30 meters). Increasing right-of-way reduces the likelihood of vegetation or debris-related outages. These measures generally require higher upfront costs for land acquisition and construction, as well as ongoing vegetation management. At the same time, regular maintenance reduces costs for emergency repairs and outage frequency. Along with ROW enhancement, robust tower design on these routes can maximize resilience.



Arborist working in Rhode Island
© Allscapes Tree Service

Solution Mechanism
- **Protect**
- **Accommodate**
- **Restore**
- **Rethink**

Scale of Innovation
- **Innovative**
- **Hybrid**
- **Traditional**

Relevant Hazards
- **Extreme Wind**

Cost
$$$$
$1M - $4M

Assumption: clear 80' of ROW and trim vegetation along edges along 10-mile transmission corridor

Increase the Number of Interconnection Points

Increase the number of interconnection points between transmission systems in a meshed network design to enhance grid flexibility and reliability. This strategy can increase overall maintenance requirements by increasing the number of energy assets to maintain. However, additional interconnections allow for rerouting power during outages, reducing the risk of cascading failures.



An electrical substation in Providence, RI
© E.S. Boulos Company

Solution Mechanism
- **Protect**
- **Accommodate**
- **Restore**
- **Rethink**

Scale of Innovation
- **Innovative**
- **Hybrid**
- **Traditional**

Relevant Hazards
- **Coastal Flooding**
- **Stormwater Flooding**
- **Riverine Flooding**
- **Extreme Wind**

Cost
$$$$
$25M - $110M

Assumption: add 10 mile of new primary overhead transmission lines to create another connection point including minor expansion of local substations

Cost Benchmarks: Building Electric Transmission Lines Review (Lawrence Berkely National Laboratory

Create Alternative Transmission Routes

Develop redundant pathways to maintain service continuity during outages or damages to primary lines. This strategy is useful for rural communities, like New Shoreham, where there are fewer transmission routes. Building redundant pathways requires significant upfront investment in lines, substations, and land acquisition. While maintenance costs increase due to more infrastructure, these expenses are offset by reduced outage-related costs and improved resilience, which can prevent major economic losses during power disruptions.



Transmission lines in Greenwich, RI
© EG NEWS

Solution Mechanism
- **Protect**
- **Accommodate**
- **Restore**
- **Rethink**

Scale of Innovation
- **Innovative**
- **Hybrid**
- **Traditional**

Relevant Hazards
- **Coastal Flooding**
- **Stormwater Flooding**
- **Riverine Flooding**
- **Extreme Wind**

Cost
$$$$
$20M - $80M

Assumption: add 10 mile of new backup transmission line within existing ROW including minor expansion of local substations

Cost Benchmarks: Building Electric Transmission Lines Review (Lawrence Berkely National Laboratory)

Underground Transmission Lines in High-Risk Areas

Underground transmission lines in urban areas and areas at particularly high climate risk, such as North and South Kingstown. While underground transmission lines often require higher initial investment, these measures can reduce storm-related repair costs and improve long-term system reliability. Maintenance includes monitoring for water ingress, insulation integrity, and corrosion of metallic components, especially in areas with high groundwater or soil salinity or areas vulnerable to coastal flooding.



Workers replacing underground electrical lines © Associated Press

Solution Mechanism
- **Protect**
- **Accommodate**
- **Restore**
- **Rethink**

Scale of Innovation
- **Innovative**
- **Hybrid**
- **Traditional**

Relevant Hazards
- **Extreme Wind**

Cost
$$$$
$55M - $230M

Assumption: remove 1 mile of existing overhead lines and reinstall them underground

Cost Benchmark: Fairfield & Bridgeport Underground Transmission Line Project

Energy Resilience Solutions Funding Strategy

Rhode Island's energy resilience strategy can be advanced through coordinated federal and state funding that supports undergrounding transmission lines, adding redundancy through new interconnection points, and developing alternative routes for high-risk areas. The following sections summarize anticipated implementation costs, cost-effectiveness considerations, and the reliability, public safety, and economic benefits these upgrades provide. They also outline funding mechanisms available, the State's role, and the next steps needed to position priority transmission corridors for investment.

Costs

Projects that involve greater extents, modification to existing infrastructure, expanded capacity, and right-of-way acquisition (excluded from this exercise) will require greater capital investment and schedule. Energy related costs are generally higher than other resilience solutions, partially due to the increased coordination and sensitivity for these networks. Vegetation management within ROW is the lowest cost intervention. Adding or modifying electrical infrastructure requires significant investment but can prove worthwhile if intended benefits are realized. Backup transmission lines are generally less costly than new main lines, and construction within existing ROW and existing towers saves money compared to new lines in new ROW. Underground transmission is significantly more expensive vs. overhead but may only be necessary for urban applications; underground transmission represents a much more resilient alternative and requires less maintenance.

Benefits

Hurricanes, Nor'easters, and flood events bring extreme wind events that down transmission lines directly, or indirectly through fallen vegetation debris, causing widespread power outages. Energy resilient solutions protect transmission lines from this damage and accommodate for power outages through redundant and alternative pathways. Reliable energy is especially essential in rural areas, like Block Island, where there are fewer backup options. Electrical power is a critical necessity to ensure operation of every-day activities and public health needs, from food refrigeration to critical health care procedures.

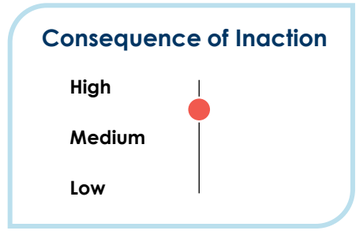


Economic Impacts

Upgrading transmission infrastructure creates construction jobs while preventing economic losses from power outages. Reliable electricity is essential for healthcare, business operations, and daily commerce throughout Rhode Island. Underground lines and enhanced interconnections reduce storm-related repair costs and service interruptions that disrupt economic activity. These investments support grid modernization efforts, attract businesses requiring reliable power, and protect critical facilities. By minimizing outage frequency and duration, energy resilience measures preserve productivity, prevent spoilage losses, maintain digital commerce, and protect the state's reputation for infrastructure reliability.

Consequence of Inaction

The consequence of inaction on Rhode Island's energy infrastructure is medium-high. Electrical transmission lines face a high risk of damage and disruption during a 100-year Category 2 wind event. Current projections from the SCV Assessment indicate that Washington County transmissions lines could be exposed to theses wind speeds, underscoring the need for action. Energy failure could trigger cascading disruptions across multiple sectors. Rural areas, like Block Island, are more vulnerable due to limited backup. However, resilience interventions tend to be costly, making proactive planning critical.



Funding Strategy

These funding mechanisms provide strong support for energy system upgrades that improve grid reliability and reduce outage risks. These programs offer a coordinated pathway to advance transmission resilience in high-risk areas such as Washington County and Block Island.

Mechanism Title: Grid Resilience and Promoting Resilient Outage Prevention (PROP) - Section 40101(d)

Mechanism Type: Grant

Level: Federal

Agency: US Department of Energy & RI OER

PROP provides formula funding to states and territories to strengthen electric grid resilience against extreme weather and natural hazards. Funds support utility and community-scale projects that reduce outage frequency and duration through infrastructure hardening, equipment upgrades, innovative technologies, and enhanced system operations.

State Role: Distribute annual formula allocations, set project selection criteria, and coordinate with utilities and OER to prioritize high-risk areas and resilience benefits.

Next Steps: Align with state hazard mitigation goals and prepare the next round of applications under the PROP formula program.

Mechanism Title: RI OER/State Energy Program (SEP) Implementation

Mechanism Type: Grant/Technical Assistance

Level: State

Agency: Rhode Island Office of Energy Resources

SEP implementation funding supports state-led energy resilience and grid modernization initiatives. Eligible activities include planning for undergrounding, evaluating interconnection expansions, conducting vegetation or ROW management assessments, and supporting design of redundant transmission paths. SEP funding strengthens coordination between state energy policy and utility-led infrastructure investments.

State Role: Offer modeling resources and review designs for alignment with statewide resilience goals.

Next Steps: Develop conceptual designs or planning studies and coordinate with OER on SEP eligibility.

Note: The Funding Strategy outlines two potential mechanisms for implementing project solutions; however, it does not represent a comprehensive list of all available funding options. For a complete overview, please refer to the Future Investment Strategy.

Sewer & Stormwater Infrastructure Solutions

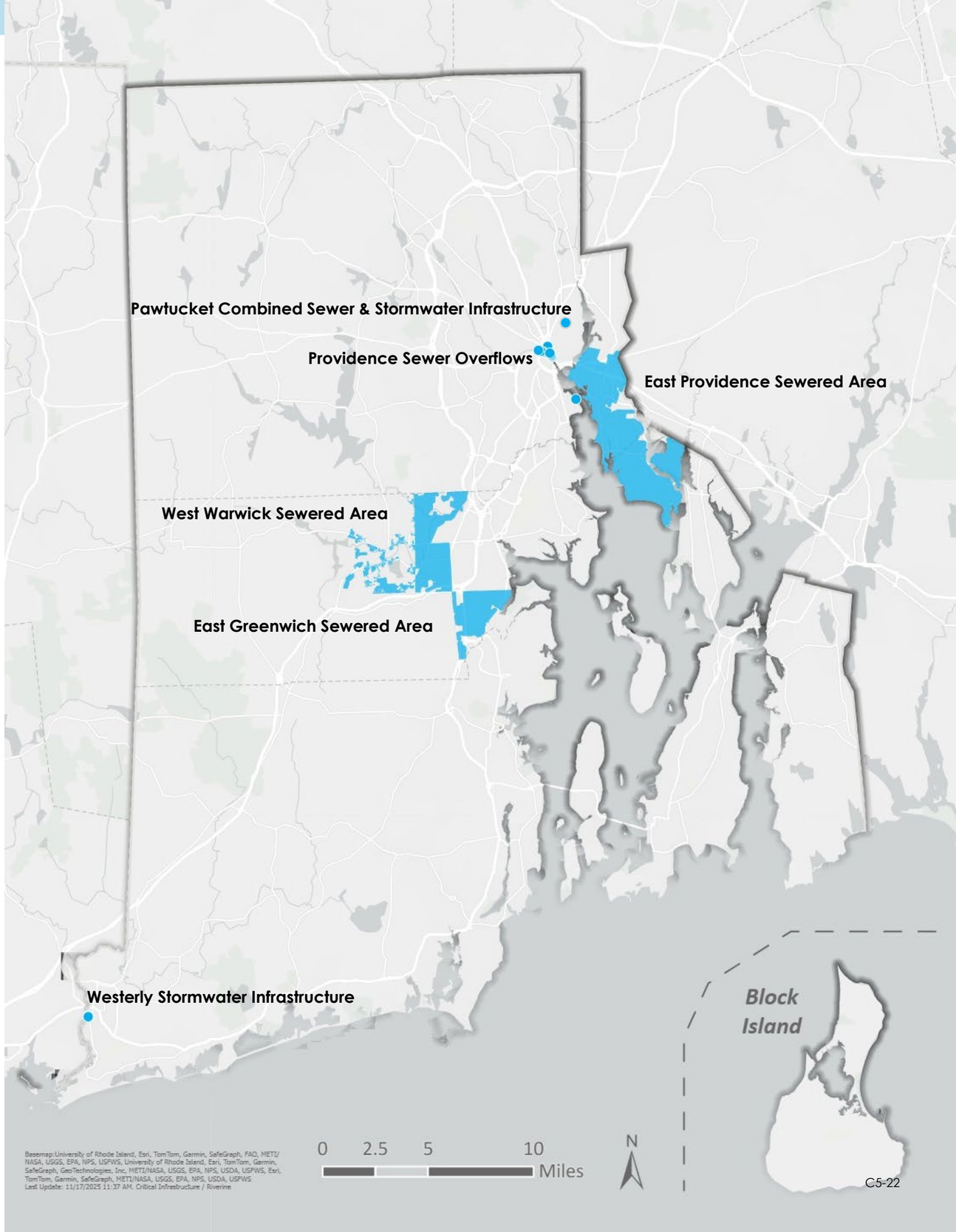
This chapter outlines adaptation solutions for sewered areas, sewer overflows, and stormwater treatment units. Sewer and stormwater infrastructure strategies are focused on reducing flooding impacts to reduce damage to infrastructure and ensure it can remain operable.

The strategies presented were developed based on assets identified as having high climate risks and aligning with the prioritization criteria established for this plan. The adjacent map illustrates how priority assets identified for solution development within this plan are distributed statewide. While these assets informed the strategies, the approaches can be applied to additional locations across the state.

Assets Identified for Sewer & Stormwater Infrastructure Solutions

Asset	Municipality
East Greenwich Sewered Areas	East Greenwich
East Providence Sewered Area	East Providence
Pawtucket Combined Sewer & Stormwater Infrastructure	Pawtucket
Providence Sewer Overflows Mitigation	Providence
Westerly Stormwater Infrastructure	Westerly
West Warwick Sewered Areas	West Warwick

*The priority assets listed herein were identified through a Prioritization Approach developed specifically for the scope of this Plan. Details of this process and the complete list can be found in Chapter 4: Priority Assets List. Please note that this list does not include all vulnerable assets, nor does it reflect broader prioritization initiatives. A comprehensive database of all at-risk assets evaluated through this process has been provided to the State to support future work and enable continued prioritization efforts beyond the scope of this initiative.



Sewer & Stormwater Infrastructure Solutions Summary

Increasing heavy precipitation and flooding are straining stormwater, sanitary, and combined sewage overflow (CSO) systems. This solution integrates infiltration and inflow (I/I) repairs, stormwater–CSO separation, groundwater recharge, and hardening to reduce runoff and protect assets, with sustainable funding improving reliability and resilience during major storms and coastal surge events.

Sanitary, stormwater, and CSO systems across Rhode Island face increasing risk from more frequent extreme precipitation, inland and coastal flooding, and rising groundwater. Priority assets such as pipes, pump stations, culverts, and drainage structures, particularly in older sewered areas like parts of East Providence and low-lying, flood-prone communities such as Westerly, are becoming more susceptible to exceedance and failure as climate hazards intensify.

Repairing pipes and structures to reduce infiltration and inflow (I/I) lowers loading on CSO systems and separate sewer systems. Stormwater recharge practices (e.g., green and gray practices) reduce runoff entering storm and CSO systems. Separating stormwater drainage from CSO systems can further reduce stress on CSO systems. Hardening strategies help protect critical assets and maintain functionality during flood events. Increasing storm drain capacity, adding storage, and upsizing culverts enhances conveyance during major storms. Sustainable funding helps implement solutions.

Ongoing Actions

Many local, regional, and state agencies are advancing projects to address challenges related to stormwater capacity, sewer system demands, and CSOs. The Narragansett Bay Commission (NBC) has spent decades implementing its multi-phase CSO Abatement Program. Phases I (2008) and II (2014) added deep-rock storage, sewer separations, interceptors, and a constructed wetlands facility, while Phase III (ongoing) is constructing a second storage tunnel to Pawtucket and Central Falls to further eliminate overflows. Key challenges include high costs and increasingly frequent high-intensity rain events, making green–gray integration and expanded funding essential for continued progress.

Resources

- RIDEM RISDISM (2018)
- Narragansett Bay Commission CSO program (2014)
- NEIWPCC TR-16 (2016)



Flooding at Salty Brine in Narraganset, RI © WJAR

Steps for Implementation

1. **Community Engagement**
   Maintain public engagement throughout the project planning process to better understand neighborhood flooding issues and to develop a plan to address local needs.
2. **Data Collection and Existing Conditions Analysis**
   This step must be tailored to each project and may include field investigations, such as flow metering, dye testing, culvert assessments, land surveying, and CCTV inspections, as well as desktop reviews of GIS data and modeling, all of which help determine the sources and volumes of stormwater to be managed.
3. **Vulnerability Assessment**
   Modeling (e.g SWMM, SewerGEMS, StormCAD, HEC-RAS) will often be used to better understand the vulnerability of overall system elements. The model can then be used to assess mitigation alternatives impacts.
4. **Optioneering Analysis**
   Both traditional and nature-based approaches should be evaluated to find the most feasible and cost-effective solution. A Benefit-Cost Analysis can indicate if a potential alternative is financially feasible for the anticipated benefits. Infrastructure/land ownership and permitting limitations should also be assessed to identify necessary collaboration with private property owners or state agencies (e.g., RIDOT).
5. **Conceptual Designs, Design Developments, and Construction Documents**
   Concept designs should be adaptable to ongoing climate change impacts and approached with a proactive mindset, designing for future storm events and/or sea-level rise. Phasing could be considered to minimize over-design. Selected concepts will move forward for design development and final designs.
6. **Costs and Funding Assessments**
   Several state, federal, and local stormwater funding sources are available for these mitigation measures and should be considered when evaluating alternatives. Cost estimates should also account for design and permitting, construction administration, surveying, mobilization, bonds and insurance, and as-built documentation in addition to construction costs.
7. **Construction and Permitting**
   Construct and procure the necessary permits for all stormwater infrastructure improvements, including working with RIDEM for approvals.
8. **Maintenance and Monitoring**
   Establish a routine maintenance and monitoring program for stormwater infrastructure improvements working with local municipalities. Monitor project success at reducing risk to hazards.

Representative Priority Assets

East Providence Sewered Areas and **Westerly Stormwater Infrastructure** are selected as representative priority assets because they serve communities with high **social vulnerability** and face significant climate risks from **stormwater and coastal flooding**. Additionally, East Providence Sewered Areas are adjacent to biodiversity and wellhead protection areas.

East Providence Sewered Areas
Municipality: East Providence

Current Climate Risks:
2050 Climate Risks:
2100 Climate Risks:

Context: Adjacent to High Social Vulnerability Index (SVI) Census, Biodiversity, and Wellhead Protection Areas, and Community Identified.

Westerly Stormwater Infrastructure
Municipality: Westerly

Current Climate Risks:
2050 Climate Risks:
2100 Climate Risks:

Context: Adjacent to High Social Vulnerability (SVI) Census.

Sewer & Stormwater Infrastructure Solutions Strategies

These strategies reduce the flow of stormwater into stressed combined sewer and storm drain systems, increase system capacity, or protect system infrastructure from damage during floods. Reducing stormwater runoff volumes is often more cost effective and resilient to future storms than larger system capacity upgrades, as site-specific solutions can be more adaptable to severe events. For example, gray infrastructure is typically only protective to a fixed elevation or flow rate while disconnecting stormwater will often provide some level of reduction even for events larger than the design storm. A range of alternatives should be considered when developing a mitigation plan.

#1

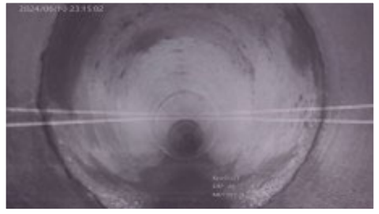
Most Pressing Issue

Community Voices

Stormwater Infrastructure ranked the #1 most pressing issue during the 1st Municipal Stakeholder Meeting held in June 2025.

Disconnect Infiltration/Inflow (I/I) Sources

Reducing infiltration (groundwater entering the sewer system) and inflow (stormwater or coastal water entering the system) decreases the volume that sanitary sewers must handle. This is particularly critical in low-lying areas near the Pawcatuck River in Westerly and in older sewered neighborhoods in East Providence. To identify defects that allow infiltration and inflow, utilities can use flow metering, dye and smoke testing, and CCTV inspections. Once identified, mitigation measures such as CIPP lining, point repairs, and disconnection of improper connections can significantly reduce loading on combined sewer overflow (CSO) systems.



CCTV pipe inspection image from Providence, RI © RIDOT

Solution Mechanism
- Protect
- Accommodate
- Restore
- Rethink

Scale of Innovation
- Innovative
- Hybrid
- Traditional

Relevant Hazards
- Coastal Flooding
- Stormwater Flooding
- Riverine Flooding

Cost

$$$$

$450K - $2M

Assumption: inspect of stormwater sewer pipe, point repairs, and 1,000 LF of CIPP lining

Replace Undersized Culverts

Culverts convey stream and river flows beneath roadways, and when undersized, they can restrict flow and contribute to roadway overtopping and upstream flooding during storm events. Strategically upsizing culverts is an effective approach to reducing stormwater-related flooding and improving resilience to more intense rainfall, though downstream conditions should be evaluated to avoid increased flooding or erosion. New culverts can also be designed to improve aquatic organism passage, utilizing open bottom and box culvert techniques.



Upsized culverts on Belfield Dr. Johnston, RI
© Fuss & O'Neill, Inc.

Solution Mechanism
- Protect
- Accommodate
- Restore
- Rethink

Scale of Innovation
- Innovative
- Hybrid
- Traditional

Relevant Hazards
- Stormwater Flooding
- Riverine Flooding

Cost

$$$$

$700K - $3M

Assumption: remove existing culvert, install larger culvert, reinstate site

Cost Benchmark: Belfield Drive Floodplain Restoration, Johnston, RI

Increase Storm Drain Capacity

Increasing storm drain storage and conveyance capacity is a common strategy for managing stormwater impacts; however, this approach presents several challenges. Enlarging storm drains can increase the risk of downstream flooding, and installing larger pipes, storage systems, and pumps within a crowded public right-of-way can be costly and logistically complex. These complexities include avoiding utility conflicts, meeting minimum pipe cover requirements, and managing the disposal of potentially contaminated soils.



Storm drain investigation in Warren, RI
© Fuss & O'Neill, Inc.

Solution Mechanism
- Protect
- Accommodate
- Restore
- Rethink

Scale of Innovation
- Innovative
- Hybrid
- Traditional

Relevant Hazards
- Stormwater Flooding

Cost

$$$$

$800K - $3.1M

Assumption: Remove and replace 1000 LF of stormwater sewer pipe, install 20,000-gal tank and pump

Harden Infrastructure in Floodplain

Infrastructure such as pump stations and gravity sanitary sewers located in floodplains can either be damaged by floodwaters and/or convey floodwaters to other wastewater infrastructure, resulting in sewer overflow events. Solutions can range from floodproofing pump stations, raising critical equipment (e.g., generators) to recommended flood-resilience elevations, and using bolted and gasketed manhole covers on low-lying roads that are frequently inundated to keep floodwaters out of the sewer systems.



Raised critical equipment. Scituate, RI
© Fuss & O'Neill, Inc.

Solution Mechanism
- Protect
- Accommodate
- Restore
- Rethink

Scale of Innovation
- Innovative
- Hybrid
- Traditional

Relevant Hazards
- Coastal Flooding
- Stormwater Flooding
- Riverine Flooding

Cost

$$$$

$300K - $1.5M

Assumption: raise equipment within pump stations; allowance to floodproof manholes

Sewer & Stormwater Infrastructure Solutions Strategies

The solutions identified are focused on restoring natural hydrogeology for increased absorption of water, reducing flood risk. Increase in green infrastructure, pervious surfaces, and NbS accommodate more absorption of water. Green infrastructure also brings additional co-benefits, including enhanced urban cooling, increased biodiversity, and enhanced environmental health. Gray infrastructure improvements, like hardening infrastructure and increasing storm drain capacity of pipes and culverts to accommodate for more water capacity, are also critical strategies. Gray and green infrastructure strategies work in tandem to improve flood resilience, however, sustainable funding mechanisms will be necessary to implement these projects.



Rainfall flooding Reservoir Avenue in Cranston © WPRI

Community Voices

"Combined sewers and stormwater infrastructure discharge into other waterways."
– attendee at the 2nd Community Forum at East Providence's Weaver Library in July 2025

Develop Nature-based Flood Storage

Safely storing stormwater during flood events can reduce hydraulic loads to the conveyance system and move stormwater away from infrastructure. Storage opportunities exist in rural and urban conditions. Examples include designing and utilizing floodable parks, enhanced floodplains, and other open space to store water during floods when those spaces are not used. This approach is also a good way to create community co-benefits.



Floodable park space. Providence, RI
© Fuss & O'Neill, Inc.

Solution Mechanism
- **Protect**
- **Accommodate**
- **Restore**
- **Rethink**

Scale of Innovation
- **Innovative**
- **Hybrid**
- **Traditional**

Relevant Hazards
- **Coastal Flooding**
- **Stormwater Flooding**
- **Riverine Flooding**

Cost
$$$$
$1.5M - $6M

Assumption: excavation, geotextile and for ~1 acre, ~1M gallon reservoir w/drainage and native planting strip around perimeter

Cost Benchmark: Nichols Nature-based Stormwater Park

Develop Green Stormwater Infrastructure

Green stormwater infrastructure (GSI) can be a cost-effective method to reduce stormwater loadings to storm and combined sewers. In Westerly, GSI is well suited to upland areas that drain toward downtown or low-lying zones near the Pawcatuck River, where surface storage and groundwater recharge can reduce pluvial flooding. GSI can also redirect runoff to bioretention, groundwater recharge practices, or subsurface systems and reduces inflow to aging pipes and CSO systems. Routine inspection and upkeep are needed to sustain long-term performance.



Green stormwater infrastructure on Pine Street. Pawtucket, RI © Fuss & O'Neil, Inc.

Solution Mechanism
- **Protect**
- **Accommodate**
- **Restore**
- **Rethink**

Scale of Innovation
- **Innovative**
- **Hybrid**
- **Traditional**

Relevant Hazards
- **Stormwater Flooding**
- **Riverine Flooding**

Cost
$$$$
$550K - $2M

Assumption: 15,000 SF of rain gardens and bioretention areas and associated infrastructure

Cost Benchmark: Pawtucket, RI Green Infrastructure on Pine Street

Remove & Disconnect Impervious Coverage

Impervious cover (e.g., parking lots and roadways) prevents rainfall from infiltrating into the ground, leading to higher stormwater runoff volumes, flooding, and water pollution. Approximately 10–15% of Rhode Island's land area consists of impervious surfaces, with coverage reaching as high as 40% in urban areas such as Providence (URI, 2007). Imperviousness contributes to flooding challenges following rainfall events. Removing pavement and replacing it with permeable materials reduces flooding to CSO systems, improves water quality, and enhances groundwater recharge. RIDEM continues to support projects across that State that involves removing impervious cover and revegetating the area.



Pervious pavers on Pine Street. Pawtucket, RI
© Fuss & O'Neill, Inc.

Solution Mechanism
- **Protect**
- **Accommodate**
- **Restore**
- **Rethink**

Scale of Innovation
- **Innovative**
- **Hybrid**
- **Traditional**

Relevant Hazards
- **Stormwater Flooding**
- **Riverine Flooding**

Cost
$$$$
$800K - $3M

Assumption: demolish 1,000 linear feet of sidewalk (8' width) and replace w/permeable surface system

Cost Benchmark: Pawtucket, RI Green Infrastructure on Pine Street

Stormwater Mitigation Funding Mechanisms

Creative funding tools like stormwater utility funds and enterprise funds provide stable, dedicated revenue to manage and reduce flooding at the local level. These fees encourage landowners, such as homeowners or businesses, to reduce runoff while ensuring equitable cost-sharing for infrastructure upgrades and maintenance. Though establishing such funds can be complex and politically sensitive, such mechanisms offer a sustainable path to financing long-term stormwater resilience.



Citizens Bank GIS Parklet Providence,
© RIDOT

Solution Mechanism
- **Protect**
- **Accommodate**
- **Restore**
- **Rethink**

Scale of Innovation
- **Innovative**
- **Hybrid**
- **Traditional**

Relevant Hazards
- **Coastal Flooding**
- **Stormwater Flooding**
- **Riverine Flooding**

Cost
$$$$
$150K - $600K

Assumption: hire consultant to develop stormwater funding mechanism plan

Sewer & Stormwater Infrastructure Solutions Funding Strategy

Rhode Island can advance sewer, stormwater, and CSO resilience through a combination of federal and state funding programs that support culvert and pipe repair, pump station hardening, storm drain upgrades, and green-gray stormwater solutions. The following sections summarize anticipated implementation costs, cost-effectiveness considerations, and the community and economic benefits of these investments. They also outline the major funding mechanisms available, describe the State's role, and identify next steps to position priority assets for implementation.

Costs

This suite of strategies includes a wide variety of interventions. Costs for these strategies scale with size – greater capacity for conveyance, storage, and runoff management will require greater capital investment but potentially result in long-term savings. The lowest cost solution includes studies of existing conditions and identifying a funding mechanism. Focused projects to address specific issues are generally lower cost, but greater impact and long-term savings can be achieved by completing larger projects and a series of connected projects across different solution types at a higher overall cost. Modifying existing stormwater systems, particularly those below grade, is generally a more costly solution than operating in greenfields and/or surface-level improvements. Repairs are cheaper than replacements and upgrades to address minor issues quickly, but may not provide long-term benefits in the same way as larger projects, and could increase overall long-term costs. The current estimate for increasing stormwater system capacity only accounts for upgrading conveyance; additional works required for storage and pumps would require greater capital investment.

Benefits

Solutions for sewer and stormwater infrastructure are designed to reduce the extent of damage and disruption. The SCV assessment estimated that Westerly is currently exposed to 2 ft of flooding during a 100-year coastal event; however, this is expected to rise to 4.5 ft by 2100. The strategies aim to control runoff of both every-day and extreme flood events, reducing stress on CSO systems. This protects community spaces, drinking water supplies, and ecosystems from the harmful pollutants in runoff, such as chemicals and waste. The identified representative priority assets are adjacent to wellhead protection areas, meaning the strategies are prioritized to protect drinking water supplies. The assets are also prioritized in socially vulnerable communities, ensuring benefits are equitably distributed. The NbS bring additional co-benefits of improved biodiversity and ecosystem health.

Benefits

Avoided Damage	●●●
Avoided Disruption	●●●
Preserved Life Safety	●○○
Other	●○○

Co-benefits include improved social equity and biodiversity.

Economic Impacts

Stormwater and sewer infrastructure investments generate construction employment while preventing flood damage to properties and businesses. Reducing system overflows protects water quality, supporting the tourism and recreation economies that depend on clean waterways. Infrastructure improvements in high social vulnerability areas promote equitable economic development and stability of property values. Green infrastructure projects create jobs in landscape design, native plant cultivation, and specialized installation. By managing stormwater effectively, communities avoid costly emergency responses, protect drinking water supplies, reduce treatment costs, and maintain business continuity during severe weather events, demonstrating measurable fiscal returns.

Consequence of Inaction

The consequence of inaction on Rhode Island's stormwater infrastructure is medium-high. Sewer and stormwater infrastructure are highly at risk to disruption and damage when they are inundated by 2 ft of flooding, and currently Westerly is expected to be exposed to more than 2 ft of flooding during a 100-year coastal storm. Infrastructure failure can lead to significant public health and environmental consequences with urban areas facing higher risk. However, in most areas of the State, redundancy and emergency pumping can mitigate most severe impacts.

Consequence of Inaction

High
Medium
Low

Funding Strategy

These mechanisms support planning and implementation of sewer, stormwater, and CSO upgrades that reduce flooding and improve water quality. The CWSRF aligns directly with pipe repairs, pump station hardening, storm drain upgrades, and green–gray stormwater solutions. RIDEM's Climate Resilience Fund complements these efforts by funding municipal and regional projects that reduce climate-driven flood impacts and build long-term drainage resilience.

Mechanism Title: Clean Water State Revolving Fund (CWSRF)

Mechanism Type: Low-Interest Loan/Principal Forgiveness

Level: Federal

Agency: Rhode Island Infrastructure Bank (RIIB), RIDEM, and EPA

CWSRF funds planning, design, and construction of wastewater, stormwater, and CSO system improvements. Eligible activities include pipelining and replacement, pump station floodproofing, culvert upgrades that provide aquatic habitat benefits, and construction of certain stormwater system improvements including green stormwater infrastructure.

State Role: Provide technical support with project scoping, and SRF eligibility review.

Next Steps: Prepare preliminary engineering reports and complete a sewer/stormwater assessment.

Mechanism Title: Rhode Island Climate Resilience Fund (CRF)

Mechanism Type: Grant

Level: State

Agency: Rhode Island Department of Environmental Management

The Climate Resilience Fund provides grants for municipal and regional projects that reduce climate-driven flood, stormwater, and drainage impacts. The program prioritizes projects that address social vulnerability, protect public health, and support nature-based or hybrid approaches that improve long-term system resilience.

State Role: Set criteria and coordinate with municipalities to align sewer and stormwater upgrades.

Next Steps: Prepare projects for upcoming CRF funding rounds and provide technical assistance for conceptual design.

Note: The Funding Strategy outlines two potential mechanisms for implementing project solutions; however, it does not represent a comprehensive list of all available funding options. For a complete overview, please refer to the Future Investment Strategy.

Wastewater Treatment Facility Hardening

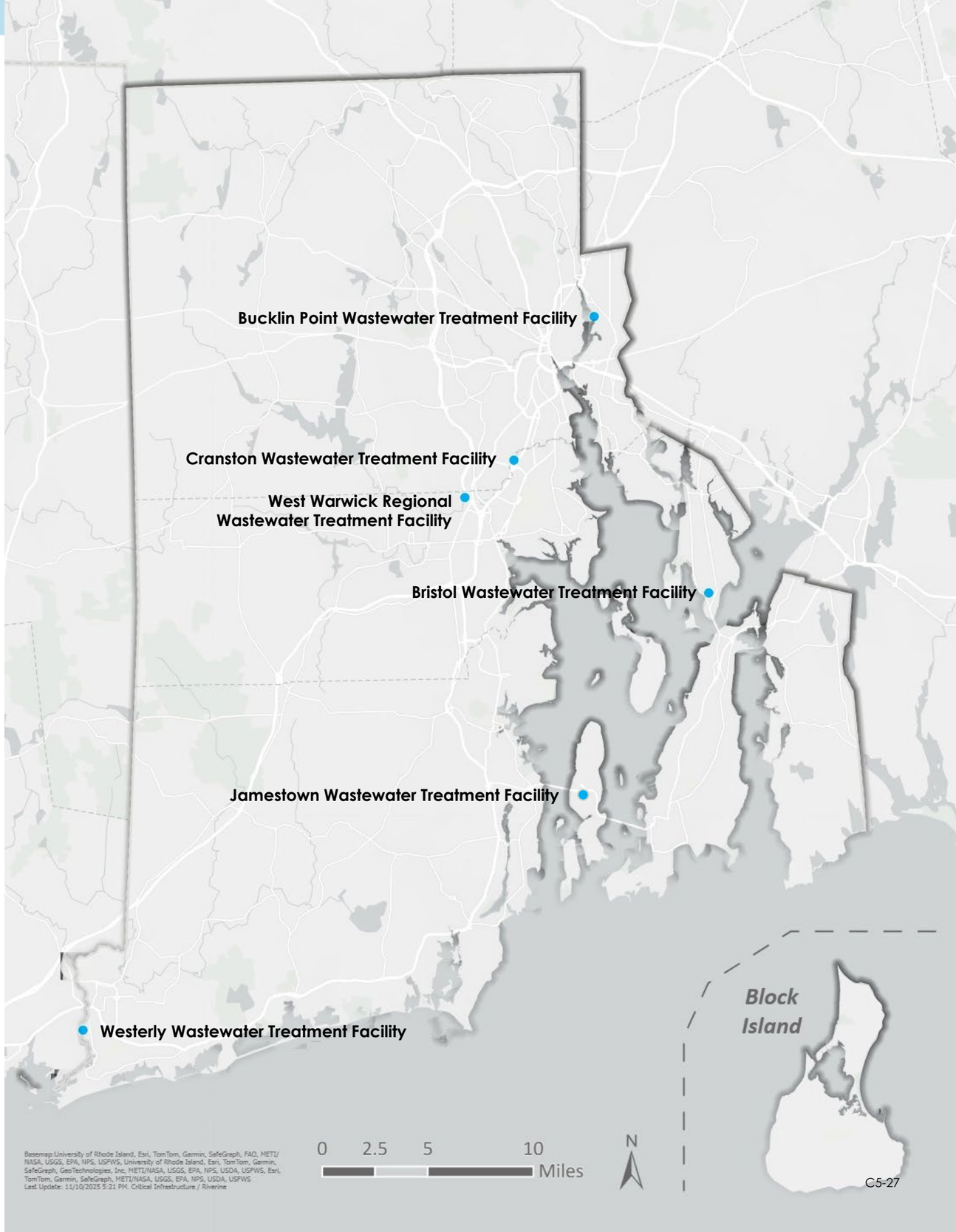
This chapter outlines adaptation solutions for wastewater treatment facilities. Wastewater treatment facility hardening strategies are focused on reducing flooding impacts to ensure continual operation of the facilities and reduce contamination from runoff, preserving public health.

The strategies presented were developed based on assets identified as having high climate risks and aligning with the prioritization criteria established for this plan. The adjacent map illustrates how priority assets identified for solution development within this plan are distributed statewide. While these assets informed the strategies, the approaches can be applied to additional locations across the state.

Assets Identified for Wastewater Treatment Facility Hardening

Asset	Municipality
Bristol Wastewater Treatment Facility	Bristol
Bucklin Point Wastewater Treatment Facility	East Providence
Cranston Wastewater Treatment Facility	Cranston
Jamestown Wastewater Treatment Facility	Jamestown
Westerly Wastewater Treatment Facility	Westerly
West Warwick Regional Wastewater Treatment Facility	West Warwick

*The priority assets listed herein were identified through a Prioritization Approach developed specifically for the scope of this Plan. Details of this process and the complete list can be found in Chapter 4: Priority Assets List. Please note that this list does not include all vulnerable assets, nor does it reflect broader prioritization initiatives. A comprehensive database of all at-risk assets evaluated through this process has been provided to the State to support future work and enable continued prioritization efforts beyond the scope of this initiative.



Wastewater Treatment Facility Hardening Summary

Wastewater treatment facilities (WWTFs) play a critical role in cleaning contaminated water so it can be safely returned to the natural environment. However, during periods of excessive flooding, these facilities can exceed their design flow capacity, creating operational challenges and increasing the risk of untreated discharges. Hardening strategies help protect these facilities from damage and maintain functionality during extreme events, ensuring continued treatment and environmental protection.

There are 19 WWTFs throughout Rhode Island that work to process a total of 120 million gallons of wastewater per day. Innately, WWTF and pump stations are positioned by bodies of water and in low lying areas to allow for efficient discharge of treated water. However, their location makes them susceptible to flooding.

As flooding events become more intense the design loads of facilities become overwhelmed, causing sanitary sewer overflow (SSO) events. When SSO events occur, untreated sewage is discharged into the environment, causing public health issues and pollution impacts to waterways. During a four-year period, Cranston WWTF experienced SSOs during 18% of extreme flood events and West Warwick Regional WWTF experienced them for 33%. Cranston WWTF, vulnerable to coastal and stormwater flooding, and West Warwick Regional WWTF, vulnerable to riverine and stormwater flooding, represent facilities that should consider resilience strategies.

Ongoing Actions

Rhode Island provides holistic resilience planning and design guidance for Wastewater Treatment Facilities (WWTFs). Their 2017 report completed a detailed resilience analysis for all WWTFs in the state. Multiple WWTF have implemented resilience projects with grant support from the RIDEM WWTF Resiliency Fund.

Resources

- RIDEM WWTF Resources (2025)
- Implications of Climate Change for RI WWTF (2017)
- Bucklin Point Resiliency Improvements (Ongoing)
- Jamestown WWTF Resilience Plan (Ongoing)
- West Warwick WWTF Levee Project (2017)
- CHAMP (Ongoing)

Steps for Implementation

1. **Existing Conditions Analysis and Stakeholder Engagement**
   WWTFs are all unique. Some plants have processes or locations that are more inherently resilient than others. Identify which facilities are most vulnerable, considering the daily flows (and therefore community importance). Conduct stakeholder engagement throughout the project planning process to better understand the site and community challenges. Assess if there are any network opportunities to utilize capacity at other WWTFs or space at the assessed WWTF. Prioritize projects with WWTF operators based on risk, impact, and ease of execution.
2. **Optioneering Analysis**
   Based on the analysis, conduct an optioneering analysis to determine the most effective select hardening strategies.
3. **Land Acquisition and Community Engagement**
   If relocation or expansion are required, engage affected communities to ensure equitable impacts.
4. **Conceptual Designs and Detailed Plans**
   Develop concept designs for hardening strategies based on the existing conditions and future climate change impacts. Move conceptual designs to design development and final design after discussion with stakeholders and community members.
5. **Costs and Funding Assessment**
   Develop order-of-magnitude costs for construction and identify potential funding sources available for implementation of the final designs.
6. **Permitting and Construction**
   Obtain permits, permits of modifications, and/or Orders for Approval for chosen resilience measures from RIDPES. Construct any new equipment, facilities, or protections.
7. **Commissioning and Maintance**
   Perform tests to ensure proper water treatment or flood protection functions. Conduct regular equipment inspections, maintenance, performance tests and trainings for any deployable or active resilience measures.



West Warwick Regional Wastewater Treatment Facility. © West Warwick Wastewater

Representative Priority Assets

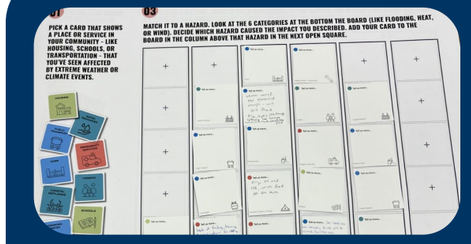
Cranston Wastewater Treatment Facility and **West Warwick Regional Wastewater Treatment Facility** are selected as representative priority assets due to their **climate risk to flooding.** The West Warwick WWTF is vulnerable due to its smaller size and limited water capacity, while the Cranston WWTF is also vulnerable because it plays a critical role in serving a larger population.

Cranston Wastewater Treatment Facility
Municipality: Cranston
Current Climate Risks:
2050 Climate Risks:
2100 Climate Risks:
Context: Design Flow [20.2 MGD].

West Warwick Regional Wastewater Treatment Facility
Municipality: West Warwick
Current Climate Risks:
2050 Climate Risks:
2100 Climate Risks:
Context: Design Flow [7.9 MGD] and Stakeholder Identified.

Wastewater Treatment Facility Hardening Strategies

These strategies offer multiple pathways for wastewater treatment facilities (WWTFs) to address flooding risks at their sites. Facilities can harden on-site infrastructure by installing additional pumps and incorporating redundant wet-weather storage processes. However, if a WWTF faces extreme climate risk or lacks capacity to accommodate future flood loads, relocation strategies may be necessary. Relocation can involve completely moving the facility to a less vulnerable area or redirecting sewage through pipelines to another WWTF without physically relocating the original facility.



Asset x Hazard Mapping at Community Forum 02 © Civic

Community Voices

"Westerly is concerned with stormwater flooding because of road closures, effect on water quality, and infiltration to the wastewater system."
- attendee at the 2nd Municipal Stakeholder Meeting in July 2025

Protect or Relocate Facilities and Equipment

WWTFs in the floodplain can consider moving the entire facility out of the floodplain. This strategy should be prioritized for older facilities that may be nearing end of useful life (EUL). WWTFs that remain within the present-day and future anticipated floodplain should at least elevate their critical equipment (e.g. blowers, control panels, electrical equipment, chemical storage) to higher locations above the future anticipated Base Flood Elevation (BFE) and consider additional flood mitigation strategies. Other strategies may include flood barriers that physically block or divert flood water away from the WWTF, or an on-site wastewater treatment systems.



Flooding at Warwick Wastewater Treatment Facility © Warwick Beacon

Solution Mechanism
- **Protect**
- **Accommodate** ●
- **Restore**
- **Rethink** ●

Scale of Innovation
- **Innovative**
- **Hybrid** ●
- **Traditional**

Relevant Hazards
- **Coastal Flooding**
- **Stormwater Flooding**
- **Riverine Flooding**

Cost

$$$$
$40M - $155M

Assumption: demolish existing WWTF, redirect 1 mile of piping, and construct new WWTF at higher elevation

Cost Benchmarks: WWTFs in East Providence, Westerly, and Attleboro RI

Provide Storage and Emergency Disinfection

During an extreme flood event, large flow rates may overload process equipment, short-circuit treatment, and discharge raw sewage. WWTFs can buffer this by providing wet weather flow emergency treatment through storage and process redundancy to increase capacity. Innovative high-rate process technologies utilizing settling, filtration, and/or flotation-based techniques at auxiliary facilities are beneficial to providing wet weather flow treatment. WWTF should provide more wet weather capacity to ensure that backup disinfection occurs to limit pollution of waterways, regulatory fines, and punishments.



Disinfection at Woonsocket WWTF
© Michael Salerno/Rhode Island Current

Solution Mechanism
- **Protect**
- **Accommodate** ●
- **Restore**
- **Rethink**

Scale of Innovation
- **Innovative**
- **Hybrid** ●
- **Traditional**

Relevant Hazards
- **Coastal Flooding**
- **Stormwater Flooding**
- **Riverine Flooding**

Cost

$$$$
$2.5M - $9M

Assumption: create new storage area (excavation, geotextile), new outfall pipe, allowance for disinfection system

Cost Benchmark: Newport Wellington Avenue CSO Facility

Install Submersible Pumps and Ensure Access to Backup Pumps

Submersible pumps offer a resilient solution because they can remain operable during flooding events, ensuring continued pumping capacity when other systems might fail. Facilities should also maintain access to backup pumps to provide redundancy. Portable pumps can help restart treatment processes. Having reliable backup pumping options is critical for all wastewater treatment facilities to maintain operations during flood conditions.



Flooding at Fields Point WWTF © Brian P. D. Hannon/ecoRI News photos

Solution Mechanism
- **Protect**
- **Accommodate** ●
- **Restore**
- **Rethink**

Scale of Innovation
- **Innovative**
- **Hybrid**
- **Traditional** ●

Relevant Hazards
- **Coastal Flooding**
- **Stormwater Flooding**
- **Riverine Flooding**

Cost

$$$$
$750K - $3M

Assumption: install new submersible pumps at existing WWTF

Redirect Sewage Flows, Where Possible

Connection to another WWTF located in a more resilient area provides operational flexibility and can be a cheaper alternative to relocating or completely protecting an existing WWTF. This involves an assessment of existing connections and construction of new pipe connections and lift stations. The receiving WWTF should not be vulnerable to the same hazards as the redirecting WWTF. The receiving WWTF should have excess storage and treatment capacity to accept new flows. Redirected sewage flows should avoid low lying areas. Improvement of septic systems and other upland sewage management strategies in rural areas supports this approach. This approach can also be utilized for vulnerable pump stations.



Scarborough WWTF © RIIB

Solution Mechanism
- **Protect**
- **Accommodate** ●
- **Restore**
- **Rethink**

Scale of Innovation
- **Innovative**
- **Hybrid**
- **Traditional** ●

Relevant Hazards
- **Coastal Flooding**
- **Stormwater Flooding**
- **Riverine Flooding**

Cost

$$$$
$15M - $55M

Assumption: modify existing WWTF and associated pump stations, redirect ~1 mile of pipe to another WWTF

Cost Benchmark: Long Beach, NY Water Pollution Control Plant Consolidation

Wastewater Treatment Facility Hardening Funding Strategy

Rhode Island can advance wastewater treatment facility hardening through a combination of state and federal funding sources that support structural upgrades, flood-proofing, and resilience improvements. The following sections outline anticipated costs, cost-effectiveness considerations, and the public health and community benefits of reducing overflow and contamination risks. They also detail available funding mechanisms, define the State's role, and identify the next steps needed to position priority WWTF assets for funding and implementation.

Costs

These strategies reflect a range of costs based on scope and complexity. Installing submersible pumps and wet weather storage provide targeted improvements for operational continuity during flooding or equipment failure at a lower cost. The costliest interventions involve significant expenses to modify, demolish and construct new WWTFs. The cost for redirecting wastewater to an existing facility and relocating an existing facility are relatively high, significantly impacted by their scale: size and capacity of the facilities, distance for redirection, ROW and property implications, etc. For example, redirecting flow between West Warwick and Cranston WWTF's is only about 3 miles point-to-point, but other facilities may be more remote and more challenging to redirect flow and operations to another. Larger scale resilience solutions can, however, deliver long-term cost savings in the form of future mitigated damages.

Benefits

Wastewater treatment facility hardening solutions protect facilities from costly damage due to extreme flood events. Reduction in damage also translates to avoided damage costs and disruption to WWTF processes. When these processes are disrupted, untreated sewage can be released into nearby waterways, threatening public and environmental health. WWTF hardening solutions directly preservers life safety.

Benefits

Avoided Damage	●●●
Avoided Disruption	●●○
Preserved Life Safety	●●○
Other	●○○

Co-benefits include improved environmental health.

Economic Impacts

Hardening wastewater facilities protects public health infrastructure essential for economic activity. Preventing treatment disruptions avoids costly emergency repairs, regulatory fines, and environmental remediation expenses. Facility upgrades create specialized engineering and construction jobs while ensuring continuous operations that support residential and commercial development. Reliable wastewater treatment protects Rhode Island's beaches and waterways, preserving tourism revenues and property values. By preventing sanitary sewer overflows, these investments protect water quality, maintain regulatory compliance, reduce long-term operational costs, and support sustainable economic growth dependent on functioning sanitation infrastructure.

Consequence of Inaction

The consequence of inaction on Rhode Island's wastewater treatment facilities is high. The SCV assessment found that a current 100-year coastal flood event could result in damage equal to 10-30% of the total value of Cranston WWTF facility with this rising to more than 30% by 2100, making implementation of these strategies essential. While interventions are often costly, untreated sewage discharge can cause major public health risks, ecological impacts, and potential regulatory issues.

Consequence of Inaction

High
Medium
Low

Funding Strategy

The proposed solutions align closely with the identified funding programs. These state and federal funding mechanism support the planning and implementation of WWTF hardening and upgrades that safeguard critical infrastructure, minimize contamination during storm events, and strengthen long-term system resilience.

Mechanism Title: Rhode Island Voter-Approved Green Bonds and Municipal Revenue Bonds

Mechanism Type: Bonds

Level: State/Municipal

Agency: State of Rhode Island; Local Municipalities

RI voter-approved Green Bonds, which fund statewide grant and loan programs, and municipal green or revenue bonds issued by cities and towns for local capital projects, offer two financing pathways to help eligible capital projects that improve environmental outcomes, including WWTF upgrades that reduce pollution risk and increase resilience..

State Role: Help municipalities structure bond issuances, verify Green Bond eligibility, and coordinate with RIIB to layer grants or loans as needed. Align project scopes with legislative priorities to improve bond package competitiveness.

Next Steps: Prepare preliminary project scopes and cost estimates for upcoming bond cycles, and work with RIIB to identify blended financing and document resilience benefits.

Mechanism Title: Clean Water State Revolving Fund (CWSRF)

Mechanism Type: Loan/Principal Forgiveness

Level: Federal

Agency: Rhode Island Infrastructure Bank (RIIB), RIDEM, & EPA

CWSRF financing can support many WWTF hardening activities, especially those tied to water quality protection. The fund offers low-interest loans and, for disadvantaged communities, principal forgiveness for eligible improvements such as pump station upgrades, treatment process resiliency, system redundancies, and floodproofing.

State Role: Provide pre-application guidance, confirm eligibility of specific hardening components, and help identify opportunities for principal forgiveness where applicable.

Next Steps: Submit a Project Priority List (PPL) request and begin preliminary engineering to support application.

Note: The Funding Strategy outlines two potential mechanisms for implementing project solutions; however, it does not represent a comprehensive list of all available funding options. For a complete overview, please refer to the Future Investment Strategy.

Drinking Water & Reservoir Resilience

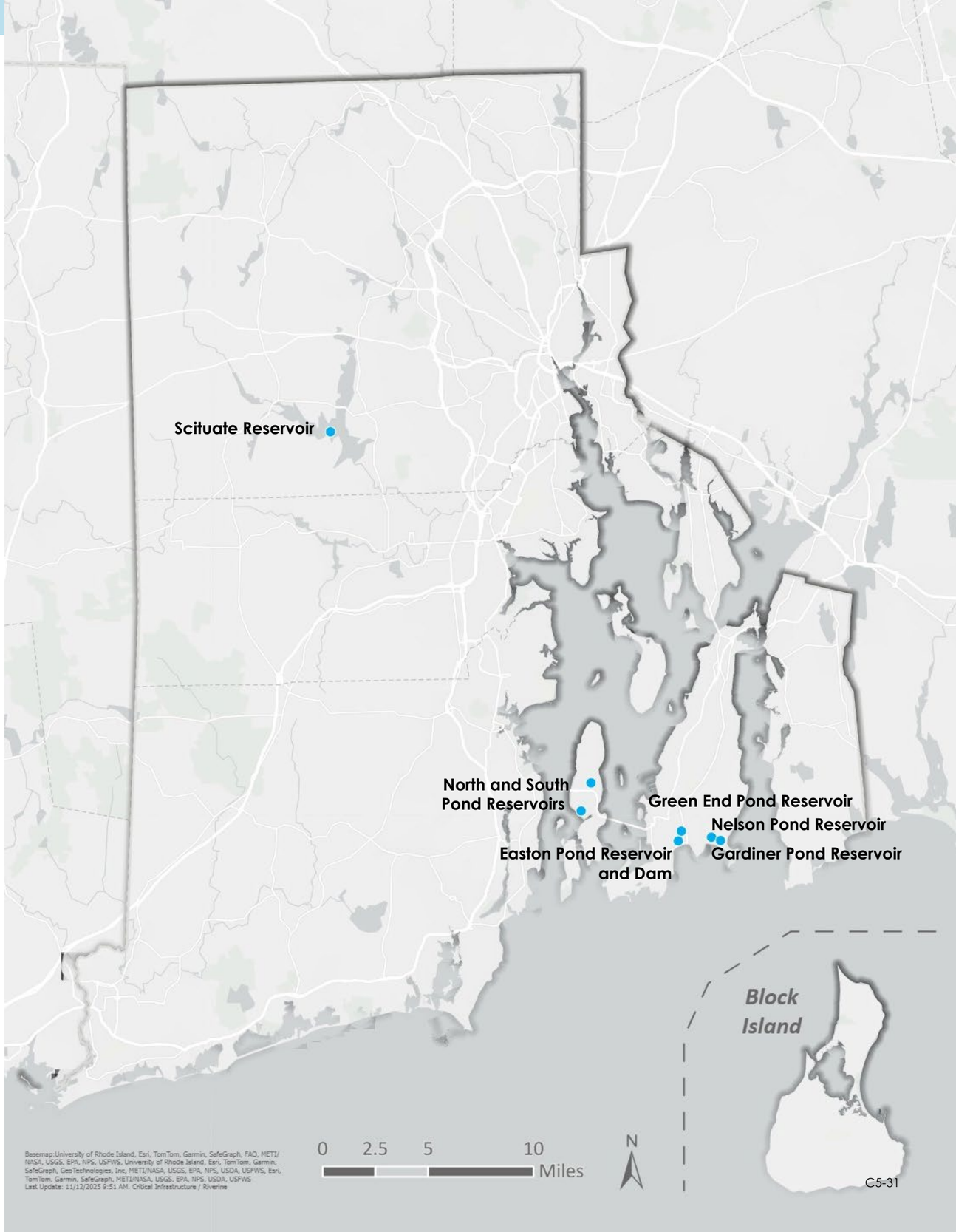
This chapter outlines adaptation solutions for drinking water infrastructure. Drinking water and reservoir resilience strategies are focused on reducing flooding and extreme heat impacts to Rhode Island's drinking water reservoirs, ensuring both quantity and quality of potable water.

The strategies presented were developed based on assets identified as having high climate risks and aligning with the prioritization criteria established for this plan. The adjacent map illustrates how priority assets identified for solution development within this plan are distributed statewide. While these assets informed the strategies, the approaches can be applied to additional locations across the state.

Assets Identified for Drinking Water & Reservoir Resilience Solutions

Asset	Municipality
Easton Pond Reservoir & Dam	Newport - Middletown
Gardiner Pond Reservoir	Newport - Middletown
Green End Pond Reservoir	Newport - Middletown
Nelson Pond Reservoir	Newport - Middletown
North and South Pond Reservoir	Jamestown
Scituate Reservoir	Scituate

*The priority assets listed herein were identified through a Prioritization Approach developed specifically for the scope of this Plan. Details of this process and the complete list can be found in Chapter 4: Priority Assets List. Please note that this list does not include all vulnerable assets, nor does it reflect broader prioritization initiatives. A comprehensive database of all at-risk assets evaluated through this process has been provided to the State to support future work and enable continued prioritization efforts beyond the scope of this initiative.



Drinking Water & Reservoir Resilience Summary

Rhode Island's 49 public water reservoirs deliver drinking water throughout the state. Climate impacts are a threat to the quality of drinking water due to increase risk for contamination of public water reservoirs. Potable drinking water is needed to sustain everyday life and preserve public health.

Climate hazards can contaminate public water reservoirs in several ways. Flooding increases polluted runoff into reservoirs, while sea level rise and coastal flooding may lead to saltwater intrusion. Extreme heat can trigger algal blooms and promote bacterial growth, both of which degrade water quality. These solutions focus on preserving water quality to protect public health.

North and South Pond Reservoir (coastal reservoirs) and Scituate Reservoir (the largest reservoir in the state) represent vulnerable drinking water assets that are essential to delivering clean drinking water throughout the state. Rhode Island reservoirs should consider fortification and planning strategies to bolster against flood and heat events, such as elevating embankments, enhancing existing spillways, and implementing heat reduction measures. In times of water shortage, municipalities need to also work with their neighboring municipalities to share water resources.

Ongoing Actions

Maintaining the quality of drinking water is a priority goal in Rhode Island and it is demonstrated by the extensive research and planning efforts. There are active resilience reservoir projects at Easton Pond Reservoir and Scituate Reservoir. Furthermore, URI built the first municipal-scale PFAS removal treatment system in the state which can serve as a model to addressing compounding water quality impacts, such as PFAS contamination.

Resources

- Nonpoint Source Management (2024)
- Rhode Island Water 2030 (2012)
- Rhode Island Water Quality 2035 (2016)
- Safe Water RI (2013)
- Saltwater Intrusion Water Study (2022)
- Easton Pond Reservoir Resilience (2019)
- Jamestown Brook Watershed Plan (2021)
- Scituate Reservoir Forest Restoration (2024)

Steps for Implementation

1. **Data Collection and Stakeholder Engagement**
   Collect current and future climate data, water quality, and past historic events. Conduct interviews with stakeholders to collect data on the current challenges at the reservoirs. Incorporate stakeholder engagement throughout the project planning process.
2. **Multi Hazard Risk Assessment**
   Conduct a reservoir-specific multi-hazard risk assessment looking across key hazards like flooding, saltwater intrusion, and extreme heat under current and future time horizons. These should account for coastal flooding risks associated with future seal-level rise scenarios. Utilize the assessment to assess the risk at key areas of the reservoirs. The most vulnerable reservoirs should be prioritized for resilience solutions.
3. **Catchment Management Plan**
   Develop a comprehensive catchment management plan that addresses key issues identified in the multi hazard risk assessment. The plan should be focused on monitoring and operational strategies to improve climate resilience.
4. **Desalination Plant Feasibility Study**
   Review RI Water 2030 and previous desalination plant feasibility studies, such as the Quonset Development Corporation Study or Supplemental Source Water Study. Utilize plans to identify best practices for sites, identifying the necessary space and cost requirements.
5. **Optioneering Analysis and Engineering Design**
   Create high-level concept designs for the optioneering process. Use the process to identify the most ideal solution for the reservoir, and/or prioritize areas of improvement. Reach out to relevant stakeholders, such as RI Coastal Resource Management Council (CRMC), to prioritize reservoir resilience strategies. Transform concept designs into detailed engineering designs.
6. **Costs and Funding Assessment**
   Develop order-of-magnitude costs for construction and identify potential funding sources available for implementation of the final designs.
7. **Permitting and Construction**
   Obtain permits for chosen final designs. Construct any new equipment, facilities, or protections.
8. **Commissioning and Maintenance**
   Perform tests to ensure proper drinking water reservoir and dam functions. Conduct regular equipment inspections, maintenance, performance tests and trainings for any deployable or active resilience measures.



Scituate Reservoir © John Mernick for Shutterstock

Representative Priority Assets

Jamestown's North and South Pond Reservoir is selected as a representative priority asset due to its **climate risk** and the presence of **ongoing resilience efforts in neighboring reservoir areas. Scituate Reservoir** is selected due to its criticality in the state, providing **60% of Rhode Island with drinking water**.

North and South Pond Reservoir
Municipality: Jamestown

Current Climate Risks:

2050 Climate Risks:

2100 Climate Risks:

Context: This asset was identified through the engagement process and Technical Assistance Packages (TAP) as an area of concern.

Scituate Reservoir
Municipality: Scituate

Current Climate Risks:

2050 Climate Risks:

2100 Climate Risks:

Context: Stakeholder identified & provides water to 60% of the State.

Drinking Water & Reservoir Resilience Strategies

The strategies work together to provide resilience strategies for both coastal and inland reservoirs. All reservoirs should consider elevating their embankment to minimize flood risk. Coastal reservoirs need to be particularly concerned about saltwater intrusion. They should consider installing temporary or permanent barriers to their existing emergency spillway and feasibility of a desalination plant. Integrated watershed-scale planning offers an essential pathway for safeguarding drinking-water supplies. For example, the Big River Management Area demonstrates how protected watershed lands can be strategically managed to secure future drinking-water sources.



Gardiner Pond © Tom Murphy for The Providence Journal

Community Voices

"Concerned about drinking water facilities located near shorelines, [because] salt intrusion [is] becoming an issue with rising sea levels."
- attendee at the 2nd Community Forum at East Providence's Weaver Library in July 2025

Implement Watershed Management and Heat Reduction Measures

Effective watershed management to conserve and restore vegetated riparian buffers reduces the amount of nitrogen and phosphorus inputs to reservoirs. When combined with rising temperatures, these chemicals can cause algal blooms in reservoirs. By reducing contaminants, riparian buffers can lessen increased algal growth due to extreme heat. Water conservation strategies, such as outdoor water bans during summer months, can also be a strategy to deal with summer water shortages.



Riparian Buffer © Virginia Department of Forestry

Solution Mechanism
- Protect ●
- Accommodate ●
- Restore ●
- Rethink ●

Scale of Innovation
- Innovative ●
- Hybrid
- Traditional

Relevant Hazards
- ⚠ Extreme Heat

Cost
$$$$
$7M - $30M

Assumption: earth moving, thin layer soil placement, native plantings, trees, and grass for 1 mile (50' width)

Cost Benchmark: Ninigret Pond Restoration, Charleston, RI

Improve Embankment

Improving embankment structures and increasing crest elevation are strategies that strengthen reservoir banks, making them more robust and better prepared for storm surges, wave-induced overtopping, and higher flood levels during extreme weather events. Bank improvement projects have been proposed as mitigation measures for Rhode Island's coastal reservoirs, such as Easton Pond Reservoir.



Easton Pond North in Newport County, RI, © City of Newport

Solution Mechanism
- Protect ●
- Accommodate ●
- Restore ●
- Rethink ●

Scale of Innovation
- Innovative ●
- Hybrid
- Traditional

Relevant Hazards
- Coastal Flooding
- Stormwater Flooding
- Riverine Flooding

Cost
$$$$
$25M - $90M

Assumption: 8k-10k linear feet of embankment raised and reinforced, installation of crest and tidal gates, and associated controls

Cost Benchmark: Easton Pond Dams Resiliency Project, RI

Enhance Existing Emergency Spillway

Coastal reservoirs should enhance existing emergency spillways by installing additional barriers to protect from surface water saltwater intrusion. A temporary barrier option is a flexible inflatable bladder, but this is not ideal as a long-term solution. For a more permanent barrier, hydraulic gates can also be implemented on a case-by-case scenario. By improving and implementing barriers, it will reduce the risk of surface saltwater intrusion and ensure the water quality is not impacted significantly. Barriers will not protect against saltwater intrusion via groundwater, which primarily impacts wells drawing upon aquifers. Groundwater salt intrusion would need to be addressed through desalination, well relocation, or other methods.



Inflatable Rubber Dam © Inflatable Dam

Solution Mechanism
- Protect ●
- Accommodate ●
- Restore ●
- Rethink ●

Scale of Innovation
- Innovative ●
- Hybrid
- Traditional

Relevant Hazards
- Coastal Flooding
- Riverine Flooding

Cost
$$$$
$5M - $15M

Assumption: install flexible, inflatable tube across dam / spillway

Cost Benchmark: San Juan Watershed Project, CA

Build a Desalination Plant

Desalination plants allow saltwater to be treated for drinking by removing salts and other minerals utilizing various methods (e.g. membranes, reverse osmosis). The RI Water 2030 plan identified desalination as a strategy to adapt to saltwater intrusion in drinking water. The plan discusses the importance of conducting feasibility studies and following the Safe Drinking Water Act. Aquidneck Island and other coastal areas have conducted feasibility studies, but financial constraints have prevented projects from progressing. The desalination plant in Brockton, MA represents one of the most recent regional case studies. Water recycling may be considered as an alternate strategy to reduce pressure on freshwater supplies.



Pure Water Center © El Paso Water

Solution Mechanism
- Protect ●
- Accommodate ●
- Restore ●
- Rethink ●

Scale of Innovation
- Innovative ●
- Hybrid
- Traditional

Relevant Hazards
- Coastal Flooding

Cost
$$$$
$90M - $350M

Assumption: 5M gallon per day water reuse/recycling desalination plant

Cost Benchmark: Pure Water Center, El Paso, TX

Drinking Water & Reservoir Resilience Funding Strategy

Rhode Island can advance drinking water and reservoir resilience through a combination of state and federal sources that support embankment upgrades, spillway improvements, watershed protection, and nature-based solutions. The following sections summarize anticipated costs, cost-effectiveness considerations, and the public health and ecosystem benefits of improving reservoir resilience. They also outline key funding mechanisms, describe the State's role, and identify next steps to position priority reservoir assets for implementation.

Costs

This diverse group of strategies address unique aspects of the potable water system. The cost of each one is strongly correlated with scale. Drinking water and reservoir improvement costs vary by solution type. Temporary measures (e.g., Tigerdams) are the least expensive, followed by watershed management approaches such as riparian buffer construction. Soil embankment improvements (i.e. raising and reinforcing embankment and adding flow control structures) and permanent hard structures (e.g., concrete and steel) are more costly, while dynamic structures (e.g., gates and controls) are typically the most expensive. The cost of desalination plants can vary drastically based on size; large plants can be extremely costly, but can reduce long-term costs associated with addressing over-topping of existing structures during storm events.

Benefits

Drinking water infrastructure is directly tied to public health. Both quality and quantity of water is needed to maintain statewide health. Floods threaten the quality of drinking water, since runoff may bring saltwater intrusion or additional runoff contamination. The solutions reduce the amount of unwanted runoff into reservoirs, and the desalination plant helps make saltwater potable. Similarly, extreme heat may bring increased algal growth, however, effective watershed restoration reduces chemical inputs that drive algal blooms, protecting the quality of the water. Reservoirs are also ecosystems, so the solutions help further enhance habitats and biodiversity.

Benefits

Avoided Damage	○ ○ ○
Avoided Disruption	● ● ○
Preserved Life Safety	● ● ●
Other	● ○ ○

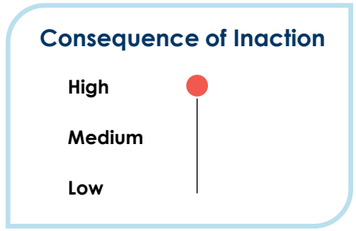
Co-benefits include improved biodiversity and ecosystems.

Economic Impacts

Protecting drinking water infrastructure safeguards public health and economic stability. Rhode Island's reservoirs serve much of the state's population; disruptions would halt business operations and residential activities. Resilience investments create jobs in watershed management, engineering, and water quality monitoring. Preventing contamination avoids costly treatment upgrades and emergency water supply expenses. Clean, reliable water supplies attract businesses, support property values, and enable economic development. Catchment management and infrastructure improvements reduce long-term operational costs while ensuring the water security essential for sustained economic activity and population health.

Consequence of Inaction

The consequence of inaction on Rhode Island's drinking water and reservoir systems is high. Investing in resilience measures offers cost-effectiveness by ensuring uninterrupted access to safe water during emergency events. While intervention costs vary, proactive solution strategies are less costly than the consequences of failure. In contrast, failure to act exposes Rhode Island communities to public health risks, emergency expenditures, and long-term infrastructure damage.



Funding Strategy

The proposed solutions align closely with the identified funding programs. Funding sources can cover infrastructure upgrades that protect drinking water quality, including embankment reinforcement, spillway modifications, and reservoir management planning. While others complement these efforts by supporting nature-based and watershed strategies that reduce runoff, prevent saltwater intrusion, and improve resilience to extreme weather. These programs collectively support both the engineered and ecological components of reservoir resilience.

Mechanism Title: Drinking Water State Revolving Fund (DWSRF)

Mechanism Type: Loan/Grant

Level: Federal

Agency : Rhode Island Infrastructure Bank (RIIB) & RIDOH

DWSRF can fund many reservoir resilience activities, including spillway upgrades, watershed protection planning, and infrastructure improvements that protect drinking water quality.

State Role: Provide guidance on project eligibility, support and technical assistance for preliminary engineering reports, and help identify opportunities for principal forgiveness.

Next Steps: Submit projects for the Priority List, prepare preliminary design, and coordinate with RIIB on financing structure.

Mechanism Title: NOAA Coastal Resilience Grants

Mechanism Type: Grants

Level: Federal

Agency: National Oceanic and Atmospheric Administration

For coastal-influenced reservoirs, NOAA funding can support nature-based stabilization, watershed protection, and embankment resilience that reduces runoff and improves water quality.

State Role: Coordinate with CRMC to align projects with coastal zone priorities and provide required consistency determinations. Identify regional partners (watershed groups, NGOs, university) to support competitive applications. Support development of any needed saltwater intrusion studies.

Next Steps: Develop a concept proposal and identify partners for collaborative application.

Note: The Funding Strategy outlines two potential mechanisms for implementing project solutions; however, it does not represent a comprehensive list of all available funding options. For a complete overview, please refer to the Future Investment Strategy.

Natural Systems
Adaptation Solutions

Beach & Wetland System Restoration

River & Stream Restoration with a focus on the Moshassuck River

Beach & Wetland System Restoration

This chapter outlines adaptation and resilience solutions for coastal beaches, barrier, and wetland systems. Beach and wetland system restoration strategies are focused on reducing coastal flooding impacts to conserve and protect these natural systems, as well as the built environment around them.

The strategies presented were developed based on assets identified as having high climate risks and aligning with the prioritization criteria established for this plan. The adjacent map illustrates how priority assets identified for solution development within this plan are distributed statewide. While these assets informed the strategies, the approaches can be applied to additional locations across the state.

Assets that Informed the Beach & Wetland System Restoration Solutions

Asset	Municipality
Napatree Barrier Beach	Westerly
Salt Pond Region Beaches and Barriers: Cards Pond, Green Hill Pond, Maschaug Pond, Ninigret Pond, Point Judith Pond, Potter Pond, Quonochontaug Pond, Trustom Pond, and Winnapaug Pond	Charlestown, Narragansett, South Kingstown, Westerly
Bristol County Coastal Wetlands	Bristol, Warren, Barrington
Newport County Coastal Wetlands	Newport, Portsmouth, Middletown, Little Compton, Tiverton, Jamestown
Washington County Coastal Wetlands	Narragansett, North Kingstown, Westerly, Charlestown

*The priority assets listed herein were identified through a Prioritization Approach developed specifically for the scope of this Plan. Details of this process and the complete list can be found in Chapter 4: Priority Assets List. Please note that this list does not include all vulnerable assets, nor does it reflect broader prioritization initiatives. A comprehensive database of all at-risk assets evaluated through this process has been provided to the State to support future work and enable continued prioritization efforts beyond the scope of this initiative.



Assets

- Critical Infrastructure & Facilities
- **Natural Systems**
- Community Resilience & Emergency Preparedness Structures

Beach & Wetland System Restoration Summary

Coastal beaches, barriers, and wetland systems are on the front lines of coastal flooding. With sea level rise and ongoing natural erosion processes, these areas are losing critical marine habitats and natural protections that once shielded coastal development from floods.

Beach and wetland systems, including Salt Pond Region beaches and barriers and the Napatree Point Conservation Area, support biodiversity, natural buffers against wave energy and coastal flooding, and store carbon. Yet, according to CRMC, 50% of Rhode Island's shoreline is vulnerable to erosion, and ongoing degradation of these connected systems threatens both marine ecosystems and coastal communities.

Restoration strategies are geared towards building on the efforts of conservation groups, like the Salt Ponds Coalition and Watch Hill Conservancy. In more undeveloped areas, like Napatree Point Conservation area, strategies are strengthening natural systems with NbS, such as marsh and dune restoration, to better withstand future sea level rise and erosion. In more developed areas, like Salt Pond Region, strategies are focused on rethinking policies and zoning regulations to limit coastal development and initiate steps towards voluntary managed retreat.

Ongoing Actions

There have been multiple climate studies, pilot projects, and guidance documents developed to further promote resilience for Rhode Island's beaches and wetlands. RI Coastal Resources Management Council (CRMC) is leading many of the efforts.

Resources

- Freshwater Wetlands and Buffer Protection (2022)
- Section 1.3.1(G) of CRMC Program (2022)
- CRMC Beach SAMP (2018)
- CRMC Coastal Erosion (2016)
- CRMC SAID Pilot (2019)
- Aquidneck Island Watershed Plan (2025)
- CCMP for Narragansett Bay (Ongoing)
- Easton's Beach Resilience Plan (Ongoing)

Steps for Implementation

1. **Assessment and Stakeholder Engagement**
   Conduct site assessments, stakeholder engagement, restoration planning and identify performance indicators. Work with Rhode Island Coastal Resources Management Council (CRMC) to identify relevant stakeholders to lead the project process.
2. **Optioneering Analysis and Planning**
   Conduct an optioneering analysis to evaluate restoration solutions. Create concept designs for physical restoration and pilot voluntary managed retreat projects. Work with Salt Pond Region community members to identify pilot locations for the retreat program. Transform concept designs into final designs.
3. **Costs and Funding Assessment**
   Develop order-of-magnitude costs for construction of restoration efforts and implementation of pilot managed retreat programs. Identify potential funding sources available for implementation, working with RI CRMC and additional funding agencies.
4. **Physical Restoration**
   Develop salt marsh and barrier beach restoration plans with input from natural resource managers to restore coastal habitats and make them more resilient to sea level rise. Engage partners, such as the Watch Hill Conservancy, and build off existing plans, such as the Aquidneck Island Watershed Plan, to identify and phase restoration projects.
5. **Policy and Regulation**
   Prepare adaptive development regulations – setback requirements, building standards for development, and restrictions on new development. Identify properties for buyouts and relocation initiatives. Conduct outreach with Rhode Island's Health Equity Zone (HEZ) communities to ensure equitable policy implementation.
6. **Monitoring and Adaptive Management**
   Establish monitoring programs to track dune and wetland elevations, health, and buffer zone effectiveness. Monitor compliance with development regulations, update restoration strategies based on monitoring data and climate projections, and incorporate lessons learned into future planning and implementation cycles.



Trustom Pond National Wildlife Refuge © U.S. Fish and Wildlife Service

Representative Priority Assets

Salt Pond Region Beaches and Barriers, including Winnapaug Pond, Quonochontaug Pond, Ninigret Pond, Trustom Pond, and Maschaug Pond, are selected as representative priority assets due to the need for **development regulation**, as identified by stakeholders. **Napatree Point Conservation Area** is selected to support ongoing **conservation and restoration** efforts.

Salt Pond Region Beaches and Barriers
Municipality: Charlestown, Narragansett, South Kingstown, Westerly

Current Climate Risks:
2050 Climate Risks:
2100 Climate Risks:

Context: Exposed to wave-action, moderately developed to developed, and stakeholder identified.

Napatree Point Conservation Area
Municipality: Westerly

Current Climate Risks*:
2050 Climate Risks*:
2100 Climate Risks*:

Context: The asset is an undeveloped conservation area and stakeholder identified.

*The Napatree Point Conservation Area was not identified as high risk for coastal flooding in the Statewide Climate Vulnerability Assessment. However, through this plan's stakeholder engagement process, erosion and storm surge were identified as critical risks for the area.

Beach & Wetland System Restoration Strategies

These strategies work together to create a layered coastal resilience system for Rhode Island. By strengthening natural defenses, restoring ecological functions, and guiding development away from high-risk areas, they reduce storm impacts, improve water quality, and allow coastal landscapes to adapt to changing conditions. This integrated approach aligns with RI CRMC guidance and regional climate goals, combining nature-based solutions with proactive planning to protect communities and ecosystems over the long term.

Enhance Dynamic Dunes and Barriers

Rebuild and stabilize dunes through sediment nourishment, planting native vegetation, and installing sand-friendly fencing to trap windblown sand. Beneficial reuse of clean sediment can also support dune and habitat restoration. These measures help reduce over wash during storms, maintain sediment transport, preserve habitat, and protect against erosive forces. Best practices include enhancing plant diversity, controlling invasive species, and redirecting visitor traffic away from dune areas to prevent damage. Maintenance requires sand replenishment and vegetation management, especially after major storm events, along with monitoring for erosion and ecological health. Move infrastructure inland to create room for dune restoration projects.



Napatree Point © Yankee Magazine

Solution Mechanism

- **Protect**
- **Accommodate**
- **Restore** ●
- **Rethink**

Scale of Innovation

- **Innovative**
- **Hybrid**
- **Traditional** ●

Relevant Hazards

- **Coastal Flooding**

Cost

$$$$$

$3.5M - $15M

Assumption: 1 mile of beach dune construction (5' tall)

Cost Benchmarks: Beach Renourishment Projects, Duval & St. Johns County, FL

Restore Wetlands and Buffer Zones

Restoring tidal wetlands and buffer zones helps absorb floodwaters, filter pollutants, and provide critical habitat. This strategy focuses on improving hydrologic connectivity, maintaining tidal exchange, and planting vegetation of native species to stabilize soils and support biodiversity. Techniques such as sediment placement raise marsh elevation to keep pace with sea-level rise, while hydrological restoration corrects drainage issues. When combined with land acquisition, marsh migration corridors can also be preserved to provide continued ecological and resilience wetland benefits. Long term success requires ongoing adaptive management of salt marsh restoration areas and marsh migration corridors as sea levels rise.



Sediment Replacement Project at Quonochontaug Pond © NOAA

Solution Mechanism

- **Protect**
- **Accommodate** ●
- **Restore** ●
- **Rethink**

Scale of Innovation

- **Innovative**
- **Hybrid** ●
- **Traditional**

Relevant Hazards

- **Coastal Flooding**
- **Stormwater Flooding**
- **Riverine Flooding**

Cost

$$$$$

$6M - $20M

Assumption: earth moving, thin layer soil placement, trees and in-water plantings for 1 mile (50' width)

Cost Benchmark: Ninigret Pond Restoration, Charleston, RI



Damage from Hurricane Sandy at Roy Carpenter's Beach © Rhode Island Sea Grant

Community Voices

"Private residential development on barriers is largely not something that can be protected. We need tools to disincentive investment and incentivize relocation." - attendee at the 1st Community Forum held at Providence Public Library in June 2025



Weeakapug, RI © Redfin

Implement Voluntary Buyout Program

This strategy reduces risk by controlling where and how development occurs and by planning for the relocation of critical infrastructure away from eroding shorelines.

A voluntary buyout program for the most vulnerable coastal communities is recommended. The program will build off RI CRMC's existing adaptive development regulations that mandate setbacks and coastal buffer zones for new construction. However, this program will target existing buildings, offering incentives like voluntary buyouts and relocation programs. The time and resources required to acquire parcels will vary greatly based on market conditions, location, and assets located on the real estate of interest. Public engagement and equity considerations are essential to ensure fair implementation and community support.

For new development, additional regulations should limit new construction in high-hazard zones and require resilient design for redevelopment, while infrastructure planning focuses on phased relocation of roads, utilities, and public facilities to safer areas.

Rhode Island's Beach SAMP (Shoreline Change Special Area Management Plan) is central to this approach, providing science-based tools such as updated shoreline change maps, STORMTOOLS flood projections, and the Coastal Hazard Application process, which evaluates erosion and sea level rise risks before permits are issued.

Solution Mechanism

- **Protect** ●
- **Accommodate**
- **Restore**
- **Rethink** ●

Scale of Innovation

- **Innovative** ●
- **Hybrid**
- **Traditional**

Relevant Hazards

- **Coastal Flooding**

Cost

$$$$$

$500K - $1.5M

Assumption: hire consultant to develop pilot voluntary buyout program

$$$$$

$1.5M - $5.5M

Assumption: purchase 5 parcels, remove homes and structures, stabilize flood prone area and revegetate

Cost Benchmark: Blue Acres Flood Buyout, Cranford, NJ

Beach & Wetland System Restoration Funding Strategy

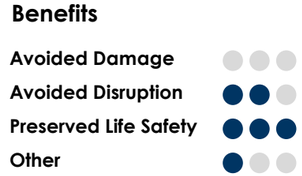
Rhode Island can advance beach and wetland restoration through a combination of federal and state programs that support habitat restoration, dune and barrier enhancement, erosion control, and nature-based shoreline management. The following sections summarize anticipated costs, cost-effectiveness considerations, and the ecological and community benefits these investments can deliver. They also outline key funding mechanisms, describe the State's role, and identify next steps to position priority coastal assets for implementation.

Costs

Dune restoration is a coastal adaptation technique that can involve adding sand either from upland or off-shore sources to create beach and dune habitat. Plantings stabilize sand and help allow dunes to capture wind-blown sand. Salt marsh restoration projects can vary from smaller scale hydrology restoration projects to larger landscape scale sediment placement projects that increase the elevation of the marsh and provide an area for future marsh migration. Larger, landscape scale marsh restoration projects will require greater capital investment, however, projects with increased stability through plantings have greater chance of sustained success, reducing long-term costs. Monitoring and maintenance is also required to ensure both strategies maintain effectiveness over time. The buy-out program set-up costs may be relatively low, but it is important to consider the ongoing investment required by local stakeholder agencies to run the program into the future as well as the financing required to acquire land, which can vary significantly based on market conditions, location, and assets located on the real estate of interest.

Benefits

The beach and wetland system restoration solutions protects undeveloped areas through enhancing ecosystems and developed areas through regulating property development. The solutions reduce damage from erosion, minimizing the cascading disruption it causes to natural habitats and developed communities. The prioritized assets are also areas near Tidal Migration Areas and in areas that have lower terrestrial resilience and/or lower social vulnerability, meaning that co-benefits are distributed to the most vulnerable habitats and communities. Life safety may be a considerable factor for privately owned assets not assessed here, but which would be benefited by a voluntary buyout program.



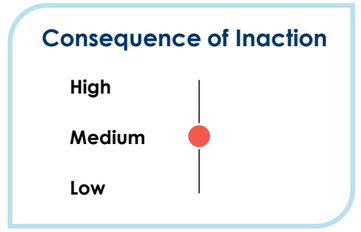
Co-benefits include improved biodiversity and ecosystems.

Economic Impacts

Coastal restoration protects tourism infrastructure and property values while creating jobs in ecological restoration, marine construction, and environmental management. Rhode Island's beaches generate significant tourism revenue; protecting these assets sustains hospitality, recreation, and service sector employment. Restored wetlands reduce flood damages to coastal development, lowering insurance costs and property losses. Nature-based solutions provide cost-effective flood protection compared to gray infrastructure. By maintaining natural buffers, communities avoid expensive emergency repairs, protect real estate investments, and preserve the coastal amenities essential to Rhode Island's economy and quality of life.

Consequence of Inaction

The consequence of inaction on Rhode Island's beaches and coastal wetlands is medium. Beaches and wetlands are highly at risk to consequences when they are inundated by 2 ft of flooding. Currently, the Salt Pond Region is expected to be exposed to 8.5 of flooding during a 100-year coastal flood event, and this is projected to increase to 12 ft by 2100, according to the SCV assessment. While beach and wetland restoration interventions are somewhat costly, failing to act can lead to escalating erosion and habitat loss.



Funding Strategy

The recommended beach and wetland restoration strategies align closely with USFWS National Coastal Wetlands Conservation Grants and the state's OSCAR Fund. The USFWS program provides capital funding for habitat restoration, coastal wetland enhancement, and conservation projects that increase resilience to flooding and erosion. OSCAR supports nature-based projects that reduce climate-driven flood risks and enhance coastal buffers. These mechanisms fund both large-scale restoration activities and state-prioritized resilience projects.

Mechanism Title: National Coastal Wetlands Conservation Grants (NCWCG)

Mechanism Type: Grant

Level: Federal

Agency: US Fish and Wildlife Service

NCWCG provides funding for the acquisition, restoration, and enhancement of coastal wetlands that protect habitat, improve water quality, and reduce coastal flood risks. This mechanism is a strong match for dune enhancement, wetland restoration, and barrier stabilization in areas at risk of sea level rise or storm surge.

State Role: Provide statewide habitat data, coastal mapping, and climate projections to strengthen proposals. Coordinate with DEM and CRMC to identify eligible restoration sites.

Next Steps: Develop a restoration or conservation concept and confirm site eligibility, secure match commitments.

Mechanism Title: Ocean State Climate Adaptation and Resilience (OSCAR) Fund

Mechanism Type: Grant

Level: State

Agency: RIDEM, CRMC, RIIB

OSCAR supports nature-based coastal resilience projects that reduce flood and erosion impacts in vulnerable coastal areas. This mechanism is well-suited for dune stabilization, marsh enhancement, buffer restoration, invasive species removal, and managed retreat strategies that provide measurable resilience benefits.

State Role: Prioritize projects that offer ecological benefits and community flood risk reduction. Provide guidance on resilience metrics, scoring criteria, and readiness requirements.

Next Steps: Prepare concept designs or site plans, identify match sources, and confirm regulatory alignment.

Note: The Funding Strategy outlines two potential mechanisms for implementing project solutions; however, it does not represent a comprehensive list of all available funding options. For a complete overview, please refer to the Future Investment Strategy.

River and Stream Restoration

This chapter outlines adaptation and resilience solutions for rivers and streams. River and stream restoration strategies are focused on reducing flooding and heat impacts to protect habitats and enhance ecosystems.

The strategies presented were developed based on assets identified as having high climate risks and aligning with the prioritization criteria established for this plan. The adjacent map illustrates how priority assets identified for solution development within this plan are distributed statewide. While these assets informed the strategies, the approaches can be applied to additional locations across the state.

Assets Identified for River and Stream Restoration Solutions

Asset	Municipality
Moshassuck River	Lincoln, Providence, Pawtucket, Central Falls

Additional Priority Assets Identified for River and Stream Restoration Solutions

Asset	Municipality
Blackstone Canal and River	Lincoln
Wood-Pawcatuck River	Washington and Kent Counties
Pawtuxet River	Kent and Providence Counties

*The priority assets listed herein were identified through a Prioritization Approach developed specifically for the scope of this Plan. Details of this process and the complete list can be found in Chapter 4: Priority Assets List. Please note that this list does not include all vulnerable assets, nor does it reflect broader prioritization initiatives. This Plan acknowledges the inherent interconnections between rivers, streams, and other water resources in Rhode Island. A comprehensive database of all at-risk assets evaluated through this process has been provided to the State to support future work and enable continued prioritization efforts beyond the scope of this initiative.



Assets

- Critical Infrastructure & Facilities
- **Natural Systems**
- Community Resilience & Emergency Preparedness Structures

River and Stream Restoration Summary

Restoring rivers and inland water areas helps improve water quality, reduce pollution, and manage flooding. By reconnecting floodplains, restoring wetlands and other natural habitats, improving how water moves through a watershed, and using green infrastructure to filter runoff and reduce impervious surfaces, communities can improve ecosystem, human health, and watershed resilience.

Historic industrial development has altered Rhode Island's watersheds, narrowing channels, hardening banks, and reducing their ability to carry floodwaters while introducing pollutants. The Moshassuck River, flowing through Lincoln, Central Falls, Pawtucket, and Providence, illustrates these challenges with frequent flooding, degraded habitat, and extensive invasive vegetation.

Strategies focusing on restoring floodplains, wetlands, riparian buffers, and addressing stormwater-related challenges can help restore natural function and enhance resilience of degraded rivers and streams. Efforts such as reconnecting floodplains, restoring wetlands, improving watershed hydraulics, and implementing green infrastructure can help store floodwaters, filter pollutants, and enhance habitat. Along the Moshassuck, these NbS not only reduce flood risk and improve water quality but also create community spaces that reduce heat island effects, support recreation, habitat, and long-term climate resilience.

Ongoing Actions

Restoration efforts across Rhode Island, including work on the Moshassuck, Woonasquatucket, Pocasset, and Wood-Pawcatuck Rivers, reflect a growing focus on addressing flooding, water-quality issues, and habitat loss with coordinated, NbS. Work by the regional Southeast New England Program (SNEP) advances restoration through annual technical assistance and grant funding, and non-profit partners provide project scoping support. On the Moshassuck River, floodplain and wetlands restoration, invasive-species management, and green infrastructure are planned to strengthen watershed resilience.

Resources

- Friends of the Moshassuck
- SNEP Network
- WRWC Habitat Restoration
- NRCS Watershed Protection Program (2023)



Aguntaug Swamp wetland restoration. Westerly, RI. © Fuss & O'Neill, Inc.

Steps for Implementation

1. **Stakeholder Engagement**
   Coordinate with affected municipalities, relevant state agencies (e.g., RIDEM), landowners, residents, and watershed groups to gather feedback on past flooding impacts, current vulnerabilities, ongoing initiatives, and identify potential challenges. Continue engagement throughout the project.
2. **Existing Conditions Analysis**
   Review of existing data such as floodplain maps, culvert/dam inventories, impervious cover, and existing water-quality or habitat assessment reports. Delineate natural resource conditions (e.g., wetlands) and identify potential sources of water quality or habitat impairments.
3. **Vulnerability and Alternatives Assessment**
   Identify flood, water-quality, and ecological vulnerabilities; identify best placement for solutions; and develop potential alternatives. Proposed solutions should address flooding, invasive species management and ecological restoration challenges, and potential project co-benefits like community greenspace.
4. **Feasibility Analysis**
   Evaluate technical, environmental, and financial feasibility of alternatives, including site constraints, permitting implications, constructability, long-term maintenance needs, and cost-benefit trade-offs. Develop rough order-of-magnitude opinion of cost estimates for each alternative.
5. **Modeling and Conceptual Design**
   Conduct hydrologic and hydraulic modeling to evaluate flood-reduction benefits and potential upstream or downstream impacts. Develop concept-level designs for the preferred alternative, refine cost estimates, and begin pre-application meetings with permitting agencies such as RIDEM (wetlands), U.S. Army Corps of Engineers (CWA §401/404), and local stormwater authorities. Develop concept designs into final designs.
6. **Costs and Funding Assessment**
   Develop order-of-magnitude costs for construction of restoration efforts. Identify potential funding sources available for implementation.
7. **Permitting and Construction**
   Prepare final engineering plans, obtain permits, and complete construction activities.
8. **Monitoring and Maintenance**
   Establish a long-term monitoring and maintenance plan.

Representative Priority Assets

The Moshassuck River is selected as a representative priority asset for River and Stream Restoration due to its **climate risk to coastal flooding, stormwater flooding, and extreme heat**. Additionally, this asset was **identified through community engagement**, showing its importance to the state's ecosystem. Restoration approaches can also be applied to other degraded rivers, such as the Blackstone, Wood-Pawcatuck, Pawtuxet, Maidford, and Seekonk Rivers.

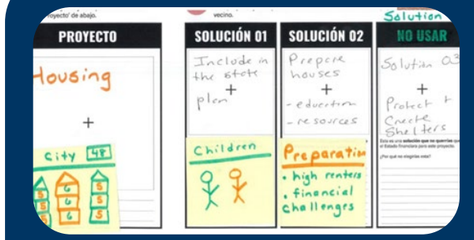
Moshassuck River
Municipality: Lincoln, Providence, Pawtucket, Central Falls
Current Climate Risks:
2050 Climate Risks:
2100 Climate Risks:
Context: Stakeholder Identified.



Moshassuck River Preserve © The Nature Conservancy

River and Stream Restoration Strategies

The solutions presented offer four key strategies for restoring resilience in river and inland water areas: reconnecting floodplains, restoring wetlands, expanding green infrastructure, and improving watershed hydraulics. Floodplain and wetland restoration help rivers and streams store and slow water, reducing flooding and improving habitat. Green infrastructure further slows and filters runoff and cools urban areas, while hydraulic improvements safely convey water during major storms. When combined, these strategies create a more climate-resilient watershed that protects communities while enhancing ecological health and public access.



Solution Development Activity at HEZ Meeting © Civic

Community Voices

"Protect the banks of the rivers, the regulation on these areas should be strong and should not be negotiable as private property, they are natural benefits whose original dimensions and surfaces should be respected and recovered." – attendee at the Health Equity Zone (HEZ) Meeting held in Olneyville in October 2025.

Improve Water Quality with Green Infrastructure

Green infrastructure, such as bioswales and rain gardens, enhances water quality by filtering runoff and removing pollutants before they reach rivers and ponds, while also supporting watershed restoration. These measures reduce pluvial flooding, lower urban temperatures by replacing impervious surfaces, and increase groundwater recharge which may alleviate localized flooding during heavy storms. Best practices include proper sizing, use of native vegetation, and integration into redevelopment projects. Long-term effectiveness depends on routine maintenance.



Rain garden in Paradise Valley Park. Middletown, RI © Fuss & O'Neill, Inc.

Solution Mechanism
- Protect
- Accommodate
- Restore
- Rethink

Scale of Innovation
- Innovative
- Hybrid
- Traditional

Relevant Hazards
- Stormwater Flooding
- Riverine Flooding
- Extreme Heat

Cost

$$$$
$550K - $2M

Assumption: 15,000 SF of rain gardens and bioretention areas and associated infrastructure
Cost Benchmark: Pawtucket, RI Green Infrastructure on Pine Street

Restore Wetland Function

For the Moshassuck River, restoration should focus on filled or degraded wetlands, low-lying parcels with poor drainage, and heat-vulnerable urban areas lacking vegetation. Wetland function can be reestablished by reshaping the site through earthmoving and grading, installing water control structures to restore natural hydrology, and planting native species with erosion control measures to stabilize soils. These restored systems improve water storage, filtration, and habitat, but require ongoing invasive species management and vegetation monitoring during the initial years to ensure long-term success.



Wetland restoration at Blackamore Pond. Cranston, RI © Fuss & O'Neill, Inc.

Solution Mechanism
- Protect
- Accommodate
- Restore
- Rethink

Scale of Innovation
- Innovative
- Hybrid
- Traditional

Relevant Hazards
- Coastal Flooding
- Stormwater Flooding
- Riverine Flooding
- Extreme Heat

Cost

$$$$
$5M - $20M

Assumption: earth moving, thin layer soil placement, native plantings for 1 mile (50' width)

Cost Benchmark: Ninigret Pond Restoration, Charleston, RI

Reconnect Floodplains and Increase Riparian Buffer Capacity

Conserving and restoring floodplains allows rivers to spread naturally during storms, reducing pluvial flooding and increasing riparian buffer capacity as climate-driven extreme rainfall becomes more frequent. Along the Moshassuck River, suitable sites can be identified by targeting low-lying parcels with frequent overbank flooding or previously filled floodplain areas. Some projects require removing structures or impervious surfaces, but restoration offers long-term benefits with minimal maintenance beyond periodic vegetation and debris management.



Floodplain restoration in West Warwick, RI © Fuss & O'Neill, Inc.

Solution Mechanism
- Protect
- Accommodate
- Restore
- Rethink

Scale of Innovation
- Innovative
- Hybrid
- Traditional

Relevant Hazards
- Stormwater Flooding
- Riverine Flooding

Cost

$$$$
$1.5M - $6M

Assumption: earthwork, plantings, and other works to improve drainage and reconnect floodplains

Cost Benchmark: Maidford River Restoration, Middletown, RI

Improve Watershed Hydraulics

Hydrologic and hydraulic modeling is essential to understand flow dynamics and prevent shifting flood risk downstream. Assessments should identify undersized culverts, constrained channels, and other areas with limited conveyance. Dam removal should also be explored in these assessments. Targeted improvements—such as enlarging culverts or opening channels—can reduce flooding and erosion while creating opportunities for open space, ecological restoration, and public access. These enhancements provide long-term benefits but require ongoing monitoring and management.



Culvert replacement. Maidford River, Middletown, RI © Fuss & O'Neill, Inc.

Solution Mechanism
- Protect
- Accommodate
- Restore
- Rethink

Scale of Innovation
- Innovative
- Hybrid
- Traditional

Relevant Hazards
- Coastal Flooding
- Stormwater Flooding
- Riverine Flooding

Cost

$$$$
$2.5M - $10.5M

Assumption: conduct assessment, remove existing 1,000 LF culvert, replace w/larger culvert, remove existing dam, earthwork

Cost Benchmark: Belfield Drive Floodplain Restoration, Johnston, RI

River and Stream Restoration Funding Strategy

Rhode Island's river and stream restoration strategy can be advanced through federal, state, and partnership-based funding that supports floodplain reconnection, wetland restoration, green infrastructure, and hydraulic improvements. The following sections outline anticipated costs, cost-effectiveness considerations, and the ecological and community benefits of restoring river systems like the Moshassuck. They also summarize the major funding mechanisms available, the State's role, and the steps needed to position priority inland water assets for competitive funding and implementation.

Costs

Strategies in this category overlap with some of those for Critical Infrastructure, but may vary in terms of scope and scale to achieve greater positive outcomes for inland water systems, watersheds, and the environment. Additional scope may include a focus on filtration, water treatment, control structures, and other relevant ecological interventions. While the costs provided here assumed scope for pointed interventions, they can be packaged together to create a greater impact on the broader area or region, typically achieving efficiencies of scale. Decision-makers should also consider not only upfront costs but also long-term benefits, maintenance requirements, and the potential for combined strategies to maximize resilience and ecological value. Watershed scale approaches and well placed solutions, while potentially having higher initial costs, can lead to lower overall costs when long-term resilience benefits are realized.

Benefits

River and stream restoration can restore connectivity to riverine systems and improve the health and function of wetlands and flood plain habitat. This is especially important for endangered species that live in rivers and streams. The Moshassuck River was identified due to its ecological significance and pollution exposure due to runoff from flooding. The SCV assessment estimates that the river is exposed to 5.5 ft of flooding during a current-day 100-year coastal flood event and this rises to nearly 8 ft by 2100. Restoration strategies help protect inland communities from these flooding events. Green infrastructure reduces the amount of polluted runoff entering streams and rivers from streets and communities. The river was identified by the community due to its ecological significance.

Benefits

Avoided Damage	● ○ ○
Avoided Disruption	● ● ●
Preserved Life Safety	● ● ●
Other	● ○ ○

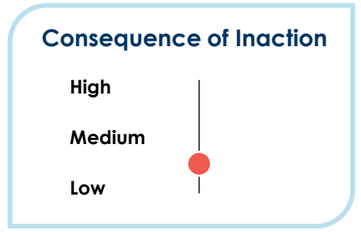
Co-benefits include improved biodiversity and ecosystems.

Economic Impacts

River and stream restoration creates employment in environmental engineering, habitat restoration, and green infrastructure installation. Improved water quality supports recreation economies and reduces municipal treatment costs. Restored floodplains prevent costly property damage while creating community spaces that enhance property values. Green infrastructure projects reduce stormwater management expenses compared to traditional systems. By reconnecting natural systems, communities lower flood insurance costs, avoid emergency response expenses, reduce heat-related health costs, and create amenities that attract residents and businesses, demonstrating measurable economic and fiscal benefits.

Consequence of Inaction

The consequence of inaction on Rhode rivers and streams is low-medium, as potential impacts from the Moshassuck River are localized to the river's watershed. While proactive resilience strategies can reduce localized flooding, prevent property damage, and protect habitats, the return on investment is modest compared to other priorities. In contrast, failing to act may still lead to repair costs and environmental degradation in and around the river.



Funding Strategy

These funding mechanisms support planning, design, and implementation for comprehensive riverine restoration that improve water quality, restore ecological function, and reduce stormwater impacts. Mechanisms directly align with floodplain reconnection, wetland restoration, green infrastructure, and hydraulic improvements along the Moshassuck River. Complementary funding for nature-based resilience projects that reduce flooding, improve water quality, and enhance community resilience are also critical in developing funding strategy.

Mechanism Title: EPA Southeast New England Program (SNEP) Watershed Implementation Grants (SWIG)

Mechanism Type: Grant/Technical Assistance

Level: Federal

Agency: Environmental Protection Agency

SNEP Watershed Implementation Grants fund on-the-ground projects that restore degraded watersheds, reduce stormwater impacts, and improve water quality through nature-based and community-driven approaches.

State Role: Provide technical assistance, data, and letters of support. Help applicants align proposed projects with statewide watershed priorities.

Next Steps: Develop a watershed-scale concept plan, identify local and regional partners, and begin scoping design elements eligible under SWIG.

Mechanism Title: Rhode Island Climate Resilience Fund (CRF)

Mechanism Type: Grant

Level: State

Agency: Rhode Island Department of Environmental Management

CRF funds projects that reduce climate-driven flood and stormwater risks using nature-based or hybrid approaches. For the Moshassuck River, CRF can support wetland restoration, reconnection of historic floodplains, stormwater improvements, green infrastructure, and hydraulic upgrades.

State Role: Provide guidance on scoring criteria and eligible project types. Support identification of match sources for projects seeking to leverage federal funds.

Next Steps: Prepare a preliminary design or concept plan, identify match funding, and confirm timing with CRF application cycles.

Note: The Funding Strategy outlines two potential mechanisms for implementing project solutions; however, it does not represent a comprehensive list of all available funding options. For a complete overview, please refer to the Future Investment Strategy.

Community Resilience & Emergency Preparedness Adaptation Solutions

School & Public Safety Building Solutions with hardening and relocation opportunities

Hospital Flood & Energy Resilience Solutions

School & Public Safety Building Solutions

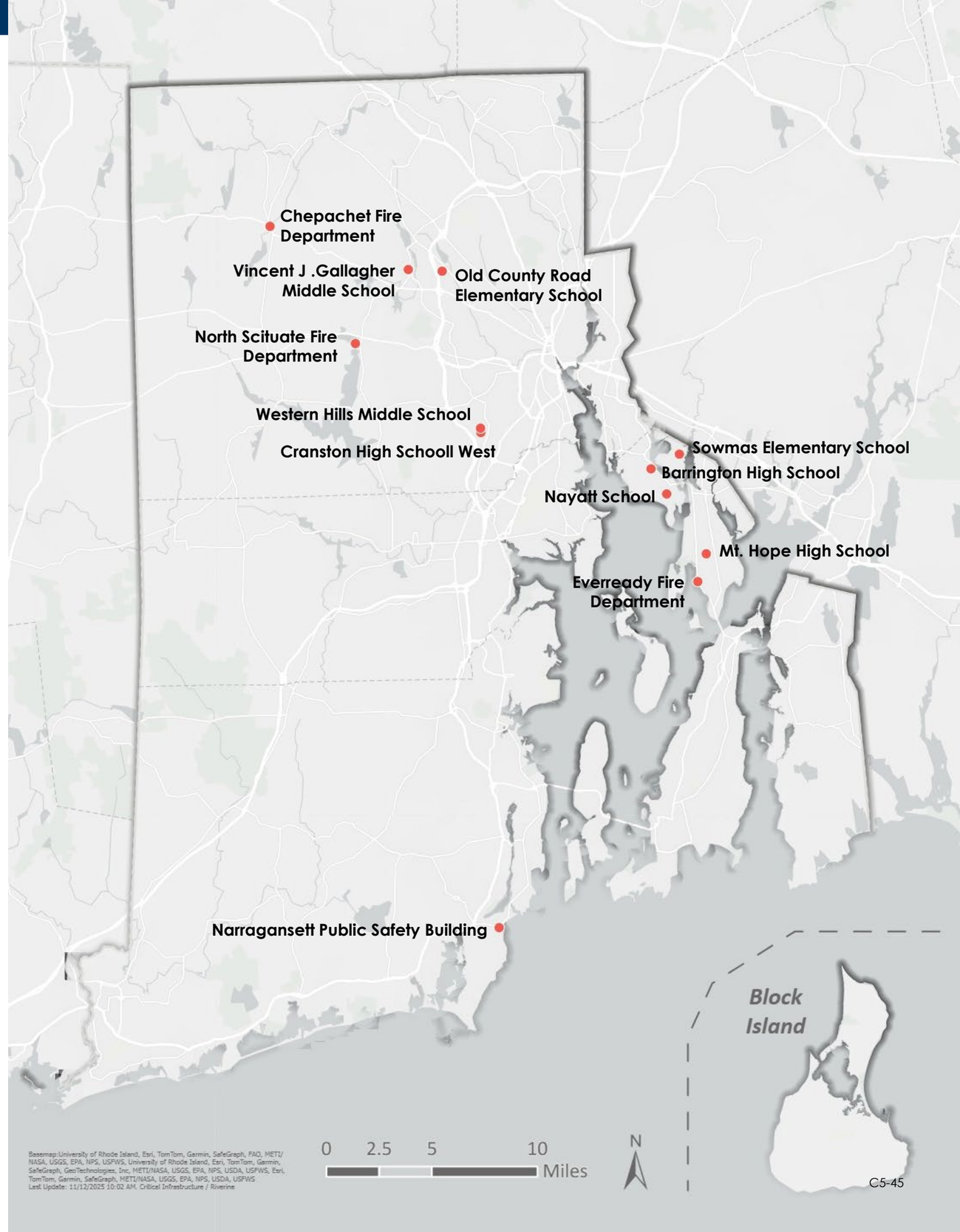
This chapter outlines adaptation and resilience solutions for schools and public safety buildings, including fire and police stations. The strategies are focused on reducing flooding, extreme heat, and extreme wind impacts to ensure these community and emergency service providers can continue to serve Rhode Island.

The strategies presented were developed based on assets identified as having high climate risks and aligning with the prioritization criteria established for this plan. The adjacent map illustrates how priority assets identified for solution development within this plan are distributed statewide. While these assets informed the strategies, the approaches can be applied to additional locations across the state.

Assets Identified for School & Public Safety Building Solutions

Asset	Municipality
Barrington High School	Barrington
Cranston High School West	Cranston
Nayatt School	Barrington
Sowams Elementary School	Barrington
Mt. Hope High School	Bristol
Old County Road Elementary School	Smithfield
Vincent J. Gallagher Middle School	Smithfield
Western Hills Middle School	Cranston
Chepachet Fire Department	Glocester
Everready Fire Station	Bristol
North Scituate Fire Department	Scituate
Narragansett Public Safety Building	Narragansett

*The priority assets listed herein were identified through a Prioritization Approach developed specifically for the scope of this Plan. Details of this process and the complete list can be found in Chapter 4: Priority Assets List. Please note that this list does not include all vulnerable assets, nor does it reflect broader prioritization initiatives. A comprehensive database of all at-risk assets evaluated through this process has been provided to the State to support future work and enable continued prioritization efforts beyond the scope of this initiative.



Assets

- Critical Infrastructure & Facilities
- Natural Systems
- **Community Resilience & Emergency Preparedness Structures**

School & Public Safety Building Solutions Summary

Many schools and public safety buildings, including fire and police stations, are not built to withstand current or future climate impacts. Many are at heightened risk for flooding, leading to building damage and disruption to critical educational and emergency services.

Rhode Island's building stock is aging: the average age of a school in the state is 82 years old. Many schools and public safety buildings were constructed in locations that were once safe from flooding or in flood-prone areas where conditions have worsened. Their proximity to trains, highways, and wastewater facilities increases the risk of runoff contamination during floods. Schools and public safety buildings, many of which are designated emergency shelters, face flood damage that disrupts educational and emergency services while threatening occupant health.

North Scituate Fire Department and Barrington High School were identified as high risk for flooding and extreme heat. It is recommended that these buildings consider relocation out of the floodplain or retrofit their buildings to mitigate against future flooding. As key community spaces, these buildings also have an opportunity to transform their buildings into resilience hubs, acting as hardened emergency shelters.

Ongoing Actions

Rhode island is supporting hazard mitigation planning, property development guidance, and school modernization initiatives led by Rhode Island Department of Education (RIDE). The state also provides a wireless broadband network to emergency providers. Locally, community centers are transforming into resilience hubs.

Resources

- Coastal Property Guide (2014)
- Local Hazard Mitigation Planning (2025)
- RIDE Modernization Plans (2023)
- RIDE Statewide Assessment (2025)
- Rhode Island First Responder Network Authority (FirstNet) and AT&T (2017)
- Olneyville Resilience Hub (Ongoing)

Steps for Implementation

1. **Stakeholder and Community Engagement**
   Partner with Rhode Island's Health Equity Zone (HEZ) communities and RIDE to identify building candidates for resilient building solutions and lead the implementation projects.
2. **Flood Hazard Assessment and Project Identification**
   Conduct on-site flooding assessments at buildings to identify areas susceptible to flooding. Use results to identify priority flood mitigation projects.
2. **Concept and Final Designs**
   Create concept designs for flood mitigation projects and evaluate them with RIDE. Transform concept designs into final designs.
3. **Cost and Funding Assessment**
   Determine the costing of the various building solutions at identified schools and public safety buildings, including both construction and operational costs. Identify the most cost-effective solutions.
4. **Resilience Hub Preparation**
   Identify the priority buildings for a resilience hub based on outreach, the flooding assessment, and cost planning. Engage with the local community at the resilience hub site to identify a resilience hub leadership team. The team should identify the goals of the resilience hub and lead implementation. Connect with the Olneyville Resilience hub to understand resilience hub best practices.
5. **Relocation Preparation**
   Identify the priority buildings for relocation based on outreach, the flooding assessment, and cost planning. Develop a transition plan for the relocated school to ensure students and teachers do not lose educational hours.
6. **Permitting and Construction**
   Procure the relevant permitting needed for the resilience solutions and implement construction, working with relevant state agencies (such as RIDE) and the Municipal Building Department throughout the relevant procedures.
7. **Maintenance**
   Partner with public safety and school building facility managers and relevant state agencies (such as RIDE) to develop a maintenance program.



North Scituate Fire Department, © North Scituate Fire Department

Representative Priority Assets

North Scituate Fire Department is selected as a representative priority asset because it is **more than a mire away from another fire station,** and it faces **stormwater and riverine flooding risk.** The asset is also identified as a **candidate for relocation. Barrington High School** is selected due to its **coastal, stormwater, and riverine flooding risk** and **ongoing flood mitigation need**.

North Scituate Fire Department
Municipality: Scituate

Current Climate Risks:
2050 Climate Risks:
2100 Climate Risks:

Context: More than a mile away from another fire station.

Barrington High School
Municipality: Barrington

Current Climate Risks:
2050 Climate Risks:
2100 Climate Risks:

Context: Ongoing flood mitigation need.

School & Public Safety Building Solutions Strategies

The solutions presented offer two key resilient options for school and public safety buildings: relocation or building hardening. Buildings at the highest level of flood risk should consider relocating out of flood zones, maximizing protection. Where relocation is not feasible, buildings can elevate critical infrastructure and utilize storm-resistant materials and dry floodproofing, protecting against flooding. Building retrofits can also incorporate community features to serve as broader resilience hubs. Resilience hubs provide community space for preparedness before emergencies, provide shelter and essential services during climate or disaster events, and support recovery afterward.



Participants at the 1st Community Forum, Credit: Civic

Community Voices

"Without HVAC in schools, [K-12 and universities] close early in June [due to extreme heat]. "
- attendee at the 2nd Community Forum at East Providence's Weaver Library in July 2025

Relocate Programming Out of Flood Zones

Move schools and emergency operations to new buildings outside of FEMA-designated Special Flood Hazard areas. This reduces long-term risk and aligns with local hazard mitigation plans. A candidate for relocation is North Scituate Fire Department, which is extremely vulnerable to riverine flooding due to its proximity to the Scituate Reservoir. Recently, the town of Scituate created a new police station outside of the flood zone to reduce flood risk.



Rhode Island School Bus
© Rhode Island Current

Solution Mechanism
- **Protect**
- **Accommodate**
- **Restore**
- **Rethink** ●

Scale of Innovation
- **Innovative**
- **Hybrid**
- **Traditional** ●

Relevant Hazards
- **Coastal Flooding**
- **Stormwater Flooding**
- **Riverine Flooding**

Cost
$$$$
$300K - $1.2M

Assumption: hire consultant to develop plan to relocate programming out of flood zones, demolish public safety building (e.g. North Scituate Fire Department), clear building site & surrounding area

Retrofit and Reinforce

Apply dry floodproofing measures such as watertight doors, flood shields, and sealants to prevent water intrusion. Install hurricane-rated doors, windows, and roofing systems to withstand wind speeds common in Rhode Island Nor'easters and hurricanes. Use impact-resistant glazing and reinforced frames. Apply wet proofing measures through utilizing flood resistant materials.



Narragansett Public Safety Building
© Narragansett Police Department

Solution Mechanism
- **Protect**
- **Accommodate** ●
- **Restore**
- **Rethink**

Scale of Innovation
- **Innovative**
- **Hybrid** ●
- **Traditional**

Relevant Hazards
- **Coastal Flooding**
- **Stormwater Flooding**
- **Riverine Flooding**
- **Extreme Wind**

Cost
$$$$
$2M - $8M

Assumption: upgrade existing doors, windows, and roofing to be floodproof and weather resistant, purchase deployable flood barriers and conduct preparatory works

Elevate Critical Infrastructure

Raise electrical panels, mechanical systems, and emergency generators above anticipated flood levels to maintain functionality during storm events and reduce downtime. Where elevation is not feasible, use waterproof enclosures and secure anchoring to prevent damage. Aging school infrastructure often lacks elevated critical equipment, making these measures essential to withstand future storms.



High Efficiency Boils mounted above the BFE
© Steven Winters Associates and Enterprise

Solution Mechanism
- **Protect**
- **Accommodate** ●
- **Restore**
- **Rethink**

Scale of Innovation
- **Innovative**
- **Hybrid** ●
- **Traditional**

Relevant Hazards
- **Coastal Flooding**
- **Stormwater Flooding**
- **Riverine Flooding**

Cost
$$$$
$50K - $250K

Assumption: clear 500sf equipment room, raise equipment, and other supportive works

Create a Resilience Hub and Microgrid

Convert part of the facility into a resilience hub by retrofitting spaces to support community needs before, during, and after climate or emergency events. Install reliable backup power such as generators or solar systems with battery storage. Designate areas with adequate storage for safe drinking water and food supplies. Include shower and sanitation facilities for extended stays and create a secure communication zone equipped with charging stations.



Olneyville Resilience Hub
© City of Providence

Solution Mechanism
- **Protect**
- **Accommodate** ●
- **Restore**
- **Rethink** ●

Scale of Innovation
- **Innovative** ●
- **Hybrid**
- **Traditional**

Relevant Hazards
- **Coastal Flooding**
- **Stormwater Flooding**
- **Riverine Flooding**
- **Extreme Heat**
- **Extreme Wind**

Cost
$$$$
$4M - $15M

Assumption: Install backup power, emergency supplies, shower and sanitation facilities
Cost Benchmark: Olney Resilience Hub

School & Public Safety Building Solutions Funding Strategy

Rhode Island can advance school and public safety building resilience through a combination of federal and state programs that support relocation from high-risk areas, structural retrofits, and the creation of resilience hubs. The following sections summarize anticipated costs, cost-effectiveness considerations, and the community benefits of protecting critical educational and emergency services. They also outline the key funding mechanisms available, define the State's role, and identify next steps to position priority assets for implementation.

Costs

Costs for this group of strategies focus on operational shifts, hardening buildings, and creating dedicated resilient spaces. Developing a plan to move operations out of floodplains can be a relatively low-cost alternative, but it is important to consider that operational costs will change, staff and users of public facilities will be impacted, and other existing facilities may require investment to modify them to accommodate potentially increased activity and uses (including the possibility of needing to construct brand new facilities). Raising equipment is typically less expensive than other more extensive hardening measures. Those measures are directly correlated to the size of the building requiring retrofit. It is typically less expensive to build new buildings to resilient standards rather than beginning with lower grade specifications and upgrading later. Costs for hardening and building resilient hubs greatly depend on the number and type of specific interventions pursued as part of a larger suite of solutions.

Benefits

School and public safety buildings solutions are geared towards protecting buildings from damage and preserving life safety. Protection from damage will help reduce associated damage costs and disruption to everyday life for students, families, and community members. Additionally, many schools serve dual purposing acting as RIEMA emergency shelters or could be designed as resilience hubs. The prioritized buildings were selected based on their redundancy. North Scituate Fire Department is the only fire department for three miles, making it a critical community asset to protect.

Benefits

Avoided Damage	●●●
Avoided Disruption	●●○
Preserved Life Safety	●●●
Other	●○○

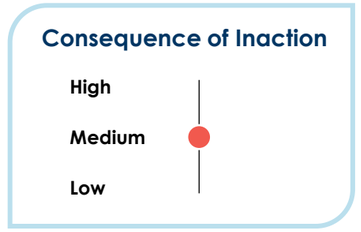
Co-benefits include protection of RIEMA emergency shelters and essential fire stations in rural areas.

Economic Impacts

Protecting schools and emergency facilities ensures continuous education and public safety services during climate events. Building improvements create construction jobs while preventing costly flood damage and operational disruptions. Resilient schools maintain property values in surrounding communities and avoid expensive temporary relocations. Emergency facilities that remain operational during disasters reduce response times and save lives, preventing economic losses from delayed emergency services. Resilience hub development creates community assets that support economic recovery after events. These investments protect essential public services infrastructure while generating employment and demonstrating fiscal responsibility.

Consequence of Inaction

The consequence of inaction on Rhode Island's school and public safety buildings is medium. Redundancy across the state allows students and emergency responders to relocate if facilities fail. Proactive strategies can improve continuity, reduce disruption, and prevent relocation costs. The SCV assessment estimated that a current day 100-year coastal flood event could result in damage of 10-30% of the total value of Barrington High School, raising to more than 30% of the value by 2100. Protection from damage will translate into reduced disruption of services.



Funding Strategy

These funding programs support planning and implementation of resilience upgrades for schools and public safety buildings. The USDA Community Facilities Program aligns with relocation, structural retrofits, and upgrades to critical systems that ensure essential services remain operational during extreme weather. The RIIB Municipal Resilience Program complements this by supporting community-identified projects that reduce flooding, improve building performance, and strengthen long-term resilience.

Mechanism Title: USDA Community Facilities Grant/Loan Program

Mechanism Type: Grant/Loan

Level: Federal

Agency: US Department of Agriculture - Rural Development

The Community Facilities Program funds construction, expansion, relocation, and modernization of essential public buildings in eligible communities. This includes fire stations, EMS facilities, schools, and emergency operations centers.

State Role: Provide technical guidance on relocation planning, site assessment, and risk reduction benefits. Assist communities in confirming 'essential community facilities' classification.

Next Steps: Identify eligible buildings and relocation/retrofit needs and conduct preliminary design.

Mechanism Title: Municipal Resilience Program (MRP)

Mechanism Type: Grant/Technical Assistance

Level: State

Agency: Rhode Island Infrastructure Bank (RIIB)

MRP funds community-led resilience projects that reduce flooding, protect critical facilities, and support climate adaptation. Eligible activities include storm proofing, elevating building systems, green infrastructure, and developing resilience hubs. The program's focus on municipal priorities makes it well suited for schools and public safety buildings.

State Role: Provide technical support for cost estimation, project readiness, and benefit assessment.

Next Steps: Participate in a MRP workshop, prepare conceptual designs, and submit priority projects.

Note: The Funding Strategy outlines two potential mechanisms for implementing project solutions; however, it does not represent a comprehensive list of all available funding options. For a complete overview, please refer to the Future Investment Strategy.

Hospital Flood & Energy Resilience Solutions

This chapter outlines adaptation and resilience solutions for hospitals. Hospital flood and energy resilience solutions are focused on reducing flooding, extreme heat, and wind impacts. These climate hazards can physically damage hospital buildings and impact life safety for patients, staff, and facility operators. Cascading impacts from climate damages can also lead to downtime of these critical facilities due to power outages or reduced transportation access.

The strategies presented were developed based on assets identified as having high climate risks and aligning with the prioritization criteria established for this plan. The adjacent map illustrates how priority assets identified for solution development within this plan are distributed statewide. While these assets informed the strategies, the approaches can be applied to additional locations across the state.

Assets Identified for Hospital Flood & Energy Resilience Solutions

Asset	Municipality
Landmark Medical Center (Woonsocket Hospital)	Woonsocket
Rhode Island Hospital	Providence
South County Hospital	South Kingstown

*The priority assets listed herein were identified through a Prioritization Approach developed specifically for the scope of this Plan. Details of this process and the complete list can be found in Chapter 4: Priority Assets List. Please note that this list does not include all vulnerable assets, nor does it reflect broader prioritization initiatives. A comprehensive database of all at-risk assets evaluated through this process has been provided to the State to support future work and enable continued prioritization efforts beyond the scope of this initiative.



Assets

- Critical Infrastructure & Facilities
- Natural Systems
- **Community Resilience & Emergency Preparedness Structures**

Hospital Flood & Energy Resilience Solutions Summary

Hospital flood and energy resilience solutions aim to reduce damages and downtime from flooding events and improve redundancy of backup power. Flood events put the operational capacity of critical equipment at risk and block transportation routes. Climate impacts put more strain on the electricity grid, heightening the chance of power outages and enhancing the need for energy resilience solutions.

Rhode Island's 17 hospitals are critical to the state and neighboring states' public health, with residents from Massachusetts and Connecticut traveling to utilize facilities. The hospitals offer various healthcare options, including critical, psychiatric, women and infant, and pediatric care. It is imperative that all hospitals remain open and accessible during climate events.

Rhode Island Hospital, South County Hospital, and Landmark Medical Center were identified as high risk across various climate hazards, specifically flooding and extreme heat. It is recommended that these hospitals develop Hazard Mitigation Plans (HMP) to more deeply understand site climate vulnerabilities. To combat flooding, hospitals should integrate gray and green infrastructure solutions and move their evacuation routes out of areas prone to flooding. To combat power outages associated with climate impacts, hospitals should develop on-site microgrids.

Ongoing Actions

Rhode Island developed a Hospital Preparedness Program and Resilient Microgrids for Critical Services Program which provides resilient planning resources for hospitals. Cities and hospital institutions are also including resilience considerations into their long-term planning efforts.

Resources

- Hospital Preparedness Program (Ongoing)
- Resilient Microgrids for Critical Services Program (Ongoing)
- City of Providence Hospital District Vision Plan (2025)
- Rhode Island Hospital Institutional Master Plan (2025)

Steps for Implementation

1. **Hazard Mitigation Planning**
   Develop a hazard mitigation plan to identify key climate hazards and develop emergency plans. Incorporate best practices from the City of Providence Hospital District Vision Plan and the Rhode Island Hospital Institutional Master Plan.
2. **Stakeholder Engagement**
   Conduct stakeholder outreach with key facility operators, staff, and patients to understand the current climate and operational challenges at the hospital. Identify priority criteria for the microgrids system with the stakeholders. Continue stakeholder engagement throughout the project.
3. **Site Flooding Assessment**
   Conduct a site flooding assessment to identify key areas of ponding and priority locations for flood mitigation projects.
4. **Energy Feasibility Analysis**
   Utilizing the resources from Resilient Microgrids for Critical Services Program, assess the back up power needs and evaluate the potential for renewable energy solutions. Consider feasibility based on lot size, as well as the hospital's maintenance and operational capacity. Analyze various energy scenarios, evaluating differing types of interventions with microgrids (solar, wind, etc.), load sizes, and phasing approaches. For the different scenarios, conduct an additional analysis based on the criteria defined by the stakeholders to identify the ideal microgrid solution.
5. **Design and Cost Planning**
   Develop design factoring in feasibility. Assess costs by factoring in capital and long-term maintenance costing.
6. **Permitting and Construction**
   Procure the relevant permitting needed for the resilience solutions and implement construction.
7. **Commissioning and Maintenance**
   Commission and test energy systems to ensure functionality. Partner hospital facility managers and relevant state agencies to develop a maintenance plan.



Rhode Island Hospital © Brown Surgical Associates

Representative Priority Assets

Rhode Island Hospital and **South County Hospital,** two major hospitals serving all of Rhode Island, are selected as representative priority assets due to their climate risk across **coastal flooding, stormwater flooding, riverine flooding, and extreme heat.**

Rhode Island Hospital
Municipality: Providence
Current Climate Risks:
2050 Climate Risks:
2100 Climate Risks:
Context: 719 hospital beds.

South County Hospital
Municipality: South Kingstown
Current Climate Risks:
2050 Climate Risks:
2100 Climate Risks:
Context: 100 hospital beds.

Hospital Flood & Energy Resilience Solutions Strategies

These strategies create a comprehensive resilience pathway for Rhode Island hospitals. Further studying climate vulnerabilities and facility challenges aligns with the RIDOH Hospital Preparedness Program and lays the groundwork needed for implementable solutions. Pairing microgrids with site and building design flood and heat mitigation strategies will reduce damage and downtime at hospitals and enhance healthcare access and public health throughout the state.

Need weighted highest in the priority criteria

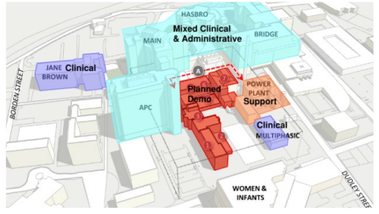
During the 3rd Community Forum

Community Voices

"Hospital, substation, and roads would probably be highest need." – attendee at the 3rd Community Forum held at Newport Public Library in September 2025

Conduct Multi Hazard Mitigation Planning

Develop hospital-specific multi hazard mitigation plans (HMP) to identify vulnerabilities and develop emergency plans. Include a future-projecting climate assessment, interviews with stakeholders (facility operators, staff, and patients), and a review of past climate and emergency events. Emergency planning should include scenario planning to identify key roles, protected evacuation routes, and microgrid operations. The HMP should build off past hospital planning efforts, such as the Rhode Island Hospital Institutional Masterplan.



Rhode Island Hospital Institutional Masterplan
© City of Providence

Solution Mechanism
- Protect
- Accommodate
- Restore
- Rethink

Scale of Innovation
- Innovative
- Hybrid
- Traditional

Relevant Hazards
- Coastal Flooding
- Stormwater Flooding
- Riverine Flooding
- Extreme Heat
- Extreme Wind

Cost

$$$$
$150K - $650K

Assumption: hire consultant to conduct multi hazard mitigation planning

Emergency Access Protective Measures

Design and maintain elevated or protected access routes for emergency vehicles and personnel. Include redundant entry points and ensure compliance with ADA and emergency egress standards. Conduct a user-centric transportation analysis for hospital facilities maintain continuity of care. Prioritize routes that minimize delays for emergency responders while maintaining safe access for all. Add protected loading docks and reinforce egress redundancy to support critical operations during disruptions.



Park Nicollet Methodist Hospital
© Jeffrey Thompson for MPR News

Solution Mechanism
- Protect
- Accommodate
- Restore
- Rethink

Scale of Innovation
- Innovative
- Hybrid
- Traditional

Relevant Hazards
- Coastal Flooding
- Stormwater Flooding
- Riverine Flooding

Cost

$$$$
$1M - $5M

Assumption: demolish existing 1,000 LF 2-lane roadway, add fill to raise 2', reconstruct in-kind, build parallel 6' sidewalk

Comprehensive Floodproofing & Façade Enhancements

Floodproof hospitals by elevating critical equipment out of the floodplain, sealing openings such as windows and doors, and utilizing flood resistant materials. Install permanent and/or deployable flood walls and provide permanent and portable pumps for emergency flood events. Ensure there is designated storage and trained staff for deployable flood walls. Utilize impact resistant materials for the façade to protect against wind drive rain. Implement passive design strategies, such as insulated windows and panes, shading devices, and reflective materials on facades to mitigate extreme heat. For new hospitals, consider the orientation, layout, and ventilation to maximize sunlight in winter and minimize heat gain in the summer.



South County Hospital
© South County Hospital

Solution Mechanism
- Protect
- Accommodate
- Restore
- Rethink

Scale of Innovation
- Innovative
- Hybrid
- Traditional

Relevant Hazards
- Coastal Flooding
- Stormwater Flooding
- Riverine Flooding
- Extreme Heat
- Extreme Wind

Cost

$$$$
$1.5M - $5M

Assumption: raise equipment, purchase deployable flood barriers and conduct preparatory works

Cost Benchmark: Tampa General Hospital (1,000 LF, 9' tall Aquafence)

Create Microgrids

Install renewable energy sources and batteries to act as a microgrid. The microgrid will act as additional back up and allow the hospital to island off the utility provider during a power outage event. Ensure that the microgrid works in tandem with existing generators and electricity distribution network. Equipment should be elevated above flood levels. Implementation should include automatic transfer switches and planning for at least 72 hours of backup power. Train relevant personnel on the microgrid operational procedures.



Kaiser Permanente Hospital Microgrid
© Fierce Healthcare

Solution Mechanism
- Protect
- Accommodate
- Restore
- Rethink

Scale of Innovation
- Innovative
- Hybrid
- Traditional

Relevant Hazards
- Coastal Flooding
- Stormwater Flooding
- Riverine Flooding
- Extreme Heat
- Extreme Wind

Cost

$$$$
$3M - $10M

Assumption: solar PV system and battery storage system

Cost Benchmark: Kaiser Permanente Microgrid (2MW solar, 9MWhr storage)

Hospital Flood & Energy Resilience Solutions Funding Strategy

Rhode Island can advance hospital flood mitigation and energy resilience through a mix of federal and state programs that support emergency access improvements, flood-proofing, microgrids, and renewable backup power. The following sections summarize anticipated costs, cost-effectiveness considerations, and the public health and operational benefits of protecting critical healthcare facilities. They also outline key funding mechanisms, define the State's role, and identify next steps to position priority hospital assets for implementation.

Costs

Hospital flood and energy resilience solution costs vary based on the scale and type of implementation. Microgrid costs are directly correlated to the capacity of the system. While hospitals already have backup power generation requirements, implementing renewable-based microgrids can help reduce energy consumption from the grid and decrease reliance on traditional backup fuels. Emergency access costs will increase for longer access routes or greater elevation changes. Developing a multi-hazard mitigation plan should consider level of stakeholder engagement and complexity of the hospital's operations when evaluating cost. Permanent hardening works are also feasible for a higher cost to minimize operational and recovery costs for the long-term, but the deployable flood barriers provide a compelling alternative due to minimized up-front cost and limited downtime for hospital operations during construction. Note that a proper plan, trained staff, and sufficient time and resources are required to respond and prepare when incoming storms and flooding are expected. Costs increase with greater height and length of flood barrier.

Benefits

Hospital and energy resilience solutions protect facilities from damage and life safety impacts from climate hazards. Implementing resilience strategies now helps avoid escalating repair costs, protects patient safety, and ensures continuity of care as climate risks intensify. Solutions are geared towards improving hospital coordination through strategic planning, reducing power outages through the microgrid, and protecting transportation routes with flood resilience strategies. Failing to implement resilience solutions exposes facilities not only to public health risks but also to mounting repair costs, emergency expenditures, and reputational harm.

Benefits

Avoided Damage	● ● ●
Avoided Disruption	● ● ○
Preserved Life Safety	● ● ●
Other	○ ○ ○

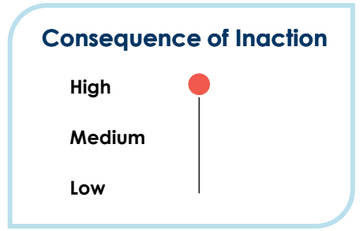
Co-benefits include improved hospital coordination, reduced power outages, and protected transportation routes.

Economic Impacts

Hospital resilience investments protect Rhode Island's multi-billion dollar healthcare sector and associated employment. Preventing flood damage and ensuring backup power maintains critical healthcare services that support economic productivity. Hospital disruptions cascade through the economy, affecting emergency response, public health, and business operations. Infrastructure improvements create specialized construction jobs while reducing costly emergency repairs and patient transfers. Reliable hospital operations attract healthcare professionals and support medical tourism. Microgrids and flood protection demonstrate fiscal prudence by preventing revenue losses, maintaining healthcare access, and protecting facilities serving Rhode Island and neighboring states.

Consequence of Inaction

The consequence of inaction on Rhode Island's hospitals is high with numerous, cost-effective strategies available for mitigating risks to hospitals. Investing in resilience measures directly safeguards life safety and reduces damage costs. The SCV assessment found that a current-day 100-year coastal flood event could result in damage equal to more than 30% of the total value of Rhode Island Hospital facilities. During a 2050 100-year coastal flood event, damage could result in 10% - 30% of the total value of South County Hospital facilities.



Funding Strategy

These funding mechanisms support planning, design, and implementation of hospital flood mitigation and energy resilience projects. The USDOT PROTECT Program aligns with improvements to emergency access routes, flood-proofing of transportation connections, and infrastructure upgrades while the DOE State Energy Program supports microgrids, renewable backup power, and energy resilience upgrades for critical facilities. These programs provide a pathway for hospitals to reduce flood impacts, maintain reliable operations, and enhance emergency preparedness.

Mechanism Title: Promoting Resilience Operations for Transformative, Efficient, and Cost-Saving Transportation (PROTECT) Program

Mechanism Type: Grant/Formula Funding

Level: Federal

Agency: US Department of Transportation

PROTECT funds can be used for transportation resilience projects that protect critical routes from flooding, erosion, and climate impacts. For hospitals, PROTECT can support elevated or protected emergency access routes, flood-proofed entrances, improved drainage around roads and parking areas, and transportation-focused resilience planning.

State Role: Assist municipalities and hospitals in aligning proposed projects with statewide transportation resilience goals. Provide hazard and flood mapping data to support project scoping.

Next Steps: Coordinate with RIDOT to confirm project eligibility under PROTECT.

Mechanism Title: USDOE State Energy Program (SEP)

Mechanism Type: Grant/Technical Assistance

Level: State

Agency: Rhode Island Office of Energy Resources (OER)

SEP supports energy resilience and efficiency improvements for critical facilities. For hospitals, eligible activities include developing microgrids, expanding renewable energy generation, installing backup storage, and improving on-site energy reliability. SEP can be used to plan, design, or implement clean energy solutions that reduce outages and ensure uninterrupted healthcare operations.

State Role: Provide technical assistance on microgrid design and feasibility.

Next Steps: Conduct microgrid or energy resilience assessment and coordinate with OER to confirm SEP funding pathways.

Note: The Funding Strategy outlines two potential mechanisms for implementing project solutions; however, it does not represent a comprehensive list of all available funding options. For a complete overview, please refer to the Future Investment Strategy.

Chapter 6
Future Investment Strategy

Resilient Rhody 2025 Future Investment Strategy

***Resilient Rhody 2025* identifies 79 actions and ten priority Climate Adaptation & Resilience Solutions that constitute the most urgent and high-impact interventions needed to protect Rhode Island's assets, residents, and natural resources.** This document provides a statewide strategy to advance these resilience actions and solutions by summarizing funding needs, identifying legislative requirements, and outlining specific funding pathways for each of the 79 actions and the ten priority solutions.

In addition to outlining the steps the State can take to advance the 79 actions and 10 solutions, this document provides actionable strategies within a Funding Strategy Framework to help state and local partners identify and prioritize projects, navigate available funding opportunities, and coordinate effective implementation beyond the scope of this plan.

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Introduction

The analysis and recommendations presented in this strategy were developed through a structured, multi-step methodology based on quantitative assessment, qualitative review, and alignment with statewide climate and resilience goals.

Resilient Rhody 2025 Actions

The *Resilient Rhody 2025* Actions set ambitious goals to strengthen resilience across systems statewide. Instead of specifying individual construction projects or physical solutions, these actions **focus on programmatic priorities** across state agencies and entities and establishing metrics to track progress.

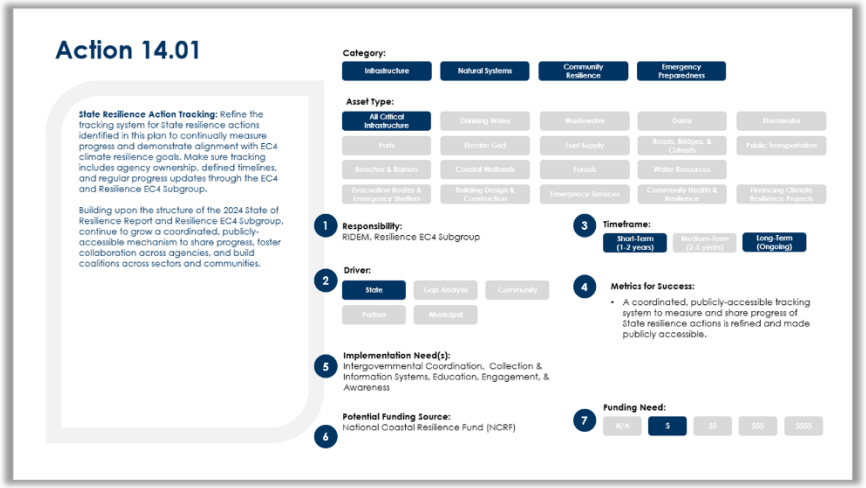
Understanding funding requirements is critical to advancing these actions. Each action includes an estimated funding need, developed through targeted research using cost ranges derived from prior state capital plans, comparable adaptation initiatives, and national benchmarks.

These estimates account for different implementation scales, from supporting small pilot initiatives serving specific communities to comprehensive statewide programs. Some action items require sustained, multi-year investment. However, not all actions will receive the same level of funding or follow the same schedule in each cycle. In these cases, funding ranges represent a single cycle's allocation with the duration of that cycle (ex. annual, bi-annual, etc.) noted where available. Inflation adjustments have not been applied due to the preliminary nature of the Actions and the lack of sufficient detail to support accurate projections.

Each proposed action was also evaluated and assigned one or more

Implementation Framework Tags to classify the type of governance or policy needs required in order for the actions to be successful. Tags were assigned based on the nature of the intervention, such as whether it required regulatory changes, cross-agency coordination, or new funding mechanisms.

Each Action includes the following information:



**One can reference the specific funding needs, potential funding sources, and implementation needs recommended for each action in Chapter 2: Resilient Rhody 2025 Actions.*

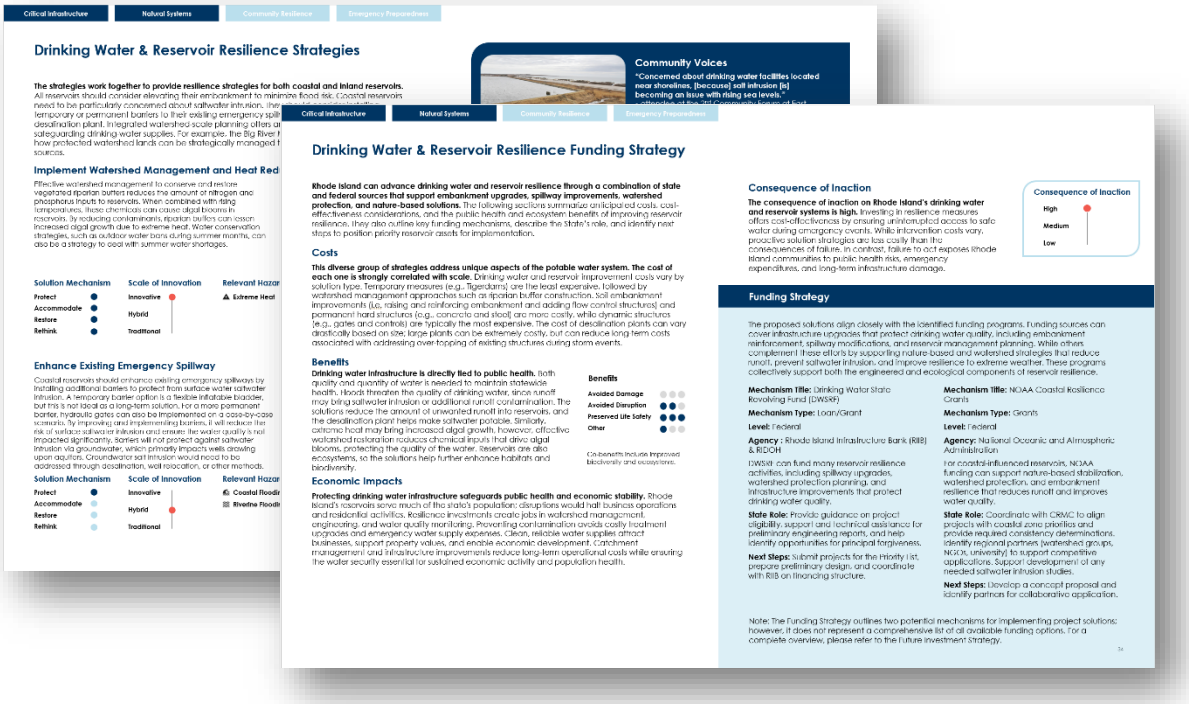
Climate Adaptation & Resilience Solutions

In addition to the *Resilient Rhody 2025* Actions, **physical infrastructure improvements** are required to increase Rhode Island's resilience to climate hazards. This Strategy details the recommended Funding Approach, primary funding mechanisms for the following Climate Adaptation & Resilience Solutions:

- Road & Bridge Flood Mitigation Solutions with a focus on evacuation routes
- Resilient Port Infrastructure Solutions
- Energy Resilience Solutions with a focus on Washington County and Block Island
- Sewer & Stormwater Infrastructure Solutions
- Wastewater Treatment Facilities Hardening
- Drinking Water & Reservoir Resilience
- Beach & Wetland System Restoration
- River and Stream Restoration with a focus on the Moshassuck River
- School & Public Safety Building Solutions with hardening and relocation opportunities
- Hospital Flood & Energy Resilience Solutions

This includes identifying the most appropriate federal programs, complementary state funding sources, match requirements, optimal sequencing from planning through construction, permitting and engineering dependencies, and the appropriate role of state agencies in advancing implementation.

Each of the ten solutions includes specific strategy guidance, accompanying costs estimates and a targeted funding strategy:



**Detailed funding strategies are also included for each of the ten priority Climate Adaptation & Resilience Solutions outlined in* Chapter 5: Climate Adaptation & Resilience Solutions.

Funding Strategy Framework

In addition to the detailed funding strategies for the ten priority solutions, a broader funding strategy framework was developed to guide state and local planners in creating actionable funding pathways for other assets prioritized in the future. This Strategy provides a roadmap to support state and local climate leaders to systematically evaluate and advance other Climate Adaptation & Resilience Solutions beyond this plan. Specifically, it provides guidance on how to:

- Step 1: Apply the Asset Prioritization Framework Criteria to Vulnerable Assets
- Step 2: Apply the Project Prioritization Framework to Priority Assets
- Step 3: Match High-Priority Projects to Available Funding Mechanisms
- Step 4: Define the State's Specific Support Role for Each Project

This structured process is designed to enable planners to prioritize additional assets, identify appropriate funding sources, and sequence key actions from planning through implementation. It also clarifies the enabling role of state agencies in providing data, coordination, and technical assistance, while ensuring that funding decisions promote equitable access to resilience investments across Rhode Island communities.

Qualification

Funding needs outlined in this document are provided for informational purposes only based on review of existing precedents and previous budgets. Actual funding needs for the Actions described herein will vary based on numerous factors, including but not limited to scope definition, project-specific risks, delivery methods, stakeholder engagement, funding mechanisms, timeframes, and existing operations. Arup does not guarantee that actual funding requirements for the Actions outlined will match the figures provided in this document or other related deliverables.

Executive Summary

Resilient Rhody 2025 Actions
The *Resilient Rhody 2025* Actions establish bold, cross-agency goals for strengthening resilience across systems statewide. These actions define programmatic priorities and set funding and planning metrics to measure success.

The total estimated funding needed to achieve the *Resilient Rhody* 2025 Actions is $121M - $304M.
The funding requirements span multiple categories, including supporting funding mechanisms, resilient infrastructure programs and initiatives, planning and coordination activities, data and mapping, workforce development and capacity building, and updating standards and codes.

Rhode Island Department of Environmental Management (RIDEM) is associated with the largest number of actions (nine) and the widest estimated funding range, from $12 million to $81 million.
Joint leadership between CRMC and RIDEM accounts for an additional five actions with estimated funding needs of $7 million to $14 million, underscoring the importance of coordinated coastal and environmental management efforts.

Funding, Technical Assistance & Capacity Building are the most cited implementation needs to achieve the *Resilient Rhody* 2025 Actions.

Climate Adaptation & Resilience Solutions
In addition to the *Resilient Rhody 2025* Actions, physical infrastructure improvements are required to increase Rhode Island's resilience. This Strategy details the recommended funding approach, primary funding mechanisms, and State role for 10 solutions.

To implement the Actions outlined in this report, additional funding will be essential for design and construction of physical projects. Two assessments, State Benchmarking and Solution Benchmarking, have been completed to establish a baseline for scaling this need. The State benchmarking analysis incorporates budget allocation trends from neighboring and peer states, contextualizing the scale and structure of resilience investments across the region. These insights are intended to support future funding decisions.

Massachusetts has adopted a structured approach to resilience funding by establishing a statutory framework that sets a goal of allocating one percent of its state budget to environmental and climate-related initiatives, including resilience. **If Rhode Island adopted a similar allocation model, the State could advance adaptation and resilience solutions across its highest risk assets.**

Funding Strategy Framework
This Strategy provides a roadmap to support state and local climate leaders systematically evaluate and advance other Climate Adaptation & Resilience Solutions beyond this plan. This includes the guidance on how to:

- **Step 1:** Apply the Asset Prioritization Framework Criteria to Vulnerable Assets
- **Step 2:** Apply the Project Prioritization Framework to Priority Assets
- **Step 3:** Match High-Priority Projects to Available Funding Mechanisms
- **Step 4:** Define the State's Specific Support Role for Each Project

1. Resilient Rhody 2025 Actions

1a - Resilient Rhody 2025 Actions Funding Needs

1b - Resilient Rhody 2025 Actions Implementation Needs

Resilient Rhody 2025 Actions

The *Resilient Rhody 2025* Actions establish bold, cross-agency goals for strengthening resilience across systems statewide. Rather than prescribing specific construction projects or built solutions, these actions focus on establishing programmatic priorities as well as funding and planning metrics to measure success.

This Plan outlines **79 Actions**

- **38 actions** focus on infrastructure asset types, addressing climate risks to critical systems.
- **14 actions** target natural systems, emphasizing preservation and restoration of vulnerable habitats.
- **18 actions** strengthen community resilience, including new measures to address health impacts of climate hazards and expand financing for resilience solutions.
- **9 actions** enhance emergency preparedness, streamlining response procedures and improving coordination.

Asset Type	Number of Actions
Critical Infrastructure	**38**
Statewide Resilience: All Critical Systems	14
Drinking Water	4
Wastewater	3
Dams	1
Stormwater Infrastructure	3
Ports	2
Electric Grid	4
Fuel Supply	2
Roads, Bridges, and Culverts	3
Public Transportation	2
Natural Systems	**14**
Beaches and Barriers	5
Coastal Wetlands	3
Forests	4
Water Resources	2
Community Resilience	**18**
Community Health & Resilience	10
Resilience Funding	5
Cross Sector Resilience	3
Emergency Preparedness	**9**
Building Design and Construction	3
Evacuation Routes & Emergency Shelters	2
Emergency Services	4

1a - Resilient Rhody 2025 Actions Funding Needs

The *Resilient Rhody* 2025 Actions Funding Needs estimates reflect a range of implementation scales, from pilot initiatives to comprehensive, statewide programs. These estimates are preliminary and will require further refinement as actions advance through scoping, program design, and implementation planning.

It is important to note that these funding estimates do not represent the full construction costs associated with large-scale capital or infrastructure projects.[1] Instead, the Action-level funding needs focus on establishing the programs, policies, coordination structures, data systems, and institutional capacity necessary to enable successful implementation. Inflation adjustments have not been applied due to the preliminary nature of these actions and the lack of sufficient detail for accurate projections.

Funding Schedule Classification

To summarize funding needs across the 79 *Resilient Rhody 2025* Actions, each action was classified into one of the following funding schedule types:

- **Annual-FTE Funding:** Actions that require the creation of new positions or the ongoing support of staff capacity.
- **NA:** Actions that can be achieved without additional funding, such as continuing partnerships, research, and learning from peer regions (e.g., Action 14.02, which focuses on learning from and maintaining collaborative partnerships with neighboring states).
- **One-Time:** Actions that require a single expenditure to complete a defined task, such as updating a specific plan or procedure.
- **Large-Scale Capital:** Actions that involve multiple, construction-focused projects (e.g., dam hardening or port upgrades) and require project-level cost estimation.*
- **Ongoing:** Actions that require sustained funding over time to remain effective. The recurrence timing and funding levels will vary based on the nature of the activity and Rhode Island's evolving priorities. Not all actions will receive the same level of funding or follow the same schedule in each cycle.

Funding Schedule Type Summary (All Actions)

Funding Schedule Type	Number of Actions
Annual-FTE Funding	6
NA	6
One-Time	10
Ongoing	45
Large-Scale Capital	12
Total	**79**

*Actions that call for multiple, construction-focused infrastructure improvement projects are excluded from the total funding needs calculation.

Actions Included in Total Funding Needs Calculation

Actions classified as NA or Large-Scale Capital were excluded from the total funding needs calculation below because funding is either negligible (NA) or they require project-specific construction cost analysis (Large-Scale Capital), which will significantly influence the Action's total funding needs depending on the scope and number of projects pursued.[2] Relevant Action pages include notes acknowledging when significant additional investment is required, when further cost estimates are needed, and when distinctions must be made between physical installation costs and broader capacity costs.[3]

61 actions primarily focus on establishing the supporting programs and initiatives needed to advance resilience goals.

Funding Schedule Type Summary (Included Actions)

Funding Schedule Type	Number of Actions	Estimated Funding Range
Annual-FTE Funding	6	$2M - $5M
One-Time	10	$4M - $11M
Ongoing	45	$115M - $288M
Total	**61**	**$121M - $304M**

Key Drivers of Funding Ranges

Several large-scale actions drive the upper end of the funding range, particularly those with significant startup costs. For example, Action 12.04 calls for extensive resource mapping, including the acquisition and use of high-resolution LiDAR data and other advanced conservation planning tools, which require substantial upfront investment.

At the same time, many actions involve lower-cost planning, coordination, and policy development activities that can generate significant resilience benefits by strengthening existing institutional frameworks and expanding implementation capacity.

For actions classified as ongoing, startup costs are often higher than long-term operating costs. Accordingly, the upper-bound total funding needs estimate of approximately $305 million reflects the level of investment needed during early implementation years, when programs are being launched or significantly expanded. In contrast, the lower-bound total funding needs estimate, estimated at approximately $120 million, more closely reflects the funding required to maintain the actions once programs and supporting systems are established.

[2] Action with NA funding needs: 6.01, 10.01, 14.02, 14.06, 15.01, 20.01

[3] Many of these Actions are marked with "$$$$" on their respective pages in Chapter 2: *Resilient Rhody 2025* Actions either because they require per-project cost estimates and/or involve the establishment or continuation of a funding mechanisms including Actions 1.01, 3.01, 4.02, 4.03, 5.02, 6.02, 6.03, 6.04, 7.01, 8.01, 9.02, 10.04, 11.03, 15.03, 17.02, 19.03, 19.04, and 20.02.

Funding Needs by Responsible Entity

The table below summarizes estimated funding requirements by the primary agency or organization responsible for implementing the *Resilient Rhody 2025* Actions. Estimates reflect high-level, preliminary cost ranges associated with establishing programs, coordination mechanisms, data systems, and, where applicable, enabling infrastructure investment programs.

Responsible Entity	Number of Actions	Estimated Funding Range
RIDEM	9	$12M - $81M
CRMC, RIDEM	5	$7M - $14M
CRMC, RIEMA, RIDEM	3	$0.75M - $2M
RIDEM, Resilience EC4 Subgroup	3	$1M - $3M
Div. of Statewide Planning	2	$0.5M - $1M
DPUC, PUC, OER, and Utilities	2	$6M - $15M
WRB, RIDOH	2	$6M - $15M
RIDEM, WRB	1	$1M - $5M
RIEMA, RIDEM, RI Div. of Statewide Planning	1	$10M - $15M
Commerce	1	$15M - $20M
RIIB, RIDEM	1	$5M - $10M
RIDOH, EOHHS	1	$0.5M - $1M
OER	1	$5M - $10M
RIIB	1	$10M - $15M
RIEMA	1	$0.5M - $1M
Other State Agencies/Partnerships	27	$41M - $96M
Total	**61**	**$121M - $304M**

The Rhode Island Department of Environmental Management (RIDEM) is associated with the largest number of actions (eight) and the widest estimated funding range, from $12 million to $81 million.[4] Joint leadership between CRMC and RIDEM accounts for an additional five actions with estimated funding needs of $7 million to $14 million, underscoring the importance of coordinated coastal and environmental management efforts.

RIDEM is associated with the highest number of actions (9), with an estimated funding need ranging from **$12 million to $81 million**.

Several multi-agency partnerships including CRMC, RIEMA, and RIDEM, as well as RIDEM and the Resilience EC4 Subgroup are each responsible for three actions, with funding needs generally ranging from $0.75 million to $3 million, reflecting more targeted or programmatic interventions.

A broad group of Other State Agencies and Partnerships collectively account for the largest share of actions (27), with combined estimated funding needs of $41 million to $96 million, highlighting the cross-government nature of resilience implementation and the importance of coordinated funding strategies across multiple implementing entities.

[4] Note that Upper-bound funding estimates are more reflective of startup and early implementation costs, whereas lower-bound estimates more closely represent ongoing maintenance and sustained programmatic support.

Funding Needs by Asset Type

The *Resilient Rhody 2025* Actions build resilience through a combination of strategies that strengthen planning, coordination, and implementation across asset types. Many actions are geared towards data-driven assessment and reporting, ensuring that assessments, like dam and evacuation routes, are current and accessible through centralized platforms. Additionally, actions promote greater standardization and alignment by embedding resilience into codes and design parameters for assets. Collaboration is another key theme of the actions, leveraging partnerships with neighboring states, universities, and professional organizations to share expertise and resources for specific asset types. The following table summarizes estimated funding requirements for these actions by the primary asset or system addressed:

Asset Type	Number of Actions	Estimated Funding Range
All Critical Infrastructure	11	$5M - $17M
Community Health and Resilience	11	$11M - $31M
Financing Climate Resilience Projects	7	$21M - $42M
Forests	4	$8M - $65M
Coastal Wetlands	4	$6M - $13M
Drinking Water	4	$8M - $25M
Roads, Bridges, and Culverts	3	$17M - $26M
Emergency Services	3	$6M - $11M
Wastewater	2	$1M - $5M
Stormwater	2	$10M - $16M
Building Design and Construction	2	$10M - $15M
Electric Grids	2	$10M - $20M
Public Transportation	1	$0.5M - $1M
Ports[5]	1	$0.25M - $0.5M
Fuel Supply	1	$5M - $10M
Beaches and Barriers	1	$0.25M - $0.5M
Water Resources	1	$0.5M - $1M
Evacuation Routes and Emergency Shelters	1	$1M - $5M
Total	**61**	**$121M - $304M**

Outstanding Actions that require significant Large-Scale Capital investments for implementation are not included in the totals above. Among the *included* Actions, forest-related programs and initiatives represent the largest anticipated investment category, with funding needs ranging from $8 million to $65 million.[6] Financing Climate Resilience Projects also carries a substantial funding requirement ($21 million to $41 million), underscoring the importance of financing tools

[5] The funding amount under Ports is related Action 5.01 which calls for partnership support and a statewide port economic vulnerability study. Larger port infrastructure projects are covered under action 5.02 and are on a per-project basis.

[6] This range is reflective of the high cost associated with establishing a new, high-tech mapping platform as indicated by a stakeholder during this Plan's review process.

and mechanisms that enable and sustain implementation across multiple asset types. Community Health and Resilience actions represent another major investment area, with funding needs estimated at $11 million to $31 million, reflecting the broad set of interventions needed to protect vulnerable populations and strengthen local capacity.

1b - Resilient Rhody 2025 Actions Implementation Needs

The review of proposed *Resilient Rhody 2025* Actions demonstrates a strong need for legislative and policy interventions that support improved coordination, data systems, and community capacity that are necessary to achieve the *Resilient Rhody 2025* Actions. **Therefore, an Implementation Framework was developed to outline the necessary supporting steps required to transition each Action into execution.** The full list of tags is defined on the following page.

Funding, Technical Assistance & Capacity Building are the most cited implementation needs to achieve the *Resilient Rhody 2025* Actions

The most cited implementation needs are for Funding and Technical Assistance & Capacity Building, underscoring the need for dedicated legislative support to expand access to workforce training and technical guidance, particularly for under-resourced communities.

Several actions call for **Data Collection & Information Systems**, reflecting the importance of standardized monitoring, data sharing, and performance tracking to guide effective decision-making across agencies and jurisdictions. **Rules and Regulations** were cited for actions involving infrastructure standards and emergency preparedness, indicating the need for updated regulatory frameworks to mandate or incentivize climate-resilient practices.

There is also a recurring emphasis on Education, Engagement, & Awareness, suggesting a need for policies and funding that support public outreach, stakeholder engagement, and technical education around climate impacts and solutions. Finally, several actions directly cite **Funding as a standalone policy need**, highlighting a legislative gap in financing mechanisms for critical infrastructure and community resilience programs.

Using the Implementation Needs Analysis

The Implementation Needs analysis is intended to inform the design and sequencing of funding strategies by identifying the policy, programming, and governance supports required to advance the *Resilient Rhody 2025* Actions. Each action may be associated with multiple implementation tags, recognizing that effective implementation often requires a combination of enabling strategies. Collectively, the results clarify how foundational investments such as capacity building, data infrastructure, coordination frameworks, or policy and regulatory development interact with and support capital and program funding, helping guide funding alignment, sequencing, and prioritization across actions and agencies.

Implementation Framework Tags

The tags were established to help communicate the type of implementation support and enabling governance required. Below are the tags used, with explanations for each designation. Additional details and examples of tags are included in Appendix A: Implementation Framework Tags Descriptions.

Category	Implementation Needs Tags	Description
Funding	**Funding**	Funding required to develop new programming (state grant programs, planning initiatives, etc.) or invest in resilience actions, including operating and capital funding sources and public financing mechanisms that make resources available.
	Community Incentives	Programs or policy tools that encourage voluntary resilience actions by residents, businesses, or property owners (e.g., tax abatements, rebate programs).
	Direct Government Investment & Procurement	Deployment of public funds through government-led capital investments, infrastructure projects, or procurement policies that model or deliver climate-resilient practices.
Policy & Compliance	**Land Use Policy**	Changes to zoning, building codes, or land use planning needed to support resilient development, open space preservation, or managed retreat.
	Rules & Regulations	Regulatory updates needed to remove barriers or mandate climate-resilient practices.
	Enforcement & Compliance Mechanisms	Creating oversight systems, inspection protocols, penalties, or compliance monitoring for existing or new climate resilience requirements.
Tools & Training	**Data Collection & Information Systems**	Creating requirements for data gathering, standardized reporting, monitoring systems, or information sharing platforms that support resilience decision-making across sectors.
	Technical Assistance & Capacity Building	Establishing government programs and staff to provide technical expertise, professional development, or direct support services to help communities, businesses, or other agencies implement resilience measures.
	Education, Engagement, & Awareness	Public education campaigns, K-12 curriculum additions, technical training, non formal educational opportunities, or stakeholder engagement efforts required to build support or understanding of climate resilience.
Coordination	**Intergovernmental Coordination**	Establishing formal mechanisms for collaboration between state, federal, and local governments, including interstate compacts, regional authorities, or mandated coordination protocols for climate resilience planning.
	Public-Private Partnership Frameworks	Establishing legal structures and policies that facilitate collaboration between government and private sector for resilience investments, risk-sharing arrangements, or innovative financing mechanisms.
	Emergency Preparedness & Response Authorities	Developing special governmental authorities for climate emergencies, including streamlined permitting during disasters, emergency procurement powers, or evacuation/relocation authorities.

Implementation Needs by Action Category

The following analysis briefly summarizes the alignment between the action categories and the implementation needs. Each action could receive more than one implementation tag, acknowledging that multiple implementation needs may be relevant for any given action. For example, 14 actions in the Infrastructure category will require technical assistance and capacity building in order to achieve the desired outcome.

The following table summarizes Implementation Needs by Asset Category:

	Asset Categories				
Implementation Needs Tags	**Community Resilience**	**Emergency Preparedness**	**Infrastructure**	**Natural Systems**	**Total**
Funding	10	1	16	2	**29**
Technical Assistance & Capacity Building	7	2	14	5	**28**
Data Collection & Information Systems	2	1	15	7	**25**
Intergovernmental Coordination	3	1	15	5	**24**
Rules & Regulations	2	-	14	4	**20**
Education, Engagement, & Awareness	5	3	6	2	**16**
Emergency Preparedness & Response Authorities	1	4	8	1	**14**
Community Incentives	1	-	1	6	**8**
Land Use Policy	1	-	6	-	**7**
Public-Private Partnership Frameworks	3	-	2	2	**7**
Direct Government Investment & Procurement	3	-	2	1	**6**
Enforcement & Compliance Mechanisms	-	-	4	1	**5**
Total	**38**	**12**	**103**	**36**	***189***

Community Resilience Actions — The leading implementation need for actions in the Community Resilience category was Funding, emphasizing the importance of legislative support to ensure adequate financial resources for community-based adaptation efforts.

Emergency Preparedness Actions — The leading implementation need for Emergency Preparedness actions was Emergency Preparedness & Response Authorities. This includes the need for support in contingency planning, interconnection protocols, and rapid deployment and mitigation efforts.

Infrastructure Actions — The infrastructure actions category identified Funding, Data Collection & Information Systems, Intergovernmental Coordination, Technical Assistance & Capacity Building, and Rules & Regulations as the top implementation needs. This highlights the level of cooperation, planning, and complexity required to improve infrastructure resilience.

Natural Systems — The leading implementation need for Natural Systems actions was for Data Collection & Information Systems. This underscores the importance of improved environmental monitoring, standardized reporting, and information sharing to guide conservation and land management efforts.

The leading implementation need(s) for each asset category are:

- Community Resilience Actions: **Funding**
- Emergency Preparedness Actions: **Emergency Preparedness & Response Authorities**
- Infrastructure Actions: **Funding, Data Collection & Information Systems, Intergovernmental Coordination, Technical Assistance & Capacity Building, and Rules & Regulations**
- Natural Systems Actions: **Data Collection & Information Systems**

Implementation Needs by Responsible Entity

The following table summarizes the number of legislative and policy interventions needed by the primary agency or organization responsible for implementation:

Agency/Organization Leader	Number of Tags
CRMC, RIDEM	22
RIDEM	22
RIDEM, Resilience EC4 Subgroup	13
CRMC, RIEMA, RIDEM	8
WRB, RIDOH	7
CRMC	6
RIDEM, WRB	5
RIDEM, OER	4
Commerce, RI Div. of Statewide Planning, RIIB	4
Div. of Statewide Planning	4
RIDOT	4
CRMC, RIDEM, URI	4
DPUC, PUC, OER, and Utilities	4
RIEMA, RI Div. of Statewide Planning	4
RIDE, RIDOH, RIIB	4
RIDEM, RIEMA	4
RIPTA, RIDOT, RI Div. of Statewide Planning	3
RIEMA, RIDEM, RI Div. of Statewide Planning	3
RIEMA	3
WRB, RIDOH, RIEMA	3
RIEMA, RIDOT, RI Div. of Statewide Planning	3
OER, RIEMA, DPUC	3
State Building Commission, RIEMA, CRMC, RIDEM, RIWARN	3
RIDEM (NBNERR), CRMC	3
RIDOT, RIDEM	3
RIDOH, EOHHS, RIDEM	2
RIIB	2
Other State Agencies/Partnerships	39

RIDEM (22) and the joint leadership pairing of CRMC and RIDEM each have the highest number of Implementation Needs tags (22), indicating that these entities will need to employ a broad set of approaches to advance the *Resilient Rhody 2025* Actions. RIDEM, in partnership with the Resilience EC4 Subgroup, follows with 13 tags, reflecting a similarly wide-ranging implementation role that will require multiple policy, regulatory, and programmatic tools. Additional multi-agency leadership groups—including CRMC, RIEMA, and RIDEM—are associated with eight tags, underscoring the importance of coordination across agencies for a subset of actions.

Organizations and partnerships with fewer tags generally oversee more focused responsibilities and will likely be able to rely on narrower, more targeted strategies to accomplish their assigned actions. Collectively, the remaining state agencies and partnerships account for approximately 39 tags, highlighting the broad, cross-government nature of resilience implementation in Rhode Island.

2. Climate Adaptation & Resilience Solutions

2a - How States are Funding Adaptation and Resilience Solutions

2b - Climate Adaptation & Resilience Solutions Funding Needs

2c - Climate Adaptation & Resilience Solutions Implementation Strategy

2a - How States are Funding Adaptation and Resilience Solutions

In addition to implementing the *Resilient Rhody 2025* Actions, Rhode Island must undertake physical infrastructure improvements to enhance climate resilience. To inform the state's funding strategy, an analysis of budget allocations in neighboring and peer states provides essential context regarding the scale and structure of resilience investments in the region. This comparative review considers states that share similar coastal vulnerabilities including Massachusetts, Connecticut, Maryland, Maine, and Delaware. The population and distance of shoreline are included for relative scale. Please refer to Appendix B for more information about each state's programming.

Massachusetts has adopted a structured approach to resilience funding by establishing a statutory framework that sets a goal of allocating one percent of its state budget to environmental and climate-related initiatives, including resilience. **If Rhode Island adopted a similar allocation model, the State could advance adaptation and resilience solutions across its highest risk assets.**

State	Population	Shoreline	Significant Investments in Climate
Massachusetts	~7.0M	~1,500 miles	**~$547M annually (Targeting 1% of $60.9 billion FY2026 state budget)**; Municipal Vulnerability Preparedness Action Grants $52.4M (Aug 2024); Disaster Relief Fund $25M
Connecticut	~3.6M	~620 miles	**Department of Energy and Environmental Protection (DEEP) Climate Resilience Fund $44.8M FY2025 ($33M state, $11.8M federal)**; $25M FY2024 + $22.5M FY2025 for dam/flood/erosion repair; $275M Clean Water Fund bonds
Maryland	~6.2M	~3,200 miles	**$29M Chesapeake & Atlantic Coastal Bays Trust Fund (FY2026)**; $24M Waterway Capital Appropriation; $97M DNR Watershed & Climate Services; $15.2M NOAA Climate-Ready Coasts
Maine	~1.4M	~3,500 miles	**$8M Community Resilience Partnership (May 2025); $60M post-storm rebuilding;** $69M NOAA Challenge (2024-2029);
Delaware	~1.1M	~380 miles	**$15M state-funded coastal shoreline resilience initiative (Oct 2024)**
Rhode Island	**~1.1M**	**~400 miles**	**$7.6M Across 12 Municipal Resiliency Program Grants in FY25, $2M Resilient Rhody Infrastructure Fund Loans, $100.5M FY25 Clean Water Loans, $34M FY25 Drinking Water Loans*[7]**

[7] Rhode Island Infrastructure Bank Annual Report 2025

The funding allocations detailed above represent identifiable climate resilience line items from each state's budget and publicly announced grant programs. These figures likely do not capture the full scope of climate-related investments these states are making, as resilience funding is often embedded within broader infrastructure, environmental, public health, and emergency management appropriations that serve multiple purposes. For example, transportation projects may include climate adaptation components, water infrastructure investments may address both aging systems and climate resilience, and emergency management budgets may support both disaster response and climate preparedness. Despite these limitations, the identified investments provide a meaningful baseline for comparison with Rhode Island's efforts, illustrating the scale, structure, and strategic approaches that neighboring and peer states have adopted to address coastal climate risks.

Highlighted State Investment Scale and Strategy

Massachusetts has adopted a structured approach to resilience funding by establishing a statutory framework that sets a goal of allocating one percent of its state budget to environmental and climate-related initiatives, including resilience. Based on the state's enacted FY2026 $60.9 billion budget, a commitment representing approximately $547 million was made for programs addressing resilience, environmental health, and watershed protection. The FY2026 budget also includes a dedicated line item of $5 million for "Climate Adaptation and Preparedness." This approach is supported by Massachusetts General Laws Chapter 30, Section 61, which requires state agencies to evaluate and implement measures to minimize environmental damage, including impacts from climate change such as sea-level rise.

If Rhode Island adopted a similar allocation model, the State could advance adaptation and resilience solutions across its highest risk assets.

2b - Climate Adaptation & Resilience Solutions Funding Needs

Ten priority adaptation and resilience solutions have been identified, designed, and costed to address the most urgent risks to transportation, coastal, energy, water, natural, and community assets. These solutions directly respond to vulnerabilities revealed through the Statewide Climate Vulnerability Assessment and are intended to strengthen critical infrastructure and safeguard essential systems.

These comprise:

- Road & Bridge Flood Mitigation Solutions with a focus on evacuation routes
- Resilient Port Infrastructure Solutions
- Energy Resilience Solutions with a focus on Washington County and Block Island
- Sewer & Stormwater Infrastructure Solutions
- Wastewater Treatment Facilities Hardening
- Drinking Water & Reservoir Resilience
- Beach & Wetland System Restoration
- River and Stream Restoration with a focus on the Moshassuck River
- School & Public Safety Building Solutions with hardening and relocation opportunities
- Hospital Flood & Energy Resilience Solutions

The strategies, their supporting cost estimates, and specific funding strategies are available in Chapter 5: Climate Adaptation & Resilience Solutions.

This section outlines the estimated funding needed if the State were to advance one representative project for each of the ten developed and costed Climate Adaptation & Resilience Solutions.

The following table provides:

- Number of priority assets associated with each solution
- Number or percentage of assessed assets rated *High* or *Very High* for the relevant hazard
- Representative project selected for cost estimation
- Estimated cost of that representative project

A complete list of priority assets can be found in Chapter 4: Priority Assets List, and cost estimates for all explored strategies are provided in Chapter 5: Climate Adaptation & Resilience Solutions.

The table is designed to illustrate the relative scale of investment for different strategies by presenting benchmark costs from previous projects. These representative project costs illustrate the rough-order-of-magnitude scale of the capital costs for real projects that are corollary to projects that might be undertaken as part of resilience interventions proposed in this report.

Project costs are reported based on the date of reporting and project location. These project costs are also normalized to Rhode Island and 2026 dollars for reference. The normalization process used the following methodology:

- Escalated project costs to 2025 dollars using Construction Cost Indices from Engineering News Record (ENR).

- Normalized project costs to Rhode Island location basis using 2025 City Cost Indices from RSMeans. Normalized project costs to Rhode Island location basis using 2025 City Cost Indices from RSMeans.

The information in this table, in conjunction with the range of costs included for specific strategies in Chapter 5, enables the State to approximate the potential funding required, based on the scope and number of projects considered feasible for implementation. For planning purposes, this table should be used alongside the State allocation comparison outlined above to ensure funding is scaled appropriately and realistically.

Capital construction and/or implementation costs for future projects in Rhode Island will vary based on a variety of factors including but not limited to defined extent of scope, project-specific risks, site constraints, environmental scope, construction delivery method, stakeholder engagement, funding mechanisms, existing asset operations and potential downtime, and/or market factors.

Solution Type	Number of Priority Assets and High & Very High Risk Assets under the most extreme scenario	Representative Project for Cost Comparison	Project Cost	Normalized Project Cost
Road & Bridge Flood Mitigation Solutions *with a focus on evacuation routes*	***3 Priority Corridors*** ***18%*** *of assessed evacuation routes with H/VH Coastal Flooding Risk* ***15%*** *of assessed evacuation routes with H/VH Riverine Flooding Risk* ***368*** */1,179 of assessed bridges with H/VH Coastal Flooding Risk* ***578****/1,179 of assessed bridges with H/VH Riverine Flooding Risk*	***Merrick Road (New York State Route 27A) Culvert Replacement, Road Raising & Reconstruction, Long Island, NY (2025)*** *Replace culvert w/wider culvert, raise roadway above 100-year flood elevation (~2' at lowest point) and reconstruct roadway (new shoulders, sidewalks, bike accommodations, barriers), traffic management & two-way temporary road access through duration of construction for 3,900 linear feet extents.*	*$11.7M*	*$10.0M*
Resilient Port Infrastructure Solutions	***2 Priority Assets*** ***813****/1568 of assessed port assets with H/VH Coastal Flooding Risk*	***Galilee North Facility – Bulkhead and Pier Repairs, Narragansett, RI (2019)*** *Remove and reconstruct ten (10) piers; rehabilitate 2,200 linear feet of bulkhead (filling areas of subsidence, sheet pile patching, repaving, and installation of fender piles to protect the deteriorated sheet pile wall)*	*$5.2M*	*$6.4M*
Energy Resilience Solutions *with a focus on Washington County and Block Island*	***2 Priority Areas*** ***~330****/885 miles of assessed electrical transmission lines with H/VH risk to Extreme Wind (2050, RCP 8.5)*	***Susquehanna-Roseland Electric Reliability Project, Susquehanna, PA – Roseland, NJ (2015)*** *Install a 150-mile, 500-kV transmission line*	*$1.4B*	*$2.1B*
Sewer & Stormwater Infrastructure *Solutions*	***6 Priority Areas*** ***13%*** *of assessed stormwater infrastructure assets with H/VH Coastal Flooding Risk*	***City of Pawtucket Green Infrastructure Installation - Pine Street, Pawtucket, RI (2022)*** *Construct pretreatment structures, seven (7) planters, and permeable pavers along a 600-ft stretch of road*	*$1.1M*	*$1.1M*
Wastewater Treatment Facilities Hardening	***6 Priority Assets*** ***13****/19 of assessed wastewater treatment facilities with H/VH Coastal Flooding Risk* ***19****/19 of assessed wastewater treatment facilities with H/VH Stormwater Flooding Risk* ***5****/19 of assessed wastewater treatment facilities with H/VH Riverine Flooding Risk*	***East Providence Wastewater Treatment Facility, East Providence, RI (2013)*** *Upgrade 8.9-mgd wastewater system by relocating interceptor, improving aeration, clarifiers, odor control, pump stations, etc., and increasing pumping capacity*	*$51M*	*$70M*

Drinking Water & Reservoir Resilience	***6 Priority Assets*** ***4****/49 of assessed public drinking water reservoirs with H/VH Coastal Flooding Risk* ***29****/49 of assessed public drinking water reservoirs with H/VH Riverine Flooding Risk*	***North & South Easton Pond Dams Resiliency Project, Newport, RI (2022)*** *Raise and/or armor 9,050 feet of embankments, widen primary spillway from 100'x4.5' to 120'x7', add hydraulic gate and control building, add automatic one-way tidal/flap gate*	*$43M*	*$46M*
Beach & Wetland System Restoration	***5 Priority Areas*** ***37****/134 of assessed coastal barriers with H/VH Coastal Flooding Risk* ***99%*** *of assessed coastal wetlands with H/VH Coastal Flooding Risk*	***St. Johns County Ponte Vedra Beach Restoration Project, Jacksonville, FL (2024)*** *Dredge about 9 miles of coastline (more than 2M CY of sand), fortify coastline by reconstructing dunes between 13 and 18 feet and berms of 8 feet and increasing beach width from 40 to 180 feet*	*$39M*	*$47M*
River and Stream Restoration *with a focus on the Moshassuck River*	***1 Priority River*** ***10%*** *of assessed rivers and streams with H/VH Coastal Flooding Risk* ***~100%*** *of assessed rivers and streams with V/VH Stormwater Flooding Risk* ***~100%*** *of assessed rivers and streams with V/VH Extreme Heat Flood Risk*	***Maidford River Restoration Project, Middletown, RI (2022)*** *Lower floodplain, construct new meandering channel (120-250ft wide, 150-390ft long, 45-95ft radius of curvature), replant riverbanks and disturbed floodplain areas with native vegetation*	*$2.0M*	*$2.1M*
School & Public Safety Building Solutions *with hardening and relocation opportunities*	***12 Priority Assets*** ***46****/ 552 of assessed Pre-K-12 Schools with H/VH Coastal Flooding Risk* ***59****/552 of assessed Pre-K-12 Schools with H/VH Riverine Flooding Risk* ***21****/241 of assessed Public Safety Buildings with H/VH Coastal Flooding Risk* ***24****/241 of assessed Public Safety Buildings with H/VH Riverine Flooding Risk*	***Olneyville Resilience Hub, Providence, RI (2024)*** *Construct a resilience hub with an approximate footprint of 3400-sqft*	*$8.3M*	*$8.5M*
Hospital Flood & Energy Resilience Solutions	**3 Priority Assets** **3**/17 assessed Hospitals with H/VH Coastal Flooding Risk **3**/17 assessed Hospitals with H/VH Riverine Flooding Risk **All** assessed Hospitals have H/VH Extreme Heat and Stormwater Flooding Risk	**Tampa General Hospital, Tampa, FL (2024)** *Design and install an Aqua Fence designed to hold back 15ft storm surge, 9ft high wall, 1000LF, elevate equipment, seal openings* ***Kaiser Permanente Microgrid Installation, Oakland, CA (2025)*** *2 MW of on-site solar power canopy energy generation (installed by Ameresco under a power purchase agreement with Kaiser Permanent) & 9 MWhr of battery storage capacity (funded through an $8.3 million grant from the California Energy Commission to Faraday Microgrids).*	$1.0M *$8.3M*	*$1.2M* *$7.0M*

2c - Climate Adaptation & Resilience Solutions Implementation Strategies

Because these solutions will require complex coordination, substantial capital investment, and consistent state leadership to advance, each demands a tailored, actionable funding strategy rather than a one-size-fits-all approach.

The funding strategies presented below translate the State's broader investment framework—including federal and state funding mechanisms, legislative requirements, equity considerations, and the Prioritization Framework outlined herein— into solution-specific pathways.

The following pages detail the recommended:

- **Funding approach**
- **Primary funding mechanisms**
- **State role**

for each of the ten Climate Adaptation & Resilience Solutions.

While the strategies focus on primary funding mechanisms most directly aligned with each solution, they are not intended to be exhaustive. In practice, implementation will often draw on a broader mix of supplemental and project-specific funding sources, including agency operating funds, formula programs, philanthropic or nonprofit contributions, private investment, utility capital budgets, and smaller state or federal grant programs. For example, stream restoration and riparian buffer projects are often supported through a combination of BWRF, EPA Nonpoint Source (Section 319) funds, and Narragansett Bay Estuary Program (NBEP) grants, including resources for project scoping, feasibility, and partnership-based planning. Additional funding sources outside of the primary mechanisms may play a critical role in advancing early planning, piloting, gap financing, or long-term operations and maintenance.

Each strategy outlines the most viable funding or financing tools that can strengthen competitiveness or meet match requirements, and the optimal sequencing of planning, engineering, and construction activities. Funding sources were identified in the summer of 2025. This plan does not guarantee the availability, continuation, or applicability of these sources. All funding sources should be verified for current availability and applicability before pursuing them.

In addition, each solution provides recommendations for the State's role in providing data, technical assistance, permitting support, and cross-agency coordination to accelerate implementation and reduce barriers for municipalities, utilities, port operators, or facility owners.

Taken together, these strategies provide Rhode Island with a pragmatic roadmap for advancing its highest-priority Climate Adaptation & Resilience Solutions.


Interstate 95 in Cranston © Kyle Kane for WPRI-TV

Road & Bridge Flood Mitigation Solutions with a focus on evacuation routes

Road and bridge flood mitigation strategies are focused on reducing flood damage to roads that cause transportation disruption throughout the state. Strategies include implementing nature-based solutions in rights-of-way, raising emergency access roads, creating flood barriers, and considering roadway rerouting and retreat. Refer to Chapter 5: Climate Adaptation & Resilience Solutions for full strategy descriptions and cost estimates.

Primary Funding Mechanisms:

- USDOT PROTECT Program through RIDOT – Elevation, floodproofing, culvert upgrades, drainage improvement, erosion protection.
- RIIB Municipal Road & Bridge Revolving Loan Fund (MRBRF) – Low-interest financing for municipal transportation upgrades.

Funding Approach

- Use PROTECT funding for major capital segments and evacuation route upgrades.
- Pair MRBRF for match financing and local road components.
- Sequence large federal applications with early engineering supported by MRBRF.

State Role

- Provide statewide flood, hydrology, and risk data to inform PROTECT applications.
- Coordinate with RIDOT on design standards and project eligibility.
- Prepare/Review preliminary flood assessments and provide technical input on roadway elevation and culvert sizing.
- Dedicate continued state funding to MRBRF and ensure resilience criteria are incorporated into project review for this program.



Resilient Port Infrastructure Solutions

Resilient port infrastructure strategies are focused on reducing flooding impacts to limit damage and ensure continual operation of Rhode Island's ports. Strategies include integrating dock and pier system improvements for accessibility, elevating bulkheads and flood barriers, designing hybrid (green- gray) shoreline solutions, and installing energy and backup power systems. Refer to Chapter 5: Climate Adaptation & Resilience Solutions for full strategy descriptions and cost estimates.

Primary Funding Mechanisms:

- Port Infrastructure Development Program (PIDP) – Hardening of bulkheads, piers, docks, power systems, cargo infrastructure.
- NOAA Coastal Zone Management (CZM) Program administered by RI Coastal Resources Management Council, CRMC – Design, permitting, shoreline stabilization, hybrid NBS.
- State Resilience Grants – Including RIIB-MRP Action Grants, RIDEM- Climate Resilience Fund, OSCAR Fund, CRMC, and RIIB – planning, design, construction, and non-federal match for port hardening, shoreline protection, and resilience upgrades.

Funding Approach

- Use PIDP for structural hardening and operational continuity.
- Layer CZM for site assessments and shoreline ecological components.
- Apply OSCAR to strengthen NBS competitiveness and meet match requirements.
- Bundle infrastructure + nature-based components to maximize scoring in federal competitions.
- Use state resilience grants from RIDEM, CRMC, & RIIB for gap funding and non-federal match for federally funded port resilience and infrastructure projects.

State Role

- Coordinate with port operators to align project scopes with statewide resilience priorities.
- Support integration of multi-benefit elements (e.g., NBS + infrastructure hardening) to improve PIDP scoring.
- Ensure alignment with CRMC Shoreline Change SAMPs.
- Provide coastal mapping, habitat data, and climate projections to strengthen competitive federal proposals.
- Continue to fund state resilience grant programs (MRP Action Grants, Climate Resilience Fund, and OSCAR) to support nature-based solutions and matching dollars.



Downed tree on electrical transmission line in Rhode Island © The Providence Journal

Energy Resilience Solutions with a focus on Washington County and Block Island

Energy resilience strategies are focused on reducing flooding and extreme wind impacts to reduce power outages and ensure the reliable delivery of electricity. Strategies include expanding right-of-way area and vegetation management, creating alternative transmission routes, increasing the number of interconnection points, and undergrounding transmission lines in high-risk areas. Refer to Chapter 5: Climate Adaptation & Resilience Solutions for full strategy descriptions and cost estimates.

Primary Funding Mechanisms:

- DOE Grid Resilience and Promoting Resilient Outage Prevention (PROP) – Section 40101(d): Supports utility and community-scale projects that reduce outage frequency and duration through grid hardening, undergrounding, equipment upgrades, interconnection enhancements, vegetation management, and improved system operations.
- RI OER State Energy Program (SEP) – Resilience planning, feasibility, modeling, vegetation management.

Funding Approach

- Use PROP funding for major grid-hardening and capital upgrades such as undergrounding transmission lines, adding redundancy, and creating alternative interconnection routes in high-risk areas including Washington County and Block Island.
- Use SEP implementation funding for planning, feasibility analysis, pre-engineering, and modeling required for PROP-supported projects, including conceptual designs for undergrounding and interconnection expansion.
- Coordinate with utilities to bundle multiple high-risk circuits into a unified proposal, emphasizing system-wide reliability benefits, alignment with state hazard mitigation goals, and reduction in outage frequency and duration.

State Role

- Coordinate with utilities and OER to develop a statewide application and investment strategy for PROP funding, including identifying priority transmission corridors and resilience benefits.
- Provide modeling resources (risk modeling, outage mapping, interconnection analysis).
- Review conceptual designs to ensure alignment with statewide resilience and energy reliability priorities.
- Continue to fund SEP program.



Floodina at Salty Brine in Narraaanset. RI © WJAR

Sewer & Stormwater Infrastructure Solutions

Sewer and stormwater infrastructure strategies are focused on reducing flooding impacts to reduce damage to infrastructure and ensure it can remain operable. Strategies include disconnecting infiltration/inflow (i/i) sources, developing green stormwater infrastructure, increasing storm drain capacity, hardening infrastructure in floodplain, stormwater mitigation funding mechanisms, developing nature-based flood storage, removing & disconnecting impervious coverage, and replacing undersized culverts. Refer to Chapter 5: Climate Adaptation & Resilience Solutions for full strategy descriptions and cost estimates.

Primary Funding Mechanisms:

- Clean Water State Revolving Fund (CWSRF) – Pipe replacement, pump station hardening, storm drain capacity, green infrastructure.
- Sewer Overflow & Stormwater Reuse (OSG) – Planning, design, and construction of infrastructure for wastewater and stormwater systems.
- State Resilience Grants – Including RIIB-MRP Action Grants, RIDEM- Climate Resilience Fund, OSCAR Fund, CRMC, and RIIB – Municipal drainage, nature-based stormwater retrofits, hybrid systems. Federal match & technical assistance for resilience upgrades.

Funding Approach

- Apply CWSRF for core sewer/stormwater upgrades, with disadvantaged communities accessing principal forgiveness.
- Use state resilience grants to fund green-infrastructure elements, flood-reduction features, and match requirements.
- Advance engineering reports and sewer assessments using CRF planning grants to strengthen readiness.
- Bundle sewer + roadway flooding + NBS for competitive multi-benefit applications.
- Establishment of stormwater and watershed vulnerability assessment grant fund.

State Role

- Provide technical support during project scoping, including sewer/stormwater assessments.
- Coordinate with municipalities to align stormwater and sewer upgrades across jurisdictions.
- Support preparation of Preliminary Engineering Reports (PERs) required for SRF.
- Promote integration of green infrastructure to meet CRF priorities and improve water-quality outcomes.
- Continue to provide funding for state resilience grant programs such as the CRF.



West Warwick Regional Wastewater Treatment Facility © West Warwick Wastewater

Wastewater Treatment Facility Hardening

Wastewater treatment facility hardening strategies are focused on reducing flooding impacts to ensure continual operation of the facilities and reduce contamination from runoff, preserving public health. Strategies include installing submersible pumps and ensuring access to backup pumps, redirecting sewage to another wastewater treatment facility, providing wet weather storage, bypass, and disinfection, and relocating facilities, equipment, and sewage. Refer to Chapter 5: Climate Adaptation & Resilience Solutions for full strategy descriptions and cost estimates.

Primary Funding Mechanisms:

- Clean Water State Revolving Fund (CWSRF) – Floodproofing, process resiliency, pump upgrades, structural hardening.
- Rhode Island Voter-Approved Green Bonds / Municipal Revenue Bonds – Large capital components (structural upgrades).
- State Resilience Grants – Including RIDEM & RIIB WWTF Resilience Fund – Planning, design, construction, and non-federal match for wastewater treatment facility flood mitigation and operational continuity improvements.

Funding Approach

- Provide continued green bond funding for the previously established RIDEM & RIIB WWTF Resilience Fund.
- Use CWSRF as financing tool for hardening and treatment reliability upgrades.
- Identify opportunities for principal forgiveness under provisions for Green Project Reserve (GPR).
- Combine bond financing + SRF for a blended, low-cost funding package.

State Role

- Verify Bond eligibility for WWTF resilience upgrades.
- Review project scopes to meet SRF eligibility and environmental compliance requirements.
- Help municipalities navigate CWSRF application processes, including match strategies.



Scituate Reservoir © John Mernick for Shutterstock

Drinking Water & Reservoir Resilience

Drinking water and reservoir resilience strategies are focused on reducing flooding and extreme heat impacts to Rhode Island's drinking water reservoirs, ensuring both quantity and quality of potable water. Strategies include restoring vegetated riparian buffers, enhancing existing emergency spillways, improving embankments, and building a desalination plant. Refer to Chapter 5: Climate Adaptation & Resilience Solutions for full strategy descriptions and cost estimates.

Primary Funding Mechanisms:

- RIIB Drinking Water State Revolving Fund (DWSRF) – Spillway upgrades, watershed management, treatment protection, embankment reinforcement; possible principal forgiveness for disadvantaged communities.
- NOAA Coastal Resilience Grants – For coastal-influenced reservoir areas needing nature-based buffers.
- Rhode Island Voter-Approved Green Bonds - Capital investments for watershed protection, embankment reinforcement, and emergency spillway enhancements at publicly owned drinking water reservoirs.

Funding Approach

- Use DWSRF for all engineered components (spillways, embankments, structural protections).
- Pair with NOAA for watershed or shoreline stabilization and nature-based water-quality protection.
- Pursue early engineering reports with RIIB technical assistance.
- Use match-eligible watershed partners (universities, NGOs) for NOAA co-applications.
- Use Rhode Island voter-approved Green Bonds to fund capital reservoir and watershed resilience investments and to provide required non-federal match for complementary federal programs.
- Establish Drinking Water Resiliency Fund.

State Role

- Provide guidance on DWSRF project eligibility and support completion of preliminary engineering reports.
- Help identify opportunities for principal forgiveness for disadvantaged communities.
- Coordinate with CRMC to provide consistency determinations for coastal-influenced reservoirs.
- Provide technical data on algal blooms, runoff pollution, and saltwater intrusion risks.



Trustom Pond National Wildlife Refuge © U.S. Fish and Wildlife Service

Beach & Wetland System Restoration

Beach and wetland system restoration strategies are focused on reducing coastal flooding impacts to conserve and protect these natural systems, as well as the built environment around them. Strategies include enhancing dynamic dunes and barriers, restoring wetlands and buffer zones, and implementing a pilot voluntary buyout program. Refer to Chapter 5: Climate Adaptation & Resilience Solutions for full strategy descriptions and cost estimates.

Primary Funding Mechanisms

- National Coastal Wetlands Conservation Grants (NCWCG) – Habitat restoration, coastal buffers, dune enhancement.
- Natural Resources Conservation Service PL 566 – Flood damage reduction, shoreline stabilization, dune and barrier protection, and small watershed restoration projects.
- Emergency Watershed Protection (EWP) Program – Post-disaster stabilization of dunes, wetlands, and streambanks; erosion control and flood-damaged natural infrastructure repair.
- State Resilience Grants – Including RIDEM OSCAR Fund, and RIIB Climate Resilience Fund and MRP – Nature-based coastal resilience in vulnerable shoreline zones.

Funding Approach

- Use NCWCG for large-scale wetland restoration or acquisition activities.
- Continue to fund state resilience grant programs that can support this work, and launch new voluntary buyout funding program with acquisition criteria and procedures developed with RIDEM's Land Acquisition Committee.
- Apply OSCAR for match funding and NBS construction.
- Bundle dune restoration + marsh enhancement + erosion control in regional proposals.

State Role

- Provide habitat data, coastal mapping, and climate projections to bolster NCWCG applications.
- Coordinate with DEM and CRMC to confirm eligibility of restoration sites and required match commitments.
- Prioritize state-identified restoration zones (e.g., low terrestrial resilience, high erosion).



Moshassuck River Preserve © The Nature Conservancy

River and Stream Restoration with a focus on the Moshassuck River

River and stream restoration strategies are focused on reducing flooding and heat impacts to protect habitats and enhance ecosystems. Strategies include improving water quality with green infrastructure, reconnecting floodplains, restoring wetland function, and improving watershed hydraulics. Refer to Chapter 5: Climate Adaptation & Resilience Solutions for full strategy descriptions and cost estimates.

Primary Funding Mechanisms

- State Resilience Grants – Including RIIB MRP, RIDEM Climate Resilience Fund, and OSCAR Fund – Stormwater improvements, nature-based flood mitigation, hydraulic upgrades, inland water area restoration and watershed planning.
- EPA SNEP Watershed Implementation Grants (SWIG) – Floodplain reconnection, wetland restoration, stormwater controls, green infrastructure.

Funding Approach

- Apply CRF for localized stormwater retrofits and match-eligible components.
- Develop multi-municipal watershed coalitions to strengthen federal scoring.
- Establish stormwater and watershed vulnerability assessment grant fund.
- Use SNEP SWIG to supplement watershed-scale restoration and green-infrastructure projects.

State Role

- Provide technical assistance & funding to local municipalities for watershed planning and identification of best placement for solutions.
- Help applicants align projects with statewide watershed priorities.
- Provide guidance on CRF, MRP, and OSCAR scoring criteria and eligible project types.
- Assist municipalities in identifying regional watershed partners (universities, watershed councils, NGOs).
- Continued funding for state resilience grant programs.



North Scituate Fire Department © North Scituate Fire Department

School & Public Safety Building Solutions with hardening and relocation opportunities

Strategies are focused on reducing flooding, extreme heat, and extreme wind impacts to ensure community and emergency service providers can continue to serve Rhode Island. These include relocating programming out of flood zones, elevating critical infrastructure, retrofitting with floodproofing principles, and creating a resilience hub or microgrid. Refer Chapter 5: Climate Adaptation & Resilience Solutions for full strategy descriptions and cost estimates.

Primary Funding Mechanisms

- USDA Community Facilities Grant/Loan Program – School retrofits, fire station resilience upgrades, emergency facility relocation.
- Municipal Resilience Program (MRP) – Building storm proofing, system elevation, green infrastructure, resilience hubs.
- State Bonds (as needed) – For large capital projects or relocations.

Funding Approach

- Use USDA for essential service facilities in eligible communities (schools, EMS, fire stations).
- Use MRP for resilience hub design, storm proofing, and building system elevation.
- Combine USDA + MRP to reduce local share for major projects.
- Consider bond financing if full facility reconstruction is required.

State Role

- Confirm "essential community facility" eligibility for USDA funding.
- Provide technical guidance on relocation planning, site assessment, and risk-reduction benefits.
- Support municipalities through MRP workshops to identify priority retrofit or hub projects.



Rhode Island Hospital © Brown Surgical Associates

Hospital Flood & Energy Resilience Solutions

Hospital flood and energy resilience solutions are focused on reducing flooding, extreme heat, and wind impacts. Strategies include conducting a multi-hazard mitigation planning effort, making comprehensive floodproofing and façade enhancements, enacting emergency access protective measures, and creating microgrids. Refer to Chapter 5: Climate Adaptation & Resilience Solutions for full strategy descriptions and cost estimates.

Primary Funding Mechanisms

- USDOT PROTECT Program – Floodproofing emergency access routes and transportation connections.
- USDOE State Energy Program (SEP) – Microgrids, renewable backup power, energy storage, energy reliability improvements.

Funding Approach

- Use PROTECT to upgrade access roads, ambulance routes, parking drainage, and floodproofing of transport connections.
- Use SEP for hospital-based microgrids, backup battery systems, and clean-energy resilience projects.
- Build a combined PROTECT + SEP package to address both access and operational continuity.
- Engage OER early for technical assistance and match planning.

State Role

- Assist hospitals and municipalities in aligning PROTECT proposals with statewide transportation resilience goals.
- Provide hazard and flood mapping data to support design/scoping of access-route improvements.
- Provide technical assistance on microgrid design and energy-resilience modeling through OER.
- Coordinate feasibility assessments for battery storage, backup generation, and clean-energy pathways.
- Support hospital coordination and prioritization based on bed count, regional service role, and life-safety implications.
- Continue to fund SEP.

3. Funding Strategy Framework

3a - A Framework for Prioritizing Resilience Solutions

3b - Funding & Financing Mechanisms

3c - Economic Impact Assessment of Investment in Resilience Infrastructure

3a - A Framework for Prioritizing Resilience Solutions

Rhode Island's climate resilience priorities extend beyond the 10 representative solutions described above. This Plan therefore includes to provide a defensible, transparent, and equitable roadmap to support state and local climate leaders systematically evaluate other candidate assets and projects. For more information on the prioritization process used to identify priority assets for solution development included in this plan, see Chapter 4: Priority Assets List.

Approach

The process below outlines how the State and local leaders can employ the Prioritization Framework to continue planning for and beyond the 10 priority solutions and priority assets.

Step 1: Apply the **Asset Prioritization Framework** Criteria to Vulnerable Assets

Step 2: Apply the **Project Prioritization Framework** to Priority Assets

Step 3: Match High-Priority Projects to Available **Funding Mechanisms**

Step 4: Define the State's Specific **Support Role** for Each Project

Step 1: Apply the Asset Prioritization Framework Criteria to Vulnerable Assets

Climate leaders can begin by evaluating vulnerable assets using the Asset Prioritization Framework. This framework has been developed to be applicable across sectors to identify those with the greatest statewide benefit. Full details on the framework, including working definitions for Low–Medium–High scoring for each criterion, are provided in Chapter 8: Prioritization Framework.

For more information on the prioritization process used in this plan, see Chapter 4: Priority Assets List.

Criteria			Working Definition
Need: How vital an asset is to the safety, stability, and functioning of interconnected systems or sectors.	N1	**Life Safety**	The extent to which damage to the asset would result in health and wellness impacts.
	N2	**Urgency**	The extent to which the asset is already experiencing climate impacts.
	N3	**Criticality**	The extent to which other systems or sectors depend on the asset. A highly critical asset may cause cascading failures across multiple systems if disrupted.
	N4	**Redundancy**	The extent to which the asset creates additional capacity or alternative service delivery during a climate event.
	N5	**Number of People Impacted**	The number of people, including residents and workers, which the asset serves or protects.
Equity and Community Support: Whether an asset serves or protects vulnerable populations, aligns with community priorities, promotes environmental justice, and protects economic opportunities.	E1	**Supports Vulnerable Populations**	The extent to which the asset serves communities with high Social Vulnerability Indices.
	E2	**Community Supported**	The extent to which the asset is important to the local community.
	E3	**Advances Environmental Justice**	The extent to which the asset serves and/or reduces environmental burdens on historically underserved communities.
	E4	**Protects Economic Resources**	The extent to which an asset protects economic resources.
Strategic Alignment: How well an asset aligns with broader municipal, regional, or resilience planning goals, including comprehensive and hazard mitigation planning efforts.	S1	**Alignment with Local/Municipal Goals**	The extent to which the asset aligns with local and municipal goals.
	S2	**Identified in Multiple Planning Initiatives**	The extent to which the asset is listed as a priority asset in planning initiatives, such as Hazard Mitigation Plans.
Holistic Resilience: Whether an asset contributes to long-term environmental, cultural, and social well-being beyond its primary function.	H1	**Advances or Protects Biodiversity**	The extent to which the asset enhances and protects biodiversity.
	H2	**Provides Ecosystems Services or Co-Benefits**	The extent to which the asset improves the ecosystems more broadly, such as improving air and water quality.
	H3	**Supports Sustainability Goals or Initiatives**	The extent to which the asset reduces greenhouse gas (GHG) emissions, sequesters carbon, or can support decarbonization efforts.
	H4	**Carries Cultural or Historical Value**	The extent to which the site is an active cultural or historical site.

Step 2: Apply the Project Prioritization Framework to Priority Assets

After developing project concepts for the highest-priority assets identified in Step 1, climate leaders can use the Project Prioritization Framework to evaluate and rank these projects. This framework helps determine which concepts should advance first based on feasibility, impact, and alignment with statewide resilience goals. The outcome should be a ranked list of project concepts that can guide investment decisions and inform the next phase of implementation.

Criteria			Working Definition
Cost Factors: Captures the overall financial commitment required to implement and sustain the project.	C1	**Initial Capital Costs**	The magnitude of upfront financial resources required to initiate the project, including design, permitting, and construction start-up expenses.
	C2	**Ongoing Costs**	The degree of recurring financial commitment required to operate, maintain, and monitor the project after completion.
	C3	**Cost of Doing Nothing**	The financial, social, and operational risks associated with inaction—specifically, the cost of damages, service disruption, and lost productivity or wellbeing if the project is not implemented.
	C4	**Potential Economy of Scale**	Potential cost efficiencies, resource sharing, or performance improvements that can be realized by implementing multiple related projects together or at a larger scale.
Impact: Reflects the extent to which the project benefits people and businesses in the broader community.	I1	**Impacted Populations**	The extent to which the project benefits or affects individuals within the community, measured by reach, safety, or accessibility. In addition to the extent to which community members will be engaged.
	I2	**Economic Resilience and Business Impact**	The degree to which the project influences economic activity through improved infrastructure, access, or resilience.
	I3	**Number of Assets and Services Impacted**	The extent to which the project benefits or affects other assets essential to Rhode Island's resilience.
	I4	**Ecosystem Health and Environmental Resilience**	The degree to which the project protects, restores, or enhances natural ecosystems and their capacity to provide essential services — such as water filtration, flood mitigation, habitat support, and carbon sequestration.
Lifespan: Indicates how long the investment will deliver value and remain functional without major reinvestment or degradation.	S1	**Longevity of Investment**	The degree to which the project delivers long-term, durable benefits that reduce the need for future interventions.
Implementation and Maintenance Feasibility: Measures the ease of successful implementation based on funding availability, organizational capacity, and project complexity.	F1	**Funding Source**	The availability, reliability, and eligibility of funding sources to support project implementation and maintenance.
	F2	**Leading Entity**	The degree to which a specific organization or agency is identified and prepared to manage project implementation and maintenance.
	F3	**Complexity**	The level of technical, regulatory, and logistical difficulty associated with implementing the project.
	F4	**Adaptability**	The project's capacity to accommodate changing conditions, future climate hazards, technologies, or future expansion.

Step 3: Match High-Priority Projects to Available Funding Mechanisms

After establishing the rankings, climate leaders should identify which funding mechanisms best align with each project's needs listed on the following pages and in Chapter 7: Funding & Financing Mechanisms Inventory, using the guidance herein and assigned to each *Resilient Rhody 2025* Action and Climate Adaptation & Resilience Solution. This process is as follows:

- Identify which federal grants, state funding programs, and low-interest loan mechanisms each project may qualify to receive
- Determine which interventions require upfront technical assistance—such as CZM for shoreline permitting or SEP for microgrid feasibility
- Clarify the funding sequence for each project phase (e.g., planning → design → construction)
- Develop match strategies that leverage municipal bond capacity, state funds (e.g., CRF, OSCAR, MRP), or SRF principal forgiveness

Continue to the following pages for list of potential funding and financing mechanisms.

Step 4: Define the State's Specific Support Role for Each Project

For each prioritized project, the State should outline its support functions such that implementing partners clearly understand what assistance will be provided.

The State's role commonly includes:

- Providing unified datasets (climate, flood, coastal, ecological, and outage data)
- Delivering engineering, modeling, and feasibility support
- Verifying funding eligibility and aligning project scopes with statewide plans and priorities
- Coordinating multi-agency review, permitting steps, and regulatory compliance
- Supporting grant applications, including match planning, cost-benefit inputs, and technical documentation
- Strengthening municipal readiness through workshops, templates, and direct technical assistance
- Helping identify and secure match funding from state programs or bond structures
- Ensuring regulatory alignment for coastal, water, energy, and transportation projects
- Embedding equity by prioritizing investments in socially vulnerable communities
- Continuing to support state resilience funding & financing programs

Refer to the State roles assigned to the 10 priority solutions outlined in this plan for guidance on the types of roles that may be relevant to different project types.

Equitable Investment Considerations

Equitable investment is a central consideration within these solutions, as many high-risk stormwater, drinking water, school, and community facilities are located in socially and economically vulnerable areas. Ensuring that investments reduce disproportionate flood and environmental health risks, maintain access to essential services, and lower participation barriers for underserved municipalities is therefore a core component of this strategy. Please refer to Chapter 8: Prioritization Framework which provides example metrics to assess whether assets and projects serve vulnerable areas.

3b - Funding and Financing Mechanisms

Rhode Island's Evolving Funding Approach[8]

Initially, Rhode Island supported resilience projects solely through grant funding. Rhode Island's Municipal Resilience Fund is the capital deployment arm of the state's broader Municipal Resilience Program. The program begins with a structured, collaborative risk assessment and planning process in which municipalities receive support to identify and prioritize locally relevant resilience projects. This is an essential first step for smaller or under-resourced jurisdictions, as they may not have in-house climate planning capacity. Thus, the program is designed for more equitable delivery, not just scaled delivery, of vital capital.

This approach succeeded at promoting resilience planning on a small scale. However, as demand grew and project size increased, it became clear that a more durable, sustainable financing method was needed. In response, the Rhode Island Infrastructure Bank shifted toward a loan model through the Resilient Rhody Infrastructure Fund (RRIF), using its experience managing state revolving funds to offer long-term, low-cost capital. On a conservative basis, every $1 in public resources can now support $3 in project costs. This turns a finite pool of funds into a self-renewing and significantly more powerful platform to meet mounting demand.

Once projects are ready for implementation, the Rhode Island Infrastructure Bank can now provide funding through a mix of revolving loan capital, state bond proceeds, green bonds, and federal infrastructure funding. The result is a layered sustainable financing model that does not rely on a single funding source. Among other strengths, this model enables small cities and towns to punch above their fiscal weight, accessing both capital and expertise without needing to master the complex mechanics of resilience finance.

Funding and Financing Mechanisms

To support the implementation of *Resilient Rhody 2025* Actions, a comprehensive inventory of funding mechanisms was developed and mapped to each Action and the 10 solutions outlined herein. The potential funding sources for these Actions are organized into three categories: federal funding, state funding, and non-traditional funding and include the following. Summaries and applicable hazards of the mechanisms listed below are available in Chapter 7: Funding & Financing Mechanisms Inventory. **All funding sources should be verified for current availability and applicability before pursuing them.**

[8] Adapted from: Muro, M., & Kammen, D. (2024, October 31). *Rethinking our assumptions and financing tools for community resilience in the face of growing climate loss and risk.* Brookings. https://www.brookings.edu/articles/rethinking-our-assumptions-and-financing-tools-for-community-resilience-in-the-face-of-growing-climate-loss-and-risk/

Federal Funding Sources*

**Federal funding sources were identified in the summer of 2025. This plan does not guarantee the availability, continuation, or applicability of these sources.*

Environmental Protection Agency (EPA)

- Brownfields Program
- National Estuary Program (Narragansett Bay Estuary)
- Section 319 Nonpoint Source Grant Program
- Sewer Overflow & Stormwater Reuse (OSG)
- SOAR Fund (Opportunity to Advance Resilience)
- Southeast New England Program (SNEP) Watershed Implementation Grants (SWIG)
- Water Infrastructure Finance and Innovation Act (WIFIA)
- Wetland Program Development Grants (WPDG)

Federal Emergency Management Agency (FEMA)

- Emergency Management Performance Grant (EMPG)
- Flood Mitigation Assistance (FMA) Grant Program
- National Dam Safety Program

National Oceanic and Atmospheric Administration (NOAA)

- Coastal Zone Management (CZM) Program
- Environmental Literacy Program
- Rhode Island Sea Grant Program
- National Coastal Resilience Fund (NCRF)

U.S. Department of Agriculture (USDA)

- Community Facilities Direct Loan & Grant Program
- Emergency Watershed Protection (EWP) Program
- Forest Service Forest Legacy Program
- Forest Service Urban and Community Forestry Grants
- Natural Resources Conservation Service (NRCS) Incentives
- Rural Development Energy Programs (REAP)
- Rural Development Technical Assistance
- Rural Development Training Programs
- Rural Development Water Programs
- Urban and Community Forestry Grant Program
- Watershed and Flood Prevention Operations Program (PL-566)

U.S. Department of Defense (DOD)

- Installation Readiness Program
- Office of Local Defense Community Cooperation Programs
- Readiness and Environmental Protection Integration Program (REPI)

U.S. Department of Transportation (DOT)

- Congestion Mitigation and Air Quality Improvement Program
- Port Infrastructure Development Program (PIDP)
- PROTECT Grant Program
- Transportation Alternatives Set Asides
- Wildlife Crossings Pilot Program (WCPP)

U.S. Army Corps of Engineers (USACE)

- Continuing Authorities Program

Other Federal Funding

- Five Star and Urban Waters Restoration Grant Program
- HUD Community Development Block Grant (CDBG)
- HUD PRO Housing Grant Program
- HUD Section 108 Loan Guarantee Program
- Centers for Disease Control and Prevention (CDC) – Climate-Ready States and Cities Initiative (CRSCI)
- Historic Preservation Fund (HPF)
- U.S. Department of Health & Human Services (DHHS) – Low Income Home Energy Assistance Program (LIHEAP)
- U.S. Department of Energy (DOE) – State Energy Program (SEP)
- U.S. Fish and Wildlife Service – State Wildlife Grants

State Funding Sources

Rhode Island Infrastructure Bank (RIIB)

- Resilient Rhody Infrastructure Fund
- Municipal Resilience Program (MRP)
- Municipal Infrastructure Grant Program (MIGP)
- Clean Water State Revolving Fund (CWSRF)
- Drinking Water State Revolving Fund (DWSRF)
- DWSRF Administration & Technical Assistance Set-Aside
- DWSRF Small Systems Technical Assistance Set-Aside
- DWSRF State Program Management Set-Aside
- Stormwater Project Accelerator (SPA)
- Efficient Building Fund (EBF)
- Municipal Road & Bridge Revolving Loan Fund (MRBRF)
- Commercial Property Assessed Clean Energy (C-PACE)
- Community Project Assistance Fund (CPAF)

Rhode Island Department of Environmental Management (RIDEM)

- RI Climate Resilience Fund (CRF)
- Bay and Watershed Restoration Fund
- State Land Conservation Program
- Local Open Space Grants
- Wastewater Treatment Facility Resilience Fund (RIDEM & RI Infrastructure Bank – RIIB)
- Ocean State Climate Adaptation & Resilience Fund (OSCAR) (RIDEM & RI Coastal Resources Management Council – CRMC)

Rhode Island Office Of Energy Resources (OER)

- Energy Resilience & Emergency Planning
- Regional Greenhouse Gas Initiative (RGGI) (RIDEM)
- Renewable Energy Fund (REF) & Resilient Microgrids for Critical Services Program
- State Clean Energy Programs & Power System Transformation Coordination

Additional State Programs

- RI Green Economy and Clean Water Bonds (State of RI)
- Site Readiness Grant Program (RI Commerce)
- RI Department of Transportation Capital Improvement Program (RIDOT)
- Coastal and Estuary Habitat Restoration Program & Trust Fund (RI CRMC)
- Resilience Technical Assistance Program (RI Department of Administration – Division of Statewide Planning)
- Rebounds Energy Efficiency Grant Program (RI Department of Commerce)

Non-Traditional Funding Sources

- Tax Increment Financing (TIF)
- Special Assessment Districts
- Developer Impact Fees / Resilience Exactions
- Transfer of Development Rights (TDR)
- Catastrophe / Resilience Bonds
- Blue Bonds
- Environmental Impact Bonds
- Dedicated Utility Fees
- Community-Based Public-Private Partnerships (CBP3)
- Parametric Insurance
- Insurance Premium Discounts
- Thriving Communities Grantmaking Program (Environmental Justice for New England)

Refer to Chapter 2: *Resilient Rhody 2025* Actions and Chapter 5: Climate Adaptation & Resilience Solutions for a detailed overview of the recommended funding mechanisms mapped to each priority.

3c - Economic Impact of Resilience Infrastructure Construction

This section presents an economic impact analysis of public investment in resilience-related construction and infrastructure in Rhode Island. The analysis establishes a rule of thumb for estimating the economic multiplier effects of direct spending on climate resilience projects, which can be scaled to projects of varying sizes. The figures presented reflect jobs created, wages paid, and economic activity generated through the construction process itself.

This analysis measures the economic impact of construction spending, *not* the benefits of enhanced resilience. This analysis does not quantify the additional and substantial long-term benefits of climate resilience, including:

- Avoided damages to property, infrastructure, and natural resources
- Prevented economic disruptions and business losses
- Reduced emergency response and repair costs
- Protected tax revenues from maintained property values and economic activity
- Lives saved and reduced health impacts
- Ecosystem services and environmental co-benefits
- Enhanced economic capacity and competitiveness

The economic impact analysis was conducted using Lightcast economic modeling software, which accounts for direct, indirect, and induced effects of construction spending through input-output modeling. The analysis examines the impact of $1 million in direct construction spending related to resilience infrastructure in Rhode Island's economy.

Overall Economic Impact

This process found that for every $1 million invested in resilience-related construction in Rhode Island generates approximately $1.56 million in total economic output (sales), supporting 7 jobs during the period of construction and producing $625,000 in earnings across the state economy.

Economic Impact of $1M in Construction Spending in Rhode Island

	Jobs	Earnings	Sales
Direct	4	$408,993	$1,000,000
Indirect	1	$69,951	$204,847
Induced	2	$145,722	$358,246
Total	**7**	**$624,666**	**$1,563,093**

Source: Lightcast

The impact breaks down as follows:

- **Direct Effects:** The initial $1 million investment directly supports 4 jobs with $409,000 in earnings within the construction sector itself.
- **Indirect Effects:** Supply chain impacts generate an additional $205,000 in sales, supporting 1 job and $70,000 in earnings as construction firms purchase materials, equipment, and services from Rhode Island suppliers.
- **Induced Effects:** Household spending by workers employed through direct and indirect effects generates $358,000 in additional sales, supporting 2 jobs and $146,000 in earnings as these workers spend their income in the local economy.

Economic Multiplier

The analysis yields an **output multiplier of 1.56**, meaning each dollar of direct construction spending generates an additional $0.56 of economic activity through indirect and induced effects. This multiplier reflects the interconnected nature of Rhode Island's economy and the broad economic benefits of resilience infrastructure investment.

A $340 million investment in resilience-related construction in Rhode Island could:

- Generate approximately **$530.4 million in total economic output.**
- Support roughly **2,380 jobs.**
- **Produce $212.5 million in earnings** across the state economy.

Application

This rule of thumb can be applied to resilience construction projects of any scale by multiplying the project's direct construction investment by the appropriate impact factors. For example, a $10 million resilience project would be expected to generate approximately 70 jobs, $6.2 million in earnings, and $15.6 million in total economic output across Rhode Island.

Investment in resilience infrastructure delivers substantial economic returns beyond its primary purpose of climate adaptation. The multiplier effects demonstrate that such investments serve dual purposes: enhancing Rhode Island's capacity to withstand climate impacts while simultaneously supporting job creation, income growth, and broad-based economic development across multiple sectors of the state economy.

Construction spending on resilience infrastructure generates measurable near-term economic activity through job creation, supply chain spending, and induced household purchases. However, the primary economic justification for these investments lies in their long-term benefits: avoiding damages that could total hundreds of millions of dollars, preventing economic disruptions, protecting lives and public health, maintaining essential services, and preserving Rhode Island's economic competitiveness. A comprehensive cost-benefit analysis quantifying these avoided costs and long-term benefits would provide a fuller picture of the economic returns from resilience investments.

Appendix A: Implementation Framework Tags Descriptions

Funding

Funding – Require access to support and dedicated financial resources, including support for grant writing, match requirements, or direct application to federal, state, or philanthropic funding streams. It may also highlight the need to establish new funding mechanisms or expand existing state-level programs.

Community Incentives – Programs or policy tools that encourage voluntary resilience actions by residents, businesses, or property owners. Examples include tax abatements for floodproofing, rebates for green infrastructure, or fast-tracked permitting for resilient construction. These incentive structures are critical for fostering a culture of shared responsibility and expanding the reach of state-led programs through private action.

Direct Government Investment & Procurement – Using government purchasing power and capital investments to drive resilient infrastructure, green procurement policies, or direct public works projects that model climate-resilient practices. This tag applies to actions that require public-sector capital investments, such as infrastructure upgrades, resilient retrofits, or the acquisition of emergency systems, or modifications to procurement processes that prioritize climate-smart practices.

Policy and Compliance

Land Use Policy – Changes to zoning, building codes, or land use planning needed to support resilient development, open space preservation, or managed retreat. Actions under this category often require changes that enable green infrastructure, floodplain protections, managed retreat strategies, or the preservation of open space to buffer against climate hazards.

Rules & Regulations – Regulatory updates needed at the local, state, or federal level to remove barriers or mandate climate-resilient practices. This may include revising stormwater rules, building performance standards, or permitting requirements. In many cases, new or updated regulations are necessary to ensure consistency, enforceability, and the effectiveness of long-term resilience measures across jurisdictions.

Enforcement & Compliance Mechanisms – Creating oversight systems, inspection protocols, penalties, or compliance monitoring for existing or new climate resilience requirements. Effective enforcement not only increases accountability but also drives long-term performance and risk reduction.

Tools & Training

Data Collection & Information Systems – Creating requirements for data gathering, standardized reporting, monitoring systems, or information sharing platforms that support resilience decision-making across sectors. These systems are critical for understanding risk, prioritizing investments, and demonstrating impact over time.

Technical Assistance & Capacity Building – Establishing government programs to provide technical expertise, professional development, or direct support services to help communities, businesses, or other agencies implement resilience measures. Building capacity ensures that stakeholders have the tools, knowledge, and resources to execute resilience strategies effectively and equitably.

Education, Engagement, & Awareness – Public education campaigns, technical training, or stakeholder engagement efforts required to build support or understanding of climate resilience. This tag signals the need for outreach campaigns, community workshops, or capacity-building sessions that help the public and local officials make informed decisions. It also highlights the importance of transparency and two-way communication in fostering trust and empowering residents to act.

Coordination

Intergovernmental Coordination – Establishing formal mechanisms for collaboration between state, federal, and local governments, including compacts, regional authorities, or mandated coordination protocols for climate resilience planning. This tag refers to the need for formal coordination mechanisms, such as joint task forces, interagency working groups, or regional compacts, that align goals, share data, and streamline implementation.

Public-Private Partnership Frameworks – Establishing legal structures and policies that facilitate collaboration between government and private sector for resilience investments, risk-sharing arrangements, or innovative financing mechanisms. These structures can be vital for scaling up infrastructure projects, leveraging private capital, and aligning business incentives with resilience outcomes.

Emergency Preparedness & Response Authorities – Developing special governmental authorities for climate emergencies, including streamlined permitting during disasters, emergency procurement, or evacuation/relocation authorities. This tag indicates the need for enabling policies that expand emergency powers during disasters to strengthen these authorities, reducing response times and improving outcomes.

Appendix B: Comparative State Climate Resilience Investments

Comparative State Climate Resilience Investments

To inform Rhode Island's resilience funding strategy, this analysis reviews budget allocations in neighboring and peer states to provide context on the scale and structure of climate resilience investments in the region.

Delaware

Delaware, the lowest-lying state in the nation with a population of approximately 1.0 million, allocated $15 million in October 2024 for a state-funded coastal shoreline resilience project to reinforce shorelines and prevent damage to coastal infrastructure. The State also operates the Resilient Community Partnership program, which provides technical assistance and potential funding to municipalities for coastal hazard planning, leveraging federal NOAA grants (specific annual amounts not publicly disclosed). This state's approach emphasizes leveraging federal partnerships for technical assistance while making strategic state investments in critical coastal infrastructure.

Maryland

Maryland, with a population of 6.2 million and over 3,190 miles of tidal shoreline, has established one of the most comprehensive and transparent resilience funding programs in the region. The Chesapeake and Atlantic Coastal Bays Trust Fund awarded $29 million in FY2026 to 27 ecological restoration projects across 160 sites. These projects deploy best management practices including stream restoration, living shorelines, wetland creation, and stormwater management.

The state's FY2026 budget includes a $24 million Waterway Capital Appropriation and over $97 million allocated to the Department of Natural Resources' Watershed and Climate Services division for operations and capital projects. Additional resilience investments include $415,000 for climate resilience planning and design projects and $248,480 for Resiliency through Restoration implementation projects. Maryland also secured $15.2 million in federal NOAA Climate-Ready Coasts funding in 2023 for four projects including wetland restoration and marine debris education.

Massachusetts

Massachusetts has established the most systematic approach with a targeted commitment to dedicate 1% of its total state budget to energy and environmental programs. In FY2026, this translated to approximately $547 million annually from its $60.9 billion budget. Key resilience line items include the Municipal Vulnerability Preparedness (MVP) Action Grant program ($52.4 million in August 2024), a Disaster Relief and Resilience Fund ($25 million capitalization including $14 million from consolidated net surplus and $11 million in seed funding), and $2.8 million for dams, culverts, and small bridges. Massachusetts has doubled municipal climate resilience funding and increased capital funding to state agencies sevenfold since 2023, establishing a predictable funding floor through its policy-driven 1% budget commitment.

Connecticut

Connecticut allocates climate resilience funding primarily through competitive grant programs and bond authorizations within its biennial budget structure. The state's DEEP Climate Resilience Fund grew from $8.8 million in its 2023 inaugural round to $44.8 million for FY2025 ($33 million state funds, $11.8 million federal), with at least 40% prioritized for vulnerable and environmental justice communities. Additional resilience investments include $25 million (FY2024) and $22.5 million (FY2025) for dam repair, flood control, and erosion repair. Connecticut authorized a Climate Resiliency Revolving Loan Fund in 2024 (bond-funded, specific amount to be determined) and allocated $275 million in bond funding for the Clean Water Fund in June 2024 to provide municipal loans. Connecticut's approach emphasizes leveraging state funds to unlock federal matching dollars while using bond authorizations for major infrastructure investments.

Maine

Maine focuses on direct municipal support through its Community Resilience Partnership, which awarded $8 million in its fifth round in May 2025, bringing total program funding to $18.8 million distributed across 263 communities since inception. The program is funded through a combination of $5 million from FY2024 state supplemental appropriations, $3 million from FY2023 legislative appropriations and federal NOAA grants, with maximum awards increased from $50,000 to $75,000 per community and up to $175,000 for joint applications. Following devastating winter storms in 2023-24 that caused approximately $90 million in infrastructure damage, Maine allocated a historic $60 million for infrastructure rebuilding and resilience.

The state operates the Maine Infrastructure Adaptation Fund (MIAF), which provided $1.4 million to 19 communities in FY2024 following its initial $20 million capitalization in FY2022 that supported 12 communities. Maine also maintains a $4 million annual Municipal Stream Crossing Program. The state secured $69 million in federal NOAA Climate Resilience Regional Challenge funding (October 2024-2029) and $6.6 million for the Maine Grid Resilience Grant Program. Maine's approach demonstrates how direct municipal grants combined with strategic emergency capital investments can address both ongoing resilience needs and acute climate-driven disasters.

Key Takeaways for Rhode Island

Successful state strategies combine three elements: (1) recurring programmatic funding through annual budget line items establishing predictable grant programs; (2) one-time capital investments responding to major climate events or addressing critical infrastructure vulnerabilities; and (3) strategic use of state funds to unlock federal matching dollars through State Revolving Funds, NOAA programs, and EPA partnerships. Most states have established dedicated resilience funds with competitive application processes rather than distributing funds through general appropriations, allowing for transparent project selection based on measurable impact criteria such as cost-effectiveness, equity considerations, and pollution reduction outcomes.

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Appendix C: Resources Used to Inform Funding Need Estimates

Below is a list of resources used to inform Action Funding Needs estimates. These sources are in addition to the research done for the individual funding programs included in the funding inventory document.

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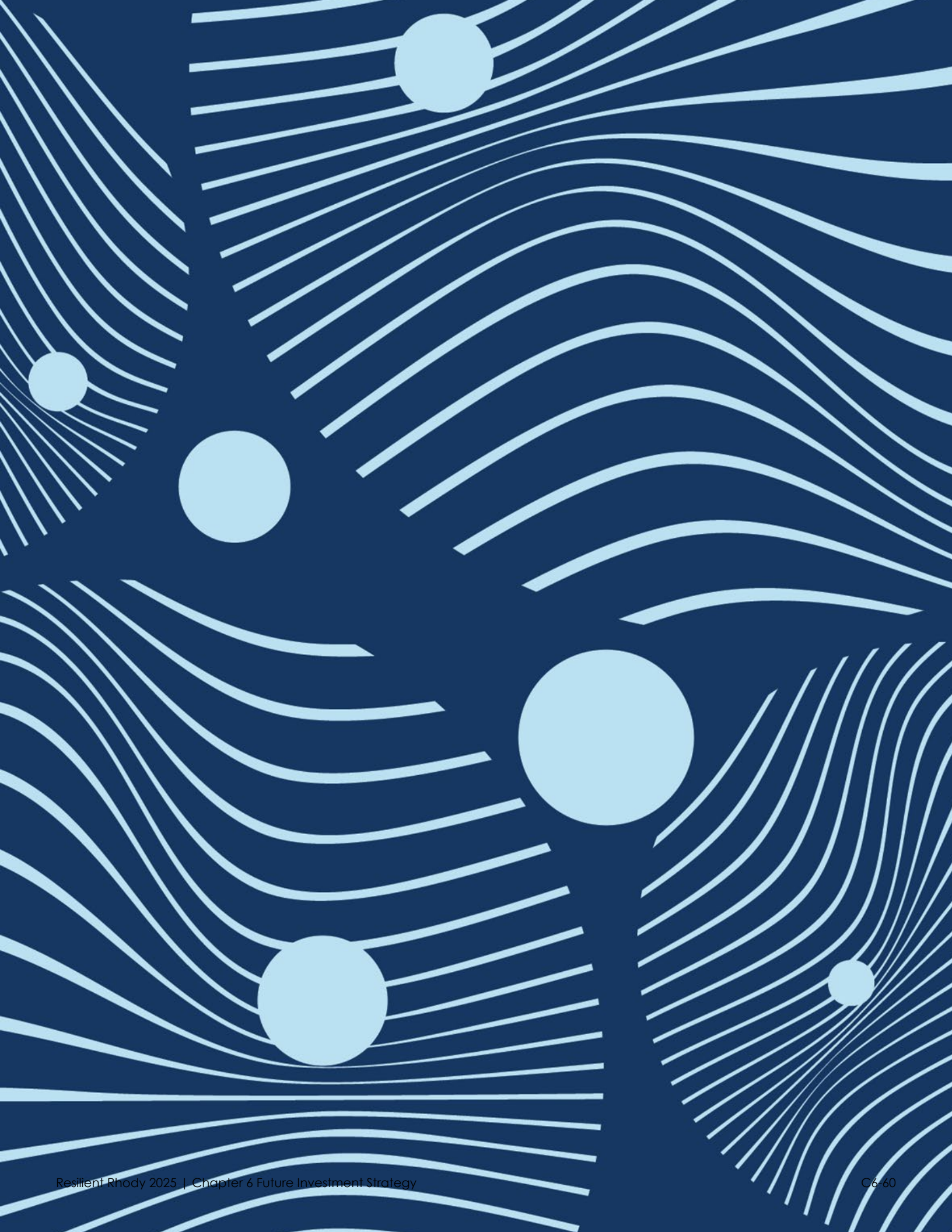
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Chapter 7
Funding & Financing Mechanisms Inventory



Schoolhouse Road reservoir causeway crossing, near the Upper Kickemuit River Dam © RIDOT

Purpose of this Document

The purpose of this document is to provide a comprehensive inventory of funding and financing mechanisms that can support the implementation of *Resilient Rhody 2025*. Each mechanism has been mapped to specific actions and the ten solutions outlined in the Plan to guide decision-making and resource allocation.

While this inventory was developed to support this Plan, it is intended to serve as a broader repository of funding mechanisms for Rhode Island stakeholders, as well as others interested in adaptation and resilience funding strategies.

This inventory represents a point-in-time assessment of funding sources identified in the summer of 2025. It is intended as a reference tool and does not guarantee the availability, continuation, or applicability of these sources. Users should verify the current status and eligibility requirements of all funding sources before pursuing them.

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List of Funding Sources

Below provides a list of funding sources referenced included in the Funding and Financing Mechanism Inventory. These programs span federal, state, and non-traditional sources, offering a range of grants, loans, and financing mechanisms to support climate resilience, infrastructure upgrades, environmental protection, and community development in Rhode Island. However, due to ongoing changes in federal and state funding programs, this list may not capture all opportunities.

Federal, State, and Non-Traditional Funding Sources

Environmental Protection Agency (EPA)

- SOAR Fund (Opportunity to Advance Resilience)
- National Estuary Program (Narragansett Bay Estuary)
- Wetland Program Development Grants (WPDG)
- Southeast New England Program (SNEP) Watershed Implementation Grants (SWIG)
- Section 319 Nonpoint Source Grant Program
- Water Infrastructure Finance and Innovation Act (WIFIA)
- Brownfields Program
- Sewer Overflow & Stormwater Reuse (OSG)

Federal Emergency Management Agency (FEMA)

- Emergency Management Performance Grant (EMPG)
- Flood Mitigation Assistance Grant Program (FMA)
- National Dam Safety Program

National Oceanic and Atmospheric Administration (NOAA)

- Coastal Zone Management (CZM) Program/Grants
- National Coastal Resilience Fund (NCRF)
- Rhode Island Sea Grant Program
- Environmental Literacy Program

US Department of Agriculture (USDA)

- Community Facilities Direct Loan & Grant Program
- Emergency Watershed Protection (EWP) Program
- Forest Service Forest Legacy Program
- Forest Service Urban and Community Forestry Grants
- Natural Resources Conservation Service (NRCS) Incentives
- Rural Development Energy Programs (REAP)
- Rural Development Technical Assistance & Training Programs
- Rural Development Water Programs
- Urban and Community Forestry Grant Program

US Department of Defense (DOD)

- Readiness and Environmental Protection Integration Program (REPI)
- Office of Local Defense Community Cooperation Programs
- Installation Readiness Program

US Department of Transportation (DOT)

- PROTECT Grant Program
- Port Infrastructure Development Program (PIDP)
- Transportation Alternatives Set Asides
- Congestion Mitigation and Air Quality Improvement Program
- Wildlife Crossings Pilot Program (WCPP)

United State Army Corps of Engineers (USACE)

- Continuing Authorities Program

Other Federal Funding

- US DHHS Low Income Home Energy Assistance Program (LIHEAP)
- HUD Community Development Block Grant (CDBG)
- HUD PRO Housing Grant Program
- HUD Section 108 Loan Guarantee Program
- US DOE State Energy Program (SEP)
- US Fish and Wildlife Service State Wildlife Grants
- CDC Climate-Ready States and Cities Initiative (CRSCI)
- Historic Preservation Fund (HPF)
- Five Star and Urban Waters Restoration Grant Program
- National Science Foundation EPSCoR (NSF)

List of Funding Sources – Continued

Below provides a list of funding sources referenced included in the Funding and Financing Mechanism Inventory. These programs span federal, state, and non-traditional sources, offering a range of grants, loans, and financing mechanisms to support climate resilience, infrastructure upgrades, environmental protection, and community development in Rhode Island. However, due to ongoing changes in federal and state funding programs, this list may not capture all opportunities.

Federal, State, and Non-Traditional Funding Sources

Rhode Island Infrastructure Bank Programs (RIIB)

- *Resilient Rhody* Infrastructure Fund (RRIF)
- Clean Water State Revolving Fund (CWSRF)
- Drinking Water State Revolving Fund (DWSRF)
- DWSRF Set Asides (Multiple)
- Municipal Resilience Program (MRP)
- Municipal Infrastructure Grant Program (MIGP)
- Efficient Building Fund (EBF)
- Municipal Road & Bridge Revolving Loan Fund (MRBRF)
- Commercial Property Assessed Clean Energy (C-PACE)
- Community Project Assistance Fund (CPAF)
- Stormwater Project Accelerator (SPA)

Rhode Island Department of Environmental Management (RIDEM)

- Rhode Island Climate Resilience Fund (CRF)
- Ocean State Adaptation and Resilience (OSCAR) Fund
- State Land Conservation Program
- Local Open Spaces Grants
- Bay and Watershed Restoration Fund
- Wastewater Treatment Facility Resilience Fund (WWTFRF)

Rhode Island Office of Energy Resources (OER)

- Clean Energy Programs & Power System Transformation Coordination
- Energy Resilience & Emergency Planning
- Regional Greenhouse Gas Initiative (RGGI)
- Renewable Energy Fund (REF) & Resilient Microgrids for Critical Services Program

Other Rhode Island-Based Funding Sources

- Coastal and Estuary Habitat Restoration Program & Trust Fund (RI CRMC)
- RI Green Economy and Clean Water Bonds
- RI Department of Administration RIDSP Resilience Technical Assistance Program
- RI Department of Commerce RI Rebounds Energy Efficiency Grant Program
- RI Department of Commerce Site Readiness Grant Program
- RI Department of Transportation Capital Improvement Program

Non-Traditional Funding Sources

- Tax Increment Financing (TIF)
- Special Assessment Districts
- Developer Impact Fees / Resilience Exactions
- Transfer of Development Rights (TDR)
- Catastrophe / Resilience Bonds
- Blue Bonds
- Environmental Impact Bonds
- Dedicated Utility Fees
- Community-Based Public-Private Partnership (CBP3)
- Parametric Insurance
- Insurance Premium Discounts
- Philanthropic Funding
- The Climate Smart Communities Initiative (CSCI)
- Thriving Communities Grantmaking Program (Environmental Justice for New England)

Understanding the Funding Inventory
Agency or Funding Source

EXAMPLE

Description

This page serves as a quick-reference guide to help users navigate the funding source profiles on the following pages. It explains the consistent layout used for each profile, from the funding source header and detailed program descriptions to the icons, side panel information, and key points. By breaking down what each section means, including program, administration, funding scale, relevant hazards, asset categories, and eligible applicants, it ensures readers can quickly interpret the information and match it to their resilience priorities.

Programs – List of programs under the agency that offers resilience funding

Program Title – This section lists the specific grant, loan, or financing program under the funding agency or source.

For each program, you'll see:

- **Administration:** Who manages the program locally or nationally.
- **Scale:** Source and type of funds (federal, state, or private), allocation method, match requirements, and typical funding range for projects.
- **Program Description:** What the program funds and key eligibility criteria.
- **Funding Notes:** Insights on recent awards, timelines for funding source availability, and special considerations.

Side Panel Icons & Information

The side panel is designed to give readers a quick, at-a-glance understanding of key information for each funding source. It contains five critical components: Relevant Hazards, Relevant Categories, Asset Types, and Who can Access Funds.

- **Relevant Hazards:** Uses icons to show the types of risks a funding source addresses, helping users quickly identify programs that align with their community's specific vulnerabilities.
- **Relevant Categories:** Connects each funding source to broader resilience action areas identified throughout the Report, guiding users toward the most applicable strategic goals.
- **Asset Types:** Using the asset types identified in the report, this section outlines the infrastructure, resources, or community elements that could benefit from funding, ensuring decision-makers can see where their needs fit.
- **Who can Access Funds:** Lists the eligible applicants, saving time and helping readers focus only on programs they can pursue.

Together, these sections offer a powerful navigation and filtering tool for identifying the most relevant funding opportunities.

Legend

Hazard Icons

- Coastal Flooding
- Stormwater Flooding
- Riverine Flooding
- Extreme Heat
- Extreme Wind

Category Icons

- Critical Infrastructure and Facilities
- Community & Emergency Preparedness Structures
- Natural Systems

Relevant Hazards



Relevant Categories



Asset Types

- Drinking Water
- Wastewater
- Stormwater
- Water Resources
- All Critical Infrastructure
- Roads, Bridges, and Culverts
- Community Health and Resilience

Who Can Access Funds

- State and local governments
- Tribal governments
- Regional authorities
- Nonprofit organizations
- Community-based groups representing disadvantaged communities
- Publicly-owned utilities

Federal Funding Mechanisms

Funding Source
Environmental Protection Agency (EPA)

Description

A key set of federal funding programs that support Rhode Island's climate resilience, water quality, habitat restoration, and coastal adaptation priorities. These programs provide grants, technical assistance, and financing to municipalities, state agencies, tribal entities, utilities, and nonprofit partners working to strengthen natural systems and reduce climate-related risks. In Rhode Island, these resources help advance watershed restoration, infrastructure upgrades, stormwater management, and community resilience across both inland and coastal areas.

Programs

Southeast New England Program Opportunity to Advance Resilience (SOAR Fund)

Administered by EPA Region 1 and Southeast New England Program (SNEP)
Scale: Funded by the Bipartisan Infrastructure Law (IIJA); Range: $50K - $300K

SOAR is a streamlined, competitive grant initiative designed to enhance climate resilience in disadvantaged communities across southeastern Massachusetts and Rhode Island.

Funding Notes: The SOAR Fund has allocated approximately $2.3 million to nine projects in eight disadvantaged communities, supporting initiatives such as urban flooding modeling, workforce training in stormwater management, and living shoreline planning. Funding is available through 2027 with expected recompete to follow.

National Estuary Program (NEP) / Narragansett Bay Estuary Program (NBEP)

Administered by EPA; NBEP hosted by Roger Williams University in partnership with regional stakeholders
Scale: Federal funds through cooperative agreements with regional estuary programs; Range: $25K - $75K

The National Estuary Program (NEP) is a non-regulatory, place-based program established under the Clean Water Act to protect and restore estuaries of national significance. EPA provides annual funding and oversight to 28 locally led estuary programs across the country, each responsible for developing and implementing a Comprehensive Conservation and Management Plan (CCMP) tailored to its watershed.

The Narragansett Bay Estuary Program (NBEP) is the NEP program serving Rhode Island and Southeastern Massachusetts. NBEP leads watershed-scale research, monitoring, and collaborative planning to implement the CCMP for the Narragansett Bay region. Through targeted grants, technical assistance, and stakeholder coordination, NBEP supports projects that improve water quality, restore habitat, enhance climate resilience, and advance watershed-based planning.

Funding Notes: NEP funding flows from EPA to NBEP, which then provides subawards to regional partners for CCMP-aligned projects. Funding is permanently authorized under Section 320 of the Clean Water Act and appropriated annually by Congress.

Wetland Program Development Grants (WPDG)

Administered by EPA HQ and Region 1
Scale: National; Range: $50K - $500K

The Wetland Program Development Grants support state, tribal, and local governments in developing and enhancing wetland protection and management programs. Eligible activities include wetland monitoring and assessment, restoration planning, regulatory program development, and integration of wetlands into broader water quality frameworks.

Funding Notes: Requires a 25% non-federal match. Annual competitive application process.

Relevant Hazards



Relevant Categories



Asset Types

- Beaches & Barriers
- Coastal Wetlands
- Drinking Water
- Wastewater
- Stormwater
- Water Resources
- Forests
- All Critical Infrastructure
- Roads, Bridges, and Culverts
- Community Health and Resilience

Who Can Access Funds

- State and local governments
- Tribal governments
- Regional authorities
- Nonprofit organizations
- Community-based groups representing disadvantaged communities
- Publicly-owned utilities

Funding Source
Environmental Protection Agency (EPA)

Description

A key set of federal funding programs that support Rhode Island's climate resilience, water quality, habitat restoration, and coastal adaptation priorities. These programs provide grants, technical assistance, and financing to municipalities, state agencies, tribal entities, utilities, and nonprofit partners working to strengthen natural systems and reduce climate-related risks. In Rhode Island, these resources help advance watershed restoration, infrastructure upgrades, stormwater management, and community resilience across both inland and coastal areas.

Programs

EPA Southeast New England Program (SNEP) Watershed Implementation Grants (SWIG)
Co-Administered by EPA Region 1 and Restore America's Estuaries (RAE)
Scale: Rhode Island and Southeastern Massachusetts; Range: $100K - $500K

The Southeast New England Program (SNEP) Watershed Implementation Grants support collaborative, watershed-based projects that improve water quality, ecosystem health, and community resilience across coastal Rhode Island and southeastern Massachusetts. These grants are intended to move beyond planning and directly support on-the-ground implementation, including green infrastructure, stormwater management, nature-based solutions, and climate resilience practices.

Funding Notes: The funding terms are normally one to two years depending on the project complexity. This program is guaranteed through 2026, likely to continue beyond pending future budgets.

Section 319 Nonpoint Source Grant Program
Administered by EPA Region 1 and RIDEM
Scale: Statewide; Competitive grants; Range: $50K - $300K

The Section 319 Nonpoint Source Grant Program provides funding to address water quality issues caused by diffuse sources of pollution, such as stormwater runoff, agricultural practices, and septic systems. Funds support watershed-based planning and implementation projects that reduce pollutants, restore water quality, and protect aquatic ecosystems.

Funding Notes: Annual allocation to Rhode Island. Requires a 40% non-federal match.

Water Infrastructure Finance and Innovation Act (WIFIA)
Administered by EPA, Office of Water
Scale: National; Range: $20M - $500M+ (loans)

The WIFIA program provides long-term, low-cost federal loans for regionally and nationally significant water infrastructure projects, including drinking water, wastewater, stormwater, and resilience-focused investments. The program helps communities access flexible financing for large-scale infrastructure improvements.

Funding Notes: Project minimum size is $20M ($5M for small communities). Borrowers repay with highly favorable terms (up to 35 years). Rolling application cycles tied to annual Notices of Funding Availability.

Brownfields Program
Administered by EPA Region 1
Scale: National; Range: $200K - $1M+

The EPA Brownfields Program helps communities clean up and redevelop contaminated or underutilized properties, supporting economic revitalization and environmental health. Funding is available for site assessments, cleanup, revolving loan funds, and technical assistance to municipalities, nonprofits, and tribes.

Funding Notes: Typical assessment grants are up to $500K; cleanup grants up to $1M per site; coalition assessment grants up to $1M. Requires a 20% cost share for cleanup (waivers available for hardship).

Relevant Hazards



Relevant Categories



Asset Types

- Beaches & Barriers
- Coastal Wetlands
- Community Health and Resilience
- Drinking Water
- Stormwater
- Water Resources
- Building Design & Construction
- All Critical Infrastructure

Who Can Access Funds

- State and local governments
- Tribal governments
- Research institutions
- Community-based organizations (via partnerships with NEPs)

Funding Source
Environmental Protection Agency (EPA)

Description

A key set of federal funding programs that support Rhode Island's climate resilience, water quality, habitat restoration, and coastal adaptation priorities. These programs provide grants, technical assistance, and financing to municipalities, state agencies, tribal entities, utilities, and nonprofit partners working to strengthen natural systems and reduce climate-related risks. In Rhode Island, these resources help advance watershed restoration, infrastructure upgrades, stormwater management, and community resilience across both inland and coastal areas.

Programs

Sewer Overflow & Stormwater Reuse (OSG)
Administered by EPA and Rhode Island Infrastructure Bank (RIIB)
Scale: Federal grant; Range: $50K - $300K

The Sewer Overflow & Stormwater Reuse Municipal Grants (OSG) program provides federal funding to support municipal projects that address combined sewer overflows, sanitary sewer overflows, and stormwater management challenges. Funds may be used for planning, design, and construction of infrastructure that reduces pollution, improves water quality, and enhances the resilience of local wastewater and stormwater systems. Eligible projects include green infrastructure, stormwater capture and reuse, system rehabilitation, and other measures that mitigate overflow events.

Funding Notes: Funding is allocated annually by Congress and distributed to states based on need. Municipalities typically access OSG dollars through their state's clean water funding programs. Match requirements and project eligibility vary by state and funding cycle.

Relevant Hazards



Relevant Categories



Asset Types

- Stormwater
- Wastewater
- Water Resources
- Coastal Wetlands
- Community Health and Resilience

Who Can Access Funds

- State and local governments
- Tribal governments
- Regional authorities
- Public-private partnerships

Funding Source
Federal Emergency Management Agency (FEMA)

Description

The Federal Emergency Management Agency (FEMA) provides critical funding to support state and local resilience efforts through a variety of grant programs focused on hazard mitigation, disaster recovery, and climate adaptation. FEMA's funding emphasizes projects that reduce long-term risk, enhance community resilience, and align with state hazard mitigation plans. States can also leverage FEMA technical assistance, pre-disaster mitigation funding, and capacity-building resources to prioritize and implement climate-resilient infrastructure, planning, and land use strategies.

Programs

Emergency Management Performance Grant (EMPG)

Administered by FEMA
Scale: Federal formula grant, typically 50% federal, 50% state/local match.

The Emergency Management Performance Grant (EMPG) program provides critical funding to build and sustain a robust all-hazards emergency management system. EMPG supports personnel, planning, training, and equipment that strengthen emergency preparedness and response capabilities. EMPG also enables state agencies to collaborate with local governments, tribal entities, and nonprofit partners to ensure coordinated disaster readiness and resilience.

Funding Notes: EMPG supported over $355 million in emergency preparedness activities nationwide in FY2024, with funding in Rhode Island used to enhance local emergency operations coordination, invest in interoperable communication systems, and support community-based preparedness planning. This funding is permanent and stable.

Flood Mitigation Assistance (FMA) Grant Program

Administered by FEMA
Scale: Federal competitive grant; 75%-100% federal cost share. Range: $300K - $50M

The Flood Mitigation Assistance (FMA) Grant Program provides funding to reduce or eliminate the risk of repetitive flood damage to buildings and infrastructure insured under the National Flood Insurance Program (NFIP). Eligible activities include property buyouts, elevation of flood-prone structures, drainage improvements, floodproofing, and the development of local flood mitigation plans. The program prioritizes cost-effective, permanent solutions for reducing future NFIP claims and enhancing long-term community resilience to flood hazards.

Funding Notes: In FY2023, FEMA awarded over $800 million through the FMA program nationwide. Rhode Island communities have used FMA grants to support floodplain property acquisitions, elevate homes at risk of recurrent flooding, and update local hazard mitigation plans to align with evolving flood risk projections. This program is permanent and reoccurring, with BIL enhancement funding through FY2026.

National Dam Safety Program

Administered by FEMA
Scale: Federal-state partnership; annual grants to state dam safety programs. Range: $100K - $170K

The National Dam Safety Program (NDSP) provides technical and financial assistance to enhance the safety of dams across the United States. Through annual grants, FEMA supports state efforts to inspect, monitor, and rehabilitate dams, improve emergency action planning, and increase community awareness of dam-related risks. The program promotes a coordinated approach to dam safety by integrating federal, state, and local efforts and advancing research, training, and best practices. States use NDSP funds to strengthen regulatory programs, conduct risk assessments, and build the capacity of emergency responders and dam owners.

Funding Notes: In FY2023, FEMA distributed over $8 million through NDSP grants. Rhode Island used funding to support dam safety inspections, conduct condition assessments of high-hazard dams, and update emergency action plans, contributing to stronger community preparedness and risk mitigation. This funding is reauthorized annually and is anticipated to be supported in future budgets.

Relevant Hazards



Relevant Categories



Asset Types

- Electric Grids
- Dams
- Building Design and Construction
- Emergency Services
- Community Health and Resilience

Who Can Access Funds

- Municipal governments
- Tribal governments
- Local emergency management agencies
- State emergency management agencies

Funding Source
National Oceanic and Atmospheric Administration (NOAA)

Description

The National Oceanic and Atmospheric Administration (NOAA) is a key federal partner in advancing climate resilience, particularly for coastal and marine environments. States can leverage NOAA funding to invest in living shorelines, habitat restoration, climate adaptation planning, sea level rise modeling, and nature-based infrastructure.

Programs

Coastal Zone Management (CZM) Program/Grants

Administered by NOAA Office for Coastal Management in partnership with state coastal programs
Scale: Federal-state partnership; Range: $150K - $5M

The Coastal Zone Management Program (CZM) provides financial and technical assistance to states and territories to protect, restore, and responsibly develop coastal communities and resources. Through a cooperative agreement with each coastal state, the program funds activities such as shoreline management, climate adaptation, habitat protection, and community resilience planning. Funding supports the implementation of each state's federally approved Coastal Zone Management Plan.

Funding Notes: This program is funded by annual base grants and BIL-expanded through FY 2026.

National Coastal Resilience Fund (NCRF)

Co-Administered by the NOAA and National Fish and Wildlife Foundation (NFWF)
Scale: Competitive federal grants; public-private partnership; Range: $100K - $10M

The National Coastal Resilience Fund (NCRF) supports projects that strengthen coastal communities by restoring natural ecosystems and reducing flood and storm risks. Projects must deliver dual benefits—enhancing community resilience and improving ecological health—and demonstrate community engagement and scientific justification.

Funding Notes: This funding is long-term and recurring, providing annual awards. The request for proposals (RFP) is typically released in late winter and due in mid-spring.

Rhode Island Sea Grant Program

Administered by NOAA National Sea Grant College Program and the University of RI
Scale: Federally funded; cost share varies by program; competitive and capacity-based; Range: $5K - $300K

The Rhode Island Sea Grant (RISG) Program supports applied research, education, and outreach to address coastal and marine challenges facing the state. RISG also serves as a trusted convener of researchers, practitioners, and decision-makers, helping to translate science into actionable strategies. The RISG biennial research competition funds 2-year research projects that advance Sea Grant's priorities in resilient communities and economies, sustainable fisheries and aquaculture, and healthy coastal ecosystems. Program development funds support small research, workforce development, outreach, and/or extension activities that are responsive to the needs of individuals and groups affected by Rhode Island coastal and ocean issues.

Funding Notes: This program is expected to continue pending congressional appropriations.

Environmental Literacy Program

Administered by NOAA, Office for Education
Scale: Competitive federal grants; Range: $250K - $600K

The NOAA Environmental Literacy Program (ELP) provides funding to advance environmental and climate literacy through formal and informal education. Funded initiatives often focus on place-based learning, community-driven resilience planning, and K–12 curriculum development that empowers youth and residents to make informed environmental decisions.

Funding Notes: This funding has been active for 15+ years and is expected to continue based on congressional appropriations.

Relevant Hazards



Relevant Categories



Asset Types

- Coastal Wetlands
- Community Health and Resilience
- Emergency Services
- Wastewater
- Fuel Supply
- All Critical Infrastructure

Who Can Access Funds

- State and local governments
- State coastal management agencies
- Municipal governments
- Academic institutions
- Regional planning agencies
- Nonprofit organizations
- Tribal governments

Funding Source
US Department of Agriculture (USDA)

Description

The US Department of Agriculture (USDA) is a vital funding source for advancing state and local climate resilience, particularly in rural and natural resource-dependent communities. Key programs such as the Rural Energy for America Program (REAP) and Urban and Community Forestry Grants help states reduce environmental vulnerabilities, promote nature-based solutions, and strengthen community capacity to adapt to climate impacts. USDA's funding is often targeted toward underserved or economically disadvantaged areas, making it a cornerstone for equitable and sustainable resilience planning.

Programs

Urban and Community Forestry Grant Program

Administered by USDA Forest Service
Scale: Competitive federal grants; Range: $2K - $10K

The Urban and Community Forestry Grant Program provides funding to support the planning, planting, and management of trees and green space in developed areas. Projects promote equitable access to nature, reduce urban heat, improve air and water quality, and enhance climate resilience. Grants prioritize disadvantaged communities and projects with measurable social and environmental benefits.

Funding Notes: Under the Inflation Reduction Act, over $1 billion was made available through this program nationwide. This program is annually funded and received expanded funding by the IRA through FY 2026.

Rural Development Energy Programs (REAP)

Administered by USDA Rural Development
Scale: Grants and loans; funding amounts vary by program; Range: $50K - $2M

USDA's energy programs promote energy efficiency and renewable energy deployment in rural areas. Key programs include the Rural Energy for America Program (REAP), which offers grants and loan guarantees to agricultural producers and rural small businesses, and other initiatives supporting community-scale clean energy development, grid improvements, and energy audits.

Funding Notes: This program is expected to have long-term continuity with expanded funding through BIL and IRA through FY2027.

Forest Service Urban and Community Forestry Grants

Administered by USDA Forest Service
Scale: Competitive grant program; Range: $85K - $200K

The Urban and Community Forestry Grants fund innovative, high-impact projects that improve urban forestry management and advance environmental justice. Grants support research, workforce development, regional tree canopy assessments, and community engagement in forest planning. Projects must demonstrate replicability and address climate adaptation, public health, or equity goals.

Funding Notes: Projects in Rhode Island may be eligible if aligned with statewide urban forestry goals or local climate action plans. This program is IRA-supported through 2026.

Rural Development Water Programs

Administered by USDA Rural Development
Scale: Loans, grants, and technical assistance; Range: $30K - $1M

USDA Rural Development offers multiple programs to support drinking water, wastewater, and stormwater infrastructure in rural areas. These programs include the Water & Waste Disposal Loan and Grant Program, Emergency Community Water Assistance Grants, and Technical Assistance and Training Grants, all of which aim to improve public health and environmental outcomes in underserved communities.

Funding Notes: This program is a long-standing program and supported by annual appropriations.

Relevant Hazards



Relevant Categories



Asset Types

- Community Health and Resilience
- Electric Grids
- Wastewater
- Forests
- Drinking Water
- Water Resources

Who Can Access Funds

- State and local governments
- Rural municipalities
- Tribal governments
- Water districts and nonprofit utilities
- Community-based organizations
- Cooperatives and nonprofit organizations
- Regional planning commissions

Funding Source
US Department of Agriculture (USDA)

Description

The US Department of Agriculture (USDA) is a vital funding source for advancing state and local climate resilience, particularly in rural and natural resource-dependent communities. Key programs such as the Rural Energy for America Program (REAP) and Urban and Community Forestry Grants help states reduce environmental vulnerabilities, promote nature-based solutions, and strengthen community capacity to adapt to climate impacts. USDA's funding is often targeted toward underserved or economically disadvantaged areas, making it a cornerstone for equitable and sustainable resilience planning.

Programs

Community Facilities Direct Loan and Grant Program

Administered by USDA Rural Development
Scale: Federal direct loans, grants, or a combination; Grant Range: $40K - $50K

The Community Facilities Direct Loan & Grant Program provides affordable financing for the development and improvement of essential community infrastructure in rural areas. Eligible projects include construction or upgrades to public safety buildings, healthcare centers, municipal buildings, schools, and community facilities that support climate resilience, public health, and economic development. The program can fund energy efficiency upgrades, emergency preparedness facilities, and other projects that enhance long-term resilience.

Funding Notes: Funding decisions are based on community income and population size. This program is a permanent USDA program with funding updated annually through USDA budget.

Natural Resources Conservation Service (NRCS) Incentives

Administered by USDA Natural Resources Conservation Service
Scale: Federal cost-share and technical assistance; Range: $20K – $1M

NRCS offers a suite of voluntary conservation incentive programs that provide financial and technical assistance to agricultural producers and landowners to implement sustainable land and water management practices. These programs support climate resilience by improving soil health, reducing runoff, restoring wetlands, and enhancing drought and flood tolerance. Key programs include the Environmental Quality Incentives Program (EQIP) and the Conservation Stewardship Program (CSP), both of which reward adoption of conservation practices that deliver environmental benefits.

Funding Notes: This program is authorized and reauthorized through the US Farm Bill, which is due for renewal in 2024/2025. Additional funding through the IRA through FY2026.

Emergency Watershed Protection (EWP) Program

Administered by USDA Natural Resources Conservation Service
Scale: Federal cost-share and technical assistance; Range: $20K – $1M

The EWP Program provides technical and financial assistance to communities to help them recover from sudden watershed impairments caused by natural disasters such as floods, hurricanes, wildfires, and windstorms. EWP does not require a disaster declaration by federal or state government officials for program assistance. The NRCS can declare a local watershed emergency and initiate EWP program assistance.

Funding Notes: This program is funded through congressional appropriations. Federal funds typically cover up to 75% of project costs, while local sponsor (municipality, conservation district, etc.) covers the remainder.

Relevant Hazards



Relevant Categories



Asset Types

- Community Health and Resilience

Who Can Access Funds

- State and local governments
- Tribal governments
- Nonprofit organizations
- Special-purpose districts
- Rural communities
- Landowners

Funding Source
US Department of Defense (DOD)

Description

The Department of Defense houses several funding streams that can be used to complement Rhode Island's climate resilience initiatives in areas near military installations. Key programs and offices offer available funding for resiliency including the Readiness and Environmental Protection Integration (REPI) Program and the Office of Local Defense Community Cooperation (OLDCC). These programs can be leveraged by Rhode Island to co-fund projects that both protect military readiness and advance statewide resilience priorities.

Programs

Readiness and Environmental Protection Integration (REPI)

Administered by the Office of the Secretary of Defense
Scale: Federal-funded competitive grant; federal and non-federal cost share Range: $1M–$15M

The REPI Program funds projects that buffer military installations from encroachment while advancing conservation and resilience. REPI supports land protection, habitat restoration, and nature-based solutions that reduce flooding, storm surge, and other climate risks. Projects are developed in partnership with local stakeholders and must directly support military readiness.

Funding Notes: Funding is congressionally allocated and ongoing. Annual Request for Proposal (RFP) typically released in the spring with awards announced around December.

Office of Local Defense Community Cooperation (OLDCC)

Administered by the Office of the Secretary of Defense
Scale: Competitive federal grants; cost-sharing requirements vary by program

OLDCC provides funding and technical assistance to strengthen the resilience of defense communities and installations. The office oversees multiple programs that may provide assistance, given the location of a particular action item. For example, the Defense Community Infrastructure Program (DCIP) supports off-base infrastructure improvements. Projects must demonstrate direct benefit to defense missions and surrounding communities.

Funding Note: Competitive notice of funding opportunities (NOFOs) are released annually. Funding is congressionally allocated and ongoing

Installation Readiness Program

Administered by the DoD's Office of Local Defense Community Cooperation (OLDCC)
Scale: Federally funded grant program, with 10% cost non-federal cost share requirement;
Range: $50K – $500K

The Installation Readiness Program helps communities and military installations identify vulnerabilities to climate hazards and develop coordinated strategies to address them. These initiatives typically assess flooding, coastal storms, and energy security risks while aligning installation resilience needs with local and state climate priorities. Outcomes guide future resilience investments and strengthen long-term defense-community partnerships.

Funding Notes: Funding is congressionally allocated and ongoing.

Relevant Hazards



Relevant Categories



Asset Types

- Costal Wetlands
- Water Resources
- Roads, Bridges, and Culverts

Who Can Access Funds

- State and local governments
- Municipal governments
- Regional planning agencies

Funding Source
US Department of Transportation (DOT)

Description

The Department of Transportation administers several funding streams that can support Rhode Island's climate resilience and infrastructure priorities. Key programs and offices offer available funding for resiliency including the Federal Highway Administration, Marine Administration, and local MPOs. These programs can be leveraged by Rhode Island communities to advance initiatives such as green infrastructure, flood-resilient roadways, and sustainable transportation systems that both improve connectivity and strengthen resilience to future hazards.

Programs

Promoting Resilience Operations for Transformative, Efficient, and Cost-Saving Transportation (PROTECT)
Administered by USDOT, Federal Highway Administration (FHWA)
Scale: Formula and competitive grants; federal cost share; Range: $500K - $876M

The PROTECT Grant Program supports the planning and implementation of climate-resilient transportation infrastructure. Funding can be used for resilience improvements to highways, bridges, transit systems, ports, and evacuation routes.

Funding Notes: This program was created under the IIJA and funded through FY2026. Reauthorization is necessary past FY2026.

Port Infrastructure Development Program (PIPD)
Administered by USDOT; Maritime Administration (MARAD)
Scale: Formula and competitive grants; federal cost share; Range: $1M - $112M

The PIDP provides funding to improve the safety, efficiency, and climate resilience of ports and their related infrastructure. Eligible projects include pier and wharf upgrades, freight and intermodal connections, environmental remediation, and infrastructure adaptations for sea level rise and extreme weather. The program prioritizes projects that improve port resilience while supporting economic competitiveness and emissions reduction.

Funding Notes: This program is funded through FY2026 per IIJA. Required legislation renewal beyond that.

Transportation Alternatives Set-Asides
Administered by the Federal Highway Administration (FHWA) through State DOTs and MPOs
Scale: Federally funded grant program, National; Range: $250K – $2M

The Transportation Alternatives Set-Aside funds community-based transportation projects that expand travel choices and improve quality of life. Eligible projects include pedestrian and bicycle facilities, safe routes to school, trails, and projects that improve environmental sustainability and community resilience.

Funding Notes: Funding is congressionally allocated. Competitive at the state and regional level. Federal share is generally 80%, with a required 20% local match.

Relevant Hazards



Relevant Categories



Asset Types

- All Critical Infrastructure
- Ports
- Roads, Bridges, and Culverts
- Public Transportation

Who Can Access Funds

- State and local governments
- Municipal governments
- Regional planning agencies

Funding Source
US Department of Transportation (DOT)

Description

The Department of Transportation administers several funding streams that can support Rhode Island's climate resilience and infrastructure priorities. Key programs and offices offer available funding for resiliency including the Federal Highway Administration, Marine Administration, and local MPOs. These programs can be leveraged by Rhode Island communities to advance initiatives such as green infrastructure, flood-resilient roadways, and sustainable transportation systems that both improve connectivity and strengthen resilience to future hazards.

Programs

Congestion Mitigation and Air Quality Improvement Program (CMAQ)

Administered by the Federal Highway Administration (FHWA) in partnership with State DOTs and MPOs
Scale: National; Range: $500K – $5M

The CMAQ program funds transportation projects and programs that reduce congestion and improve air quality, especially in areas that do not meet National Ambient Air Quality Standards. Eligible projects include traffic flow improvements, alternative fuel vehicles, active transportation, and transit enhancements.

Funding Notes: Funds apportioned to states by formula. Federal share is generally 80%, with 20% local match required.

Wildlife Crossings Pilot Program (WCPP)

Administered by the Federal Highway Administration (FHWA)
Scale: Competitive grants; federal cost share up to 100% for certain safety projects; Range: $300K-$24M

The WCPP funds projects that reduce wildlife-vehicle collisions (WVCs) and improve habitat connectivity for terrestrial and aquatic species. Eligible projects include construction (e.g., overpasses, underpasses, engineering, ROW acquisition) and non-construction activities (e.g., planning, research, education, hotspot analyses). Eligible applicants include state DOTs, MPOs, local governments, tribal governments, and federal land agencies.

Funding Notes: $350 million authorized under IIJA/BIL; funding available through FY2026

Relevant Hazards



Relevant Categories



Asset Types

- Roads, Bridges, and Culverts
- Public Transportation
- Forests
- Community Health and Resilience

Who Can Access Funds

- State and local governments
- State agencies
- Municipal governments
- Regional planning agencies
- Tribal governments

Funding Source
United State Army Corps of Engineers (USACE)

Description

The US Army Corps of Engineers (USACE) plays a critical role in supporting state and local climate resilience through planning, technical assistance, and targeted infrastructure funding. USACE offers cost-shared support for flood risk reduction, coastal protection, and ecosystem restoration projects that strengthen community resilience to sea level rise, erosion, storm surge, and inland flooding. USACE also provides engineering expertise, feasibility studies, and benefit-cost analyses to help states prioritize and implement resilient infrastructure solutions.

Programs

Continuing Authorities Program

Administered by the United State Army Corps of Engineers (USACE), New England District
Scale: Federally authorized and cost-shared; Typically, 65% federal / 35% non-federal. Range: $1M-$10M per project

The USACE Continuing Authorities Program (CAP) provides a streamlined way for USACE to plan, design, and construct small-scale projects without the need for separate Congressional authorization. CAP supports a wide range of local resilience, navigation, and ecosystem restoration priorities that directly benefit communities and natural systems in Rhode Island. Projects must include a non-federal sponsor and are subject to federal feasibility and environmental review.

Funding Notes: The process to obtain these funds requires substantial state involvement and is time-sensitive. This may not be advantageous for most projects.

Key Sections:

- **Section 14 – Emergency Streambank and Shoreline Protection:** Protects public facilities (roads, bridges, utilities) threatened by erosion.
- **Section 103 – Hurricane and Storm Damage Reduction (Beach Erosion):** Reduces coastal storm damage through beach nourishment and related measures.
- **Section 107 – Navigation Improvements:** Improves navigation channels, anchorages, and harbors.
- **Section 111 – Mitigation of Shore Damage Attributable to Navigation Works:** Addresses shoreline erosion caused by federal navigation projects.
- **Section 204 – Beneficial Use of Dredged Material:** Reuses dredged material for ecosystem restoration, beach nourishment, or other beneficial purposes.
- **Section 205 – Flood Damage Reduction:** Reduces flood risks through levees, channels, or floodwalls.
- **Section 206 – Aquatic Ecosystem Restoration:** Restores degraded aquatic ecosystems, including wetlands, rivers, and riparian zones.

Funding Notes: Each section has its own federal funding limit (generally $5M–$10M per project). Projects require a non-federal sponsor (state, tribe, or municipality) to cost-share (typically 35% non-federal). Applications are accepted year-round through the New England District office.

Relevant Hazards



Relevant Categories



Asset Types

- Beaches and Barriers
- Roads, Bridges, and Culverts
- Water Resources

Who Can Access Funds

- State and local governments
- Tribal governments
- Public agencies (non-federal sponsors)

Funding Source
Other Federal Sources

Description

Below are four federal funding sources for resilience. The HUD Community Development Block Grant (CDBG), HUD PRO Housing Grant Program, the HUD Section 108 Loan Guarantee Program, and DOE State Energy Program (SEP) are key federal funding sources that support state climate resilience efforts across sectors. Together, these programs offer vital resources for integrating resilience into community development, energy systems, and transportation networks.

Programs

US Department of Housing and Urban Development (HUD) – Community Development Block Grant (CDBG)
Administered by HUD; State and Local Governments
Scale: Formula-based federal grants; Range: $10K - $500K

The CDBG Program provides flexible funding to support community development and infrastructure projects that benefit low- and moderate-income populations. While traditionally used for housing rehabilitation, public facilities, and economic development, CDBG funds can also support resiliency initiatives such as stormwater infrastructure, floodplain restoration, and community planning to reduce vulnerability to climate-related hazards. States and municipalities have broad discretion to integrate resilience into CDBG-funded priorities.

Funding Notes: This program is a core HUD program that is funded annually through the federal budget.

US Department of Housing and Urban Development (HUD) – PRO Housing Grant Program
Administered by HUD
Scale: Competitive federal grant program; (i.e., Inflation Reduction Act); Range: $1M - $7M

The PRO Housing Grant Program (Pathways to Removing Obstacles to Housing) provides funding to help local, state, and tribal governments identify and remove barriers to affordable housing production and preservation.

Funding Notes: This program was created under IRA and funded via FY 2022 appropriations. Currently, no reoccurring funding.

US Department of Housing and Urban Development (HUD) – Section 108 Loan Guarantee Program
Administered by HUD
Scale: National, Loan guarantee program for CDBG recipients; Range: $1M - $50M+

The Section 108 Loan Guarantee Program allows local governments to access federally guaranteed loans for large-scale community development projects. Funds can be used for infrastructure, housing rehabilitation, economic development, and resilience investments that benefit low- and moderate-income communities.

Funding Notes: Loans are guaranteed by HUD but repaid with future Community Development Block Grant (CDBG) funds. Flexible terms allow projects to leverage significant private investment.

US Department of Energy (DOE) – State Energy Program (SEP)
Administered by DOE; State energy offices
Scale: Formula and competitive grants; requires cost share; Range: $10K - $100K

The State Energy Program (SEP) provides funding and technical assistance to state energy offices to advance clean energy, energy security, and climate resilience. States use SEP funds to improve energy efficiency in public facilities, develop energy assurance plans, and support resilient infrastructure investments. SEP also supports workforce training and innovation aligned with state energy and climate goals.

Funding Notes: SEP is authorized through FY2026.

Relevant Hazards



Relevant Categories



Asset Types

- Community Health and Resilience
- Fuel Supply
- All Critical Infrastructure
- Roads, Bridges, and Culverts
- Evacuation Routes and Emergency Shelters
- Public Transportation
- Building Design and Construction
- Electric Grids

Who Can Access Funds

- State and local governments
- Entitlement Communities
- Nonprofit organizations
- Planning organizations

Funding Source
Other Federal Sources

Description

Below are four federal programs that support climate resilience. The US Fish and Wildlife Service (USFWS) grants, the CDC's Climate-Ready States and Cities Initiative (CRSCI), the Historic Preservation Fund (HPF), and Five Star and Urban Waters Restoration grant program provide targeted resources that help states and communities reduce vulnerabilities, protect critical assets, and strengthen long-term adaptive capacity.

Programs

US Fish and Wildlife Service Grants

Administered by US Fish and Wildlife Service (USFWS)
Scale: Competitive and formula-based grants; federal and non-federal cost share varies by program; Range: $20K - $5M

USFWS offers a suite of grant programs that support habitat restoration, coastal resilience, species protection, and ecosystem conservation. Programs such as the National Coastal Wetlands Conservation Grant, Partners for Fish and Wildlife, Habitat Conservation Planning Assistance and the State Wildlife Grant Program help state agencies, nonprofits, and landowners implement nature-based projects that enhance biodiversity and buffer communities against climate impacts.

Funding Notes: This program operates under continuous congressional appropriations.

Climate-Ready States and Cities Initiative (CRSCI)

Administered by the Centers for Disease Control and Prevention (CDC); National Center for Environmental Health
Scale: Competitive federal funding; multi-year cooperative agreements by state

The CRSCI helps state and local health departments prepare for and respond to the public health impacts of climate change. Funding supports the implementation of CDC's BRACE framework (Building Resilience Against Climate Effects). CRSCI projects focus on heat illness, vector-borne disease, extreme weather, and community vulnerability—ensuring that climate resilience is integrated into public health planning and infrastructure.

Funding Notes: This program is expected to continue.

Historic Preservation Fund (HPF)

Administered by National Park Service (NPS), in partnership with Rhode Island Historical Preservation & Heritage Commission, and Tribal Historic Preservation Offices
Scale: Formula and competitive matching grants; Range: $2K - $200K

The HPF provides matching grants to preserve historically significant sites and support cultural resource management. In Rhode Island, HPF funds could be leveraged to integrate climate resilience into preservation efforts, such as elevating or floodproofing historic waterfront structures and incorporating hazard mitigation into preservation planning.

Funding Notes: Annual funding is provided from Outer Continental Shelf oil and gas lease revenues, and congressional appropriations.

Five Star and Urban Waters Restoration Grant Program

Administered by National Fish and Wildlife Foundation (nonprofit), in partnership with EPA, USFS, NOAA, and others.
Scale: National, Competitive grants; Range: $20K - $50K

The Five Star and Urban Waters Restoration Grant Program supports community-based projects that restore and protect water quality, habitat, and ecological function in urban and rural watersheds. Projects emphasize partnerships, environmental education, and measurable ecological and community outcomes.

Funding Notes: Annual competitive program. Requires match at least equal to federal request, achieved through cash, in-kind, or volunteer time.

Relevant Hazards



Relevant Categories



Asset Types

- Community Health and Resilience
- Ports
- Water Resources
- Beaches & Barriers
- Coastal Wetlands
- Building Design and Construction

Who Can Access Funds

- State coastal management agencies
- State and local governments
- Academic institutions
- Regional planning agencies
- Nonprofit organizations
- Tribal governments

State Funding Mechanisms

Funding Source
Rhode Island Infrastructure Bank

Description

The Rhode Island Infrastructure Bank manages a suite of funding programs that support municipal resilience, energy efficiency, stormwater management, and climate adaptation. RIIB provides low-cost loans, grants, and technical assistance to municipalities, quasi-public agencies, businesses, and nonprofit partners to support projects that improve water and wastewater systems, transportation infrastructure, stormwater management, energy efficiency, renewable energy, and climate resilience. By leveraging public and private capital, RIIB helps communities modernize critical infrastructure, reduce long-term costs, and advance statewide environmental and resilience goals.

Programs

Resilient Rhody Infrastructure Fund (RRIF)

Administered by Rhode Island Infrastructure Bank (RIIB) in coordination with EC4 agencies
Scale: State revolving loan fund; Range: financing terms vary by project type

The Resilient Rhody Infrastructure Fund (RRIF) is a dedicated state revolving fund established to provide low-cost financing for infrastructure projects that reduce Rhode Island's vulnerability to climate impacts. The fund supports investments aligned with the state's *Resilient Rhody* climate resilience strategy, including upgrades that address flooding, stormwater management, coastal hazards, and other climate-driven risks to public infrastructure and community assets.

Funding Notes: RRIF was capitalized through state appropriations dedicated to implementing *Resilient Rhody*. As a revolving fund, its long-term viability depends on continued loan repayment and periodic state deposits.

Clean Water State Revolving Fund (CWSRF)

Co-Administered by Rhode Island Infrastructure Bank (RIIB) and Rhode Island Dept. of Environmental Management
Scale: Federal funds, Congressionally allocated; 20% state match; Range: $500K - $5M

The Clean Water State Revolving Fund (CWSRF) is a federal–state partnership program that provides low-interest loans and other financial assistance for water quality protection and infrastructure improvements. The CWSRF is one of the nation's primary tools for financing wastewater treatment plants, stormwater management systems, nonpoint source pollution control, water reuse, and green infrastructure projects. Funding can also support estuary restoration, septic system replacements, and energy or water efficiency upgrades at water facilities.

Funding Notes: Delivered over $75 million in low-cost financing in 2024 alone, supporting critical wastewater and stormwater infrastructure upgrades, advancing climate resilience, and improving water quality.

Drinking Water State Revolving Fund (DWSRF)

Co-Administered by RIIB and Rhode Island Dept. of Health (RIDOH)
Scale: Federal funds, Congressionally allocated; 20% state match; Range: $1M - $5M

The Drinking Water State Revolving Fund (DWSRF) is a federal–state partnership that provides low- or no-interest loans to public water systems to finance projects that improve drinking water infrastructure and protect public health. Eligible applicants include community water systems—both publicly and privately owned—as well as nonprofit non-community water systems such as schools and churches.

Funding Notes: In FY 2024, seven new loans totaling $73.2 million were provided for low-interest financing of critical infrastructure improvements.

Relevant Hazards



Relevant Categories



Asset Types

- Beaches & Barriers
- Coastal Wetlands
- Drinking Water
- Stormwater
- Wastewater
- Water Resources
- All Critical Infrastructure
- Roads, Bridges, and Culverts
- Building Design & Construction

Who Can Access Funds

- State and local governments
- State agencies
- Regional and conservation organizations
- Tribal governments
- School districts

Funding Source
Rhode Island Infrastructure Bank

Description

The Rhode Island Infrastructure Bank manages a suite of funding programs that support municipal resilience, energy efficiency, stormwater management, and climate adaptation. RIIB provides low-cost loans, grants, and technical assistance to municipalities, quasi-public agencies, businesses, and nonprofit partners to support projects that improve water and wastewater systems, transportation infrastructure, stormwater management, energy efficiency, renewable energy, and climate resilience. By leveraging public and private capital, RIIB helps communities modernize critical infrastructure, reduce long-term costs, and advance statewide environmental and resilience goals.

Programs

DWSRF Set-Asides

Administered and determined by RIIB
Scale: Federal funds, State allocated into set-aside categories; Range: $100K - $1.5M

The DWSRF has four main set-asides, including Administration and Technical Assistance, Small System Technical Assistance, State Program Management, Local Assistance, and Other State Programs.

Funding Notes: These set-asides allow states to build system capacity, enhance long-term sustainability, and address public health needs in a more proactive and preventive way. They are especially valuable for supporting underserved and small community water systems that may lack the resources or expertise to maintain safe drinking water.

Municipal Resilience Program (MRP)

Administered by RIIB in partnership with The Nature Conservancy
Scale: State grant program; Range: $100K - $750K

The Municipal Resilience Program (MRP) helps Rhode Island cities and towns identify, prioritize, and implement climate resilience projects. Through a structured community workshop process, municipalities develop Resilience Plans that guide future investments. Upon completion of the planning phase, municipalities become eligible for state grant funding to implement priority adaptation and risk-reduction projects.

Funding Notes: This program is ongoing and funded by state bond funds, the CRF, and RIIB capital. Long-term program that depends on state appropriations, dedicated bonds, and federal match.

Efficient Buildings Fund (EBF)

Administered by RIIB, in coordination with the Office of Energy Resources (OER)
Scale: State-funded, low-interest loan program; revenue from bond issuance and utility bill savings; Range: $1M - $13M

The Efficient Buildings Fund (EBF) provides financing to municipalities and public schools for energy efficiency and renewable energy upgrades in public buildings. Eligible projects include HVAC upgrades, lighting retrofits, solar installations, energy storage, and resilience measures that reduce utility costs and improve building performance.

Funding Notes: This program is funded through tax-exempt infrastructure bonds. It is a permanent financing program.

Relevant Hazards



Relevant Categories



Asset Types

- Beaches & Barriers
- Coastal Wetlands
- Drinking Water
- Water Resources
- All Critical Infrastructure
- Roads, Bridges, and Culverts
- Building Design & Construction
- Electric Grids

Who Can Access Funds

- State and local governments
- State agencies
- Regional and conservation organizations
- Tribal governments
- School districts

Funding Source
Rhode Island Infrastructure Bank

Description

The Rhode Island Infrastructure Bank manages a suite of funding programs that support municipal resilience, energy efficiency, stormwater management, and climate adaptation. RIIB provides low-cost loans, grants, and technical assistance to municipalities, quasi-public agencies, businesses, and nonprofit partners to support projects that improve water and wastewater systems, transportation infrastructure, stormwater management, energy efficiency, renewable energy, and climate resilience. By leveraging public and private capital, RIIB helps communities modernize critical infrastructure, reduce long-term costs, and advance statewide environmental and resilience goals.

Programs

Municipal Infrastructure Grant Program (MIGP)

Administered by Rhode Island Infrastructure Bank (RIIB)
Scale: Grants; Range: $300K - $500K

The MIGP provides grants to municipalities for critical infrastructure projects that support long-term community and environmental resilience, economic development, and public health and safety. The program complements RIIB's loan programs by helping communities with limited borrowing capacity access capital for infrastructure improvements.

Funding Notes: These grants can fill gaps for small-scale, or early-phase resilience infrastructure needs, and can be combined with RIIB loan programs or federal funding for multi-layered project finance. This program is subject to annual or periodic state budget appropriations.

Municipal Road & Bridge Revolving Loan Fund (MRBRF)

Administered by Rhode Island Infrastructure Bank (RIIB), in partnership with RI Department of Transportation (RIDOT)
Scale: Low-interest loans; Range: $2.5M - $20M

The MRBRF provides low-interest loans to Rhode Island cities and towns for the design, construction, reconstruction, and improvement of local roads and bridges, including projects that enhance transportation resilience and public safety.

Funding Notes: This program is financed through RIIB-issued bonds with a revolving structure that replenishes funds as loans are repaid. It is legislatively authorized and available annually.

Commercial Property Assessed Clean Energy (C-PACE)

Administered by Rhode Island Infrastructure Bank (RIIB)
Scale: Fee-based charge to fund quality projects; Range: $200K - $1M+

C-PACE enables commercial, non-profit, and industrial property owners to finance clean energy, water conservation, and efficiency upgrades. Loan repayment is attached to the property tax bill over terms up to 25 years. Open capital platform with statewide administration.

Funding Notes: C-PACE finances private-sector energy and water conservation upgrades to commercial properties. This program is financed via private capital secured through property tax assessments and is subject to market participation and regulatory support.

Stormwater Project Accelerator (SPA)

Administered by Rhode Island Infrastructure Bank (RIIB)
Scale: State technical assistance and financing support; Range: $50K - $150K

The Stormwater Project Accelerator (SPA) helps municipalities advance stormwater retrofit and green infrastructure projects from concept to implementation. The program provides targeted technical assistance to identify high-impact stormwater improvements, develop conceptual designs, estimate costs, and prepare projects for financing through RIIB's Clean Water State Revolving Fund (CWSRF) or other funding sources. By supplying early-phase planning and engineering support, SPA reduces barriers that often prevent communities from pursuing complex stormwater upgrades.

Funding Notes: SPA is not a grant program; it is supported through RIIB resources to provide technical assistance and project development services.

Relevant Hazards



Relevant Categories



Asset Types

- Public Transportation
- All Critical Infrastructure
- Roads, Bridges, and Culverts
- Stormwater
- Water Resources
- Building Design & Construction
- Electric Grids
- Financing Climate Resilience Projects

Who Can Access Funds

- State and local governments
- State agencies
- Regional and conservation organizations
- Tribal governments
- School districts

Funding Source
Rhode Island Department of Environmental Management (RIDEM)

Description

The Rhode Island Department of Environmental Management (RIDEM) administers a variety of funding programs that support water quality improvement, habitat restoration, climate resilience, and natural resource protection across the state. These programs provide grants, technical assistance, and capital funding for stormwater management, wastewater infrastructure, open space preservation, watershed restoration, and coastal and inland resilience projects. RIDEM's investments help municipalities, state agencies, land trusts, and conservation partners safeguard ecosystems, reduce pollution, and enhance community resilience to climate impacts.

Programs

Rhode Island Climate Resilience Fund (CRF)

Administered by RI Department of Environmental Management (RIDEM)
Scale: State-funded; Range: up to $350K

The Climate Resilience Fund (CRF) provides direct state funding to support on-the-ground projects that reduce vulnerability to climate change and build long-term community resilience. Eligible projects include flood mitigation, stormwater management, shoreline protection, and green infrastructure. The CRF prioritizes projects that address high-risk areas, protect critical infrastructure, and deliver co-benefits such as public health or environmental improvement.

Funding Notes: In its first round, the CRF awarded $4.5 million in grants to 20 projects focused on flood prevention, nature-based solutions, and climate adaptation in vulnerable areas. This program is ongoing but dependent on state budget allocations.

Regional Greenhouse Gas Initiative (RGGI) – Rhode Island

Administered by OER and RIDEM
Scale: Funded through quarterly CO2 allowance auctions; Range: $10K - $25K

RGGI generates revenue through cap-and-trade auctions on power sector emissions, which Rhode Island reinvests in energy efficiency measures and renewable energy projects and provide direct rate relief to low-income customers. RGGI funds support several state programs to help spur solar PV, heat pump, and energy efficiency adoption with an emphasis on reducing greenhouse gas emissions and increasing system reliability. The allowable use of auction proceeds in Rhode Island is governed by RI gen. laws §23-82-6.

Funding Notes: This program is a multi-state cap-and-invest program with a long-term regulatory foundation. The stable annual funding is tied to carbon auction revenues.

Ocean State Climate Adaptation and Resilience (OSCAR) Fund

Administered by RIDEM and Rhode Island Coastal Resource Management Council (CRMC)
Scale: State-established; funded by fees from coastal development permits; Range: $100K - $275K

The OSCAR Fund supports climate adaptation and resilience projects in Rhode Island's coastal communities. Funded by fees collected through coastal permitting, OSCAR is designed to finance small- to mid-scale projects that address sea level rise, erosion, and other coastal hazards. The fund complements federal and state resilience efforts and provides local governments with flexible, implementation-ready support.

Funding Notes: OSCAR funding is typically used for local shoreline restoration, nature-based adaptation strategies, and resilience planning aligned with CRMC's coastal policies and the state's Beach SAMP. This program is funded through state appropriations and/or environmental bond measures and is subject to renewal.

State Land Conservation Program

Administered by RIDEM and EC4 agencies
Scale: Bond funded and leveraged with other sources; Range: $1M-10M+

Guided by the DEM Land Acquisition Committee, the State Land Conservation Fund identifies, assesses, and acquires lands of State-wide interest and significance. Preserved lands are available to the public for uses including boating, fishing, swimming, hiking, hunting, biking and nature observation.

Funding Notes: The program is funded by State voter approved bond funds leveraged with grants from various Federal programs, and non-profit or local organizations.

Relevant Hazards



Relevant Categories



Asset Types

- Beaches & Barriers
- Coastal Wetlands
- All Critical Infrastructure
- Forests
- Roads, Bridges, and Culverts
- Stormwater
- Water Resources
- Public Transportation
- Building Design & Construction

Who Can Access Funds

- State and local governments
- State agencies
- Regional and conservation organizations
- Tribal governments
- School districts

Funding Source
Rhode Island Department of Environmental Management (RIDEM)

Description

The Rhode Island Department of Environmental Management (RIDEM) administers a variety of funding programs that support water quality improvement, habitat restoration, climate resilience, and natural resource protection across the state. These programs provide grants, technical assistance, and capital funding for stormwater management, wastewater infrastructure, open space preservation, watershed restoration, and coastal and inland resilience projects. RIDEM's investments help municipalities, state agencies, land trusts, and conservation partners safeguard ecosystems, reduce pollution, and enhance community resilience to climate impacts.

Programs

Local Open Spaces Grants

Administered by RI Department of Environmental Management (RIDEM)
Scale: State funded grant program; Range: up to $400K

This grant program provides up to 50% matching funds to municipalities, land trusts and non-profit conservation land organizations to preserve valuable open space throughout the state. A maximum of 50% of the approved appraised value, up to a per-project cap of $400,000, has been awarded. Awardees are also eligible for reimbursement of up to 50% of appraisal, title, and survey costs associated with the project.

Funding Notes: Program is capitalized through periodic voter-approved Open Space and Green Economy Bonds. Funding availability depends on bond authorizations, and rounds are offered when bond capacity exists. All awards require a 50% local match.

Bay and Watershed Restoration Fund

Administered by RIDEM
Scale: State bonds; Range: $10K - $25K

The Bay and Watershed Restoration Fund supports projects that improve water quality, restore habitats, and reduce pollution across the Narragansett Bay watershed. The program funds practical, on-the-ground solutions such as stormwater retrofits, nonpoint source pollution controls, and ecological restoration efforts that advance state water quality and watershed management goals.

Funding Notes: Capitalized through state appropriations and periodic environmental bonds. Funding availability varies by budget cycle and is released when resources are allocated.

Wastewater Treatment Facility Resilience Fund (WWTFRF)

Administered by RIDEM and Rhode Island Infrastructure Bank (RIIB)
Scale: Matching grants, 50% match required; Range: $250K - $625K

The Wastewater Treatment Facility Resilience Fund supports upgrades that strengthen the resilience of Rhode Island's wastewater treatment facilities to flooding, sea level rise, extreme storms, and climate-related operational risks. The program helps facilities assess vulnerabilities, incorporate climate projections into capital planning, and invest in infrastructure improvements that ensure continuity of service and protection of water quality during hazard events.

Funding Notes: Funded through state appropriations dedicated to climate resilience planning and implementation. Often paired with Clean Water SRF financing for construction. Availability depends on annual budget allocations and RIIB program capacity.

Relevant Hazards



Relevant Categories



Asset Types

- Beaches & Barriers
- Coastal Wetlands
- All Critical Infrastructure
- Forests
- Water Resources
- Wastewater

Who Can Access Funds

- State and local governments
- State agencies
- Regional and conservation organizations
- Tribal governments
- Nonprofit conservation organizations
- Land Trusts

Funding Source
Rhode Island Office of Energy Resources (OER)

Description

The Rhode Island Office of Energy Resources (OER) administers a range of funding and technical assistance programs that support clean energy deployment, grid modernization, and community energy resilience. These programs provide grants, planning support, and targeted incentives for renewable energy, storage, microgrids, and critical facility resilience upgrades. OER's initiatives help municipalities, state agencies, businesses, and nonprofits advance energy projects that reduce emissions, strengthen grid reliability, and prepare critical services for climate-related disruptions.

Programs

Clean Energy Programs & Power System Transformation Coordination

Administered by RI Office of Energy Resources (OER)
Scale: State-led program; funding from SEP, RGGI, and utility system benefit charges; Range: $50K - $500K

OER leads and coordinates Rhode Island's efforts to accelerate clean energy deployment and modernize the power system to meet emissions and resilience goals. Programs include support for solar, offshore wind, energy storage, microgrids, and energy efficiency upgrades in public and critical facilities. OER also oversees Power Sector Transformation planning, aligning grid modernization with climate mitigation and resilience priorities.

Funding Notes: This program is funded through a mix of state energy efficiency charges, regional transmission system coordination, and federal DOE funding.

Energy Resilience and Emergency Planning

Administered RI Office of Energy Resources (OER)
Scale: State technical assistance and planning support; Range: funding varies by initiative

The Energy Resilience & Emergency Planning program supports state agencies, municipalities, and critical facility operators in assessing energy vulnerabilities and improving resilience to grid disruptions. OER provides planning tools, technical assistance, and targeted funding to evaluate backup power needs, integrate clean and resilient energy solutions (such as solar-plus-storage), and strengthen continuity-of-operations planning for emergency events. The program helps communities identify priority facilities, conduct feasibility analyses, and align projects with federal funding opportunities.

Funding Notes: Supported through periodic state allocations and federal pass-through funds (such as DOE resilience initiatives). Funding availability and eligible activities vary by program cycle, with many projects leveraging FEMA, DOE, or utility incentives for implementation.

Renewable Energy Fund (REF) & Resilient Microgrids for Critical Services Program

Administered by OER and RI Department of Commerce
Scale: State grant program; Range: amounts vary by project type and funding round

RI Commerce's Renewable Energy Fund provides programs and grants to support renewable energy projects across the state. Leveraging multiple funding sources and RGGI, the fund offers programs to individuals, businesses, municipalities and organizations for solar, wind, battery storage, and other eligible technologies. Additionally, the Resilient Microgrids for Critical Services Program, a joint program between the Office of Energy Resources and the Renewable Energy Fund, offers grant support for microgrid construction through Phase 2 of the program. Phase 1 is currently on hold, with Phase 2 pending Phase 1 completion.

Funding Notes: REF is capitalized through multiple funding sources, including but not limited to the system benefit charge, alternative compliance payments and RGGI.

Relevant Hazards



Relevant Categories



Asset Types

- Electric Grids
- All Critical Infrastructure
- Financing Climate Resilience Projects
- Roads, Bridges, and Culverts
- Building Design & Construction

Who Can Access Funds

- Municipalities
- State agencies
- Regional and conservation organizations
- Tribal governments

Funding Source
Other Rhode Island-Based Funding Sources

Description

Rhode Island offers several state funding programs that advance resilient infrastructure and community preparedness. Green Economy and Clean Water Bonds support environmental restoration and water infrastructure upgrades; the Site Readiness Program funds planning and improvements that prepare sites for resilient development; and RIDOT's Capital Improvement Program invests in transportation projects that address stormwater, coastal risks, and long-term infrastructure resilience.

Programs

RI Green Economy and Clean Water Bonds

Administered by the State of Rhode Island
Scale: State Bonds ; Range: project allocations vary by bond issue

Rhode Island's Green Economy and Clean Water Bonds provide capital funding for environmental, resilience, recreation, and clean water infrastructure projects across the state. Authorized by voters through periodic statewide bond referenda, these bonds finance programs such as open space protection, stormwater and flood mitigation, wastewater and drinking water system upgrades, park and trail improvements, and coastal and habitat restoration. Bond allocations are distributed to implementing agencies, including RIDEM, CRMC, RIIB, and others, to support eligible projects identified in each bond question.

Funding Notes: Bond funding is subject to voter approval and legislative authorization. Amounts and eligible uses vary with each bond cycle, and programs supported by these bonds (e.g., Open Space Grants, WWTFRF, recreation grants) are only available when new bond proceeds are appropriated.

Site Readiness Grant Program

Administered by RI Department of Commerce
Scale: State grant program; Range: up to $125K

The Site Readiness Program offers funding to public or private entities for site-specific technical assistance, planning, and/or improvements. Activities including property surveys, master planning, engineering surveys, environmental studies, infrastructure improvements, land assembly activities, site clearing or demolition, and building improvements are supported. Assistance with writing zoning ordinances, updating comprehensive plans, strategic planning support, development coordination, and/or marketing support is also supported.

Funding Notes: Program availability and award levels depend on annual state budget appropriations. Funds may support both planning and physical improvements but are not continuously available each year.

RI Department of Transportation Capital Improvement Program (CIP)

Administered by RI Department of Transportation
Scale: State and federal transportation capital funding; Range: $50K - $500K

The RIDOT Capital Improvement Program (CIP) directs state and federal transportation funds toward major infrastructure projects across Rhode Island, including roads, bridges, transit facilities, active transportation networks, stormwater systems, and coastal transportation assets. The CIP identifies priority projects for investment, integrates federal formula and discretionary funding (e.g., FHWA, FTA), and outlines a multi-year schedule for project delivery. Increasingly, the CIP incorporates climate resilience and flood mitigation upgrades into transportation infrastructure design.

Funding Notes: Funded through a combination of federal transportation allocations, state match, and bond proceeds. Funding levels and project eligibility are determined through the State Transportation Improvement Program (STIP) process, and project timing is tied to the multi-year CIP planning cycle.

Relevant Hazards



Relevant Categories



Asset Types

- Electric Grids
- All Critical Infrastructure
- Financing Climate Resilience Projects
- Roads, Bridges, and Culverts
- Coastal Wetlands
- Stormwater
- Wastewater
- Drinking Water
- Water Resources
- Public Transportation

Who Can Access Funds

- Municipalities
- State agencies
- Regional and conservation organizations
- Tribal governments

Non-Traditional Funding Mechanisms

Non-Traditional Funding Sources
Land Value Capture Strategies

Description

Below are land value capture strategies that are increasingly being considered as innovative tools to finance infrastructure and resilience investments. These strategies aim to recover some or all of the increase in land value that results from public investment or regulatory changes, such as flood protection, green infrastructure, or transit-oriented development, and redirect that value toward funding further resilience or climate adaptation actions.

Sources

Tax Increment Financing (TIF)

Initiated: Legislative action needed by municipalities around defined project area
Scale: ~20-25-year term; special district designation; District – Municipal

Tax increment financing captures the increase in property tax revenue from higher property values after resilience improvements and uses it to fund those improvements. TIF can work for resilience projects because these investments often create measurable increases in property values, providing a sustainable revenue source to repay bonds or fund ongoing maintenance.

Call to Action: Identify potential TIF districts in climate-vulnerable or redevelopment areas and assess revenue potential; coordinate with municipal planning and finance departments to amend enabling legislation for TIF policies to include resilience projects.

Special Assessment Districts

Initiated: Legislative action needed by local government
Scale: Locally established; targeted to properties directly benefiting

Special assessment districts are locally created financing mechanisms in which property owners pay assessments based on the specific benefits they receive from resilience improvements. These districts are particularly well-suited for climate resilience and disaster preparedness projects because these improvements often provide concentrated benefits to specific geographic areas.

Call to Action: Engage stakeholders in high-risk areas and review legal authority to establish special districts for resilience investments.

Developer Impact Fees / Resilience Exactions

Initiated: Developer in the development review and permitting process
Scale: Neighborhood - Municipality

Developer impact fees are one-time charges imposed on new development to help fund public infrastructure or services needed to accommodate growth. Resilience exactions are a variation focused on climate adaptation needs—such as elevated roads, green infrastructure, energy microgrids, or coastal protections. These tools ensure that private development contributes fairly to the cost of mitigating the environmental and social risks it may amplify.

Call to Action: Review enabling statutes and draft a model ordinance linking development fees to local climate resilience

Transfer of Development Rights (TDR)

Initiated: Local or regional land use policy
Scale: Parcel - Neighborhood – Municipal – Regional (Urban-Rural Interface)

TDR is a market-based tool that allows landowners in hazard-prone or conservation-priority areas to sell the rights to develop their land to developers in designated receiving areas. This shifts development away from areas at high risk of climate impacts (e.g., flooding, erosion) and helps fund land preservation, managed retreat, or resilience infrastructure. The financial value captured through development rights sales can support conservation easements or relocation.

Call to Action: Map out sending and receiving areas with support from regional planning agencies. Convene a working group of local planners, developers, and legal experts to design a TDR framework that incorporates flood-prone or conservation-priority parcels and evaluate necessary zoning changes.

Relevant Hazards



Relevant Categories



Asset Types

- Building Design & Construction
- Community Health and Resilience

Who Can Access Funds

- Designated project areas
- State and local governments
- Tribal governments
- Public agencies (non-federal sponsors)

Non-Traditional Funding Sources
Bonds

Description

Below are non-traditional funding sources for resiliency. Non-traditional funding sources are emerging to support climate resilience, infrastructure adaptation, and risk mitigation. These tools often leverage market-based mechanisms, public-private partnerships, or innovative financing models that go beyond conventional capital or grant funding.

Sources

Catastrophe / Resilience Bonds

Initiated: Public Issuer structures insurance-linked securities
Scale: Municipal-Regional-Statewide; large capital market tool

Catastrophe and resilience bonds are insurance-linked securities that provide upfront capital for resilience projects in exchange for transferring disaster risk to capital markets. These innovative financial instruments allow governments to access large amounts of capital for proactive risk reduction while simultaneously securing insurance coverage for disaster recovery.

Call to Action: Initiate an asset-specific risk assessment of Rhode Island's most vulnerable public infrastructure assets and quantify potential avoided losses from climate shocks (e.g., storms, flooding). Coordinate with the State Treasury, Division of Insurance, and Emergency Management Agency to explore legal authority and investor appetite for catastrophe bond issuance. If needed, propose enabling legislation that authorizes resilience bonds as a new financing instrument, with clear performance triggers and payout conditions.

Blue Bonds

Initiated: Government or qualified issuer structures bonds dedicated to 'blue economy' projects
Scale: Regional-Statewide

Blue bonds are debt instruments specifically designed to finance ocean and coastal conservation projects, including coastal resilience and marine ecosystem protection. Blue bonds are particularly valuable for coastal communities because they can fund projects that provide both environmental benefits and resilience value.

Call to Action: Identify priority coastal and marine ecosystem restoration or conservation projects that generate measurable environmental benefits and long-term cost savings. Collaborate with a public finance advisor to structure a bond tied to blue infrastructure outcomes. Pursue technical assistance from NOAA or environmental finance institutions to model returns and verify environmental impact metrics.

Environmental Impact Bonds

Initiated: A public entity sets measurable outcomes and contracts with private investors who fund the project upfront; payments depend on verified performance.
Scale: Flexible; can finance a single pilot project in one watershed or be scaled up to multi-city infrastructure programs

This pay-for-success model aligns investor returns with actual environmental performance, creating incentives for effective project design and implementation. The approach transfers performance risk from government to private investors while ensuring public funds are only spent on successful outcomes. This financing tool allows municipalities to implement resilience projects without upfront capital costs while ensuring that payments are tied to actual performance rather than just project completion.

Call to Action: Select a climate resilience project with clear performance and gather baseline data. Engage social impact investors, foundations, or municipal finance partners to co-design a pay-for-success bond framework. Coordinate with the Department of Administration and Office of Management and Budget to outline repayment terms tied to performance thresholds and determine if legislation is needed to enable outcome-based contracting.

Relevant Hazards



Relevant Categories



Who Can Access Funds

- Designated project areas
- State and local governments
- Tribal governments
- Public agencies (non-federal sponsors)
- Multilateral Development Banks
- Public-Private partnerships
- Utility authorities

Non-Traditional Funding Sources
Other Sources

Description

Below are non-traditional funding sources for resiliency. Non-traditional funding sources are emerging to support climate resilience, infrastructure adaptation, and risk mitigation. These tools often leverage market-based mechanisms, public-private partnerships, or innovative financing models that go beyond conventional capital or grant funding.

Sources

Dedicated Utility Fees

Initiated: Municipality; property-based fees
Scale: Municipal-Regional

Property-based fees are generated from ongoing service fees tied directly to infrastructure systems such as water, sewer, stormwater, energy, etc.. Utility fees are dedicated charges levied on property owners to fund management and resilience projects. Funds are earmarked for reinvestment into the utility system and upgrades.

Call to Action: Work with utility commissions and municipal councils to assess legal authority and public appetite for establishing a climate resilience fee on water, stormwater, or sewer bills.

Parametric Insurance

Initiated: Jurisdictions buy policy with predefined hazard triggers
Scale: Determined by geographic footprint covered by hazard trigger

Parametric insurance provides payouts based on predefined parameters such as wind speed, storm surge height, or rainfall levels rather than actual damage assessment. This approach enables faster payouts for recovery and resilience activities since payments are triggered automatically when specified conditions are met.

Call to Action: Collaborate with state insurance regulators and brokers to identify eligible hazards (e.g., rainfall, surge) and model a pilot parametric policy for a critical public asset or utility.

Insurance Premium Discounts

Initiated: Communities or property owners implement resilience measures; Insurers or FEMA's CRS provide reduced premiums
Scale: Parcel-Neighborhood-Municipal

Insurance premium discounts provide reduced insurance costs for properties or communities that invest in resilience measures, creating financial incentives for proactive risk reduction. This market-based approach leverages the insurance industry's risk assessment capabilities. An example of this is the FORTIFIED home and roof program, developed by the Insurance Institute for Business & Home Safety (IBHS), that sets construction and re-roofing standards designed to better withstand high winds, heavy rain, and hurricanes. Some insurance carriers provide premium discounts for homeowners who obtain a FORTIFIED Roof designation.

Call to Action: Coordinate with insurers and building code officials to define qualifying resilience measures and launch a pilot program offering premium reductions for verified upgrades.

Relevant Hazards



Relevant Categories



Who Can Access Funds

- State and local governments
- Tribal governments
- Regional or special-purpose districts
- Utility authorities
- Regional planning authorities
- Private sector partners
- Property owners

Non-Traditional Funding Sources
Other Sources

Description

Below are non-traditional funding sources for resiliency. Non-traditional funding sources are emerging to support climate resilience, infrastructure adaptation, and risk mitigation. These tools often leverage market-based mechanisms, public-private partnerships, or innovative financing models that go beyond conventional capital or grant funding.

Sources

Community-Based Public-Private Partnership (CBP3)

Initiated: Government or qualified issuer structures bonds
Scale: Regional-Statewide

Community-Based Public-Private Partnerships represent a collaborative financing model that brings together government entities, private sector organizations, and local communities to address shared resilience challenges. This approach differs from traditional public-private partnerships by structuring risk-sharing agreements in which community stakeholders are active partners rather than just beneficiaries. These are risk-sharing arrangements between public and private partners, with repayment mechanisms such as user fees or government payments.

Call to Action: Identify a portfolio of green infrastructure or stormwater projects and engage legal and financial advisors to evaluate the feasibility of bundling them under a long-term CBP3 model.

The Climate Smart Communities Initiative (CSCI)

Administered by a public-private consortium (Climate Resilience Fund, EcoAdapt, NRDC, etc.) in collaboration with NOAA and philanthropic partners
Scale: National, competitive grants for 12-month projects; Range: $50K - $130K

The Climate Smart Communities Initiative provides competitive grants and technical support to community-government partnerships aiming to design, advance, or pilot climate resilience plans and projects. Eligible uses include risk & vulnerability assessments, project prioritization, community engagement, adaptation planning, and implementation of smaller scale resilience actions.

Call to Action: Rhode Island municipalities, community-based organizations, and adaptation professionals can position themselves for CSCI funding by forming eligible teams and identifying resilience priorities that align with program goals. Potential applicants should assess local vulnerabilities, engage community partners early, and prepare to leverage CSCI resources for capacity building, planning, and small-scale implementation projects.

Philanthropic Funding for Climate Resilience

Initiated: Foundations, corporate philanthropy, or community-based funders provide grants and technical assistance
Scale: Local to statewide, with opportunities for regional collaboration

Philanthropic funding represents a flexible, non-traditional financing pathway that can supplement government programs and accelerate climate resilience efforts. Unlike traditional federal or state grants, philanthropic dollars can be deployed more quickly. These funds often help underserved or smaller communities build capacity, demonstrate innovative solutions, and leverage additional public investment. Notable examples include the Bezos Earth Fund, the Kresge Foundation, Bloomberg Philanthropies, and regional partners such as the Rhode Island Foundation and the Barr Foundation (Boston), both of which have supported climate, environment, and community resilience initiatives in New England.

Call to Action: Identify philanthropic foundations and regional funder collaboratives that align with Rhode Island's resilience priorities, and develop proposals that highlight equity, innovation, and scalability to attract private grantmaking support.

Relevant Hazards



Relevant Categories



Who Can Access Funds

- State and local governments
- Tribal governments
- Regional or special-purpose districts
- Utility authorities
- Regional planning authorities
- Private sector partners
- Property owners

Chapter 8
Prioritization Framework

Asset Prioritization Framework

This framework is designed to systematically evaluate diverse asset types and identify those that should be prioritized for intervention.
Stakeholders can start by assessing vulnerable assets using this Asset Prioritization Framework, which is applicable across sectors and helps identify assets for which resilience projects that could deliver the greatest benefits.

Criteria			Working Definition	Low	Medium	High
Need: How vital an asset is to the safety, stability, and functioning of interconnected systems or sectors.	N1	**Life Safety**	The extent to which damage to the asset would result in health and wellness impacts.	L: Impacts to the asset would not compromise life safety or cause health and wellness consequences.	M: Impacts to the asset would indirectly compromise life safety or cause health and wellness consequences.	H: Impacts to the asset would directly compromise life safety or cause health and wellness consequences.
	N2	**Urgency**	The extent to which the asset is already experiencing climate impacts.	L: The asset is not currently experiencing climate-related service disruptions, and models project exposure only in late-century scenarios beyond current design thresholds.	M: The asset shows early or intermittent impacts today, with moderate disruptions projected by 2035–2050 under at least one emissions scenario.	H: The asset is already experiencing major, recurring disruptions, with severe and chronic impacts projected by 2035 or sooner under both scenarios.
	N3	**Criticality**	The extent to which other systems or sectors depend on the asset. A highly critical asset may cause cascading failures across multiple systems if disrupted.	L: Dependencies are limited or non-critical. The asset supports localized or non-essential functions, and its failure would cause inconvenience without compromising safety or essential operations.	M: The asset provides important community or regional functions, and its failure would create significant but manageable disruptions across multiple users or sectors.	H: Disruption would trigger widespread, cascading impacts across multiple systems and communities, extending well beyond the immediate area.
	N4	**Redundancy**	The extent to which the asset creates additional capacity or alternative service delivery during a climate event.	L: The asset has strong redundancy, with multiple reliable alternatives capable of maintaining service under both present and future high-emission scenarios.	M: The asset has limited redundancy, with alternatives available but constrained in capacity or exposed to similar hazards.	H: The asset has no redundancy, and failure would result in total loss of service with no viable alternatives.
	N5	**Number of People Impacted**	The number of people, including residents and workers, which the asset serves or protects.	L: The asset serves or protects a minimally populated area, less than 100 people per square mile, with a low number of residents and workers.	M: The asset serves or protects a moderately populated area, between 100 to 1,000 people per square mile, with a moderate number of residents and workers.	H: The asset serves or protects a densely populated area, more than 1,000 people per square mile, with a large number of residents and workers.
Equity and Community Support: Whether an asset serves or protects vulnerable populations, aligns with community priorities, promotes environmental justice, and protects economic opportunities.	E1	**Supports Vulnerable Populations**	The extent to which the asset serves communities with high Social Vulnerability Indices.	L: The asset serves a community with Social Vulnerability Indices below 0.50.	M: The asset serves a community with Social Vulnerability Indices from 0.50 to 0.75.	H: The asset serves a community with Social Vulnerability Indices above 0.75.
	E2	**Community Supported**	The extent to which the asset is important to the local community.	L: Asset has not been identified in community or municipal stakeholder engagement.	M: Asset has been identified in community or municipal stakeholder engagement.	H: Asset has been discussed on multiple occasions in community or municipal stakeholder engagement.
	E3	**Advances Environmental Justice**	The extent to which the asset serves and/or reduces environmental burdens on historically underserved communities.	L: The asset does not serve or protect a historically underserved community.	M: The asset indirectly serves a historically underserved community.	H: The asset is located in an Environmental Justice area or directly serves a historically underserved community.
	E4	**Protects Economic Resources**	The extent to which an asset protects economic resources.	L: The asset has minimal or no impact on protecting economic resources.	M: The asset moderately protects economic resources, indirectly supporting economic growth and job creation.	H: The asset significantly protects economic resources, acting has a hub of economic growth, development, and job creation.
Strategic Alignment: How well an asset aligns with broader municipal, regional, or resilience planning goals, including comprehensive and hazard mitigation planning efforts.	S1	**Alignment with Local/Municipal Goals**	The extent to which the asset aligns with local and municipal goals.	L: The asset does not contribute to local and municipal goals.	M: The asset indirectly supports local and municipal goals.	H: The asset directly supports local and municipal goals.
	S2	**Identified in Multiple Planning Initiatives**	The extent to which the asset is listed as a priority asset in planning initiatives, such as Hazard Mitigation Plans.	L: The asset is not listed as a priority asset in planning initiatives.	M: The asset is listed as a priority asset in a singular planning initiative.	H: The asset is listed as a priority asset in multiple planning initiatives.
Holistic Resilience: Whether an asset contributes to long-term environmental, cultural, and social well-being beyond its primary function.	H1	**Advances or Protects Biodiversity**	The extent to which the asset enhances and protects biodiversity.	L: The asset does not impact, or have the ability to impact, biodiversity.	M: The asset minimally enhances or protects biodiversity, or minimally has the opportunity to enhance or protect biodiversity.	H: The asset meaningfully advances and/or protects biodiversity.
	H2	**Provides Ecosystems Services or Co-Benefits**	The extent to which the asset improves the ecosystems more broadly, such as improving air and water quality.	L: The asset does not impact ecosystems.	M: The asset minimally improves, or minimally has the opportunity to improve ecosystems.	H: The asset meaningfully improves ecosystems and provides co-benefits, such as improving air and water quality.
	H3	**Supports Sustainability Goals or Initiatives**	The extent to which the asset reduces greenhouse house gas (GHG) emissions, sequesters carbon, or can support decarbonization efforts.	L: The asset increases greenhouse gas (GHG) emissions.	M: The asset has no impact on greenhouse gas (GHG) emissions.	H: The asset reduces greenhouse gas (GHG) emissions.
	H4	**Carries Cultural or Historical Value**	The extent to which the site is an active cultural or historical site.	L: The asset is not identified as a cultural or historical site.	M: The asset is identified as a cultural or historical site.	H: The asset is identified as a cultural or historical site and/or provides tangible or intangible meaning where impacts result in irreversible cultural loss.

Project Prioritization Framework

This framework is designed to systematically evaluate projects after they have been identified. Stakeholders can use the Project Prioritization Framework to assess and rank these projects based on feasibility, impact, and alignment with statewide resilience goals. The process helps determine which concepts should advance first, resulting in a prioritized list of projects that can guide investment decisions and inform the next phase of implementation.

Criteria			Working Definition	Low	Medium	High
Cost Factors: Captures the overall financial commitment required to implement and sustain the project.	C1	**Initial Capital Costs**	The magnitude of upfront financial resources required to initiate the project, including design, permitting, and construction start-up expenses.	L: Initial capital costs are substantial and represent a significant portion of available funding or require complex multi-source financing.	M: Initial capital costs are moderate and may require some external funding or reallocation of local resources.	H: Initial capital costs are minimal relative to total program budgets and can be absorbed without external financing or external financing for initial costs has already been obtained.
	C2	**Ongoing Costs**	The degree of recurring financial commitment required to operate, maintain, and monitor the project after completion.	L: Ongoing costs are high and may require dedicated long-term funding sources or new operational capacity.	M: Ongoing costs require moderate annual allocations or shared maintenance responsibilities among partners.	H: Ongoing costs are minimal and can be integrated into existing budgets without additional staffing or operational strain.
	C3	**Cost of Doing Nothing**	The financial, social, and operational risks associated with inaction—specifically, the cost of damages, service disruption, and lost productivity or wellbeing if the project is not implemented.	L: Minimal or no measurable losses are expected if the project is deferred; impacts can be easily mitigated or addressed later.	M: Deferral of the project would lead to moderate disruptions, costs or degradation in service quality, requiring additional expenditures in the near term.	H: Inaction would result in significant financial, social, or infrastructure losses, escalating repair or replacement costs, or permanent loss of functionality.
	C4	**Potential Economy of Scale**	Potential cost efficiencies, resource sharing, or performance improvements that can be realized by implementing multiple related projects together or at a larger scale.	L: Project is stand-alone with limited opportunities for cost savings or integration with other efforts.	M: Project could achieve moderate efficiencies if coordinated with one or more related projects or programs.	H: Project offers substantial cost savings or performance improvements through being implemented jointly with other projects, leveraging shared resources or infrastructure.
Impact: Reflects the extent to which the project benefits people and businesses in the broader community.	I1	**Impacted Populations**	The extent to which the project benefits or affects individuals within the community, measured by reach, safety, or accessibility.	L: Benefits a small number of residents or primarily already well-served populations.	M: Benefits a moderate number of residents, including some underserved areas or populations.	H: Benefits a large number of residents, with clear, measurable benefits for vulnerable or historically underserved populations.
	I2	**Economic Resilience and Business Impact**	The degree to which the project influences economic activity through improved infrastructure, access, or resilience.	L: Project does not meaningfully support or improve local or regional economic stability or continuity.	M: The project provides measurable improvements to operations, access, or infrastructure that enhance the economic resilience of local or regional economies.	H: The project generates widespread, measurable benefits for local and regional economies by significantly improving infrastructure, access, and resilience. Multiple regions experience enhanced operational reliability, reduced vulnerability to disruptions, and strengthened market competitiveness as a result of the project.
	I3	**Number of Assets and Services Impacted**	The extent to which the project benefits or affects other assets essential to Rhode Island's resilience.	L: Supports, protects, and/or improves a limited number of assets.	M: Supports, protects, and/or improves a moderate number of assets.	H: Supports, protects, and improves multiple assets across several categories.
	I4	**Ecosystem Health and Environmental Resilience**	The degree to which the project protects, restores, or enhances natural ecosystems and their capacity to provide essential services — such as water filtration, flood mitigation, habitat support, and carbon sequestration.	L: The project does not meaningfully protect or improve local ecosystems, or may have neutral ecological effects.	M: The project includes measurable environmental co-benefits, such as moderate habitat restoration, water quality improvements, or reduced resource consumption.	H: The project delivers substantial, lasting ecological benefits, such as large-scale habitat restoration, improved water or air quality, enhanced carbon storage, or the creation of self-sustaining natural systems that increase ecosystem resilience to climate and human pressures.
Lifespan: Indicates how long the investment will deliver value and remain functional without major reinvestment or degradation in performance.	S1	**Longevity of Investment**	The degree to which the project delivers long-term, durable benefits that reduce the need for future interventions.	L: Provides short-term or temporary benefit; requires frequent maintenance or replacement. (<10 years).	M: Provides medium-term benefit with moderate maintenance needs; may require future upgrades (10–30 years).	H: Offers long-lasting, self-sustaining benefits that permanently reduce risks or enhance resilience, with minimal need for reinvestment (30+ years).
Implementation and Maintenance Feasibility: Measures the ease of successful implementation based on funding availability, organizational capacity, and project complexity.	F1	**Funding Source**	The availability, reliability, and eligibility of funding sources to support project implementation and maintenance.	L: The project does not align with existing funding sources, and there is no clear fit for potential funding mechanisms.	M: Some potential funding sources identified but contingent on future approvals or may need to be partially funded by various funding sources.	H: Secured or committed funding in place; clear and strong eligibility across one or more funding sources and match commitments established.
	F2	**Leading Entity**	The degree to which a specific organization or agency is identified and prepared to manage project implementation and maintenance.	L: No clear lead entity or responsible organization identified.	M: Potential lead identified but with limited capacity or competing priorities.	H: Clearly defined lead entity with authority, capacity, and commitment to manage implementation as well as strong partnerships and resources supporting lead entity.
	F3	**Complexity**	The level of technical, regulatory, and logistical difficulty associated with implementing the project.	L: Highly complex with significant interagency coordination, technical challenges, or permitting hurdles that could delay execution.	M: Moderate complexity requiring multiple partners or regulatory reviews but manageable within standard timelines.	H: Straightforward implementation with minimal permitting, coordination, or technical risk.
	F4	**Adaptability**	The project's capacity to accommodate changing conditions, technologies, or future expansion.	L: Design is rigid and difficult to modify once implemented.	M: Moderate adaptability with some opportunities for adjustment or incremental upgrades.	H: Highly adaptable design that supports future scaling, technological integration, or climate resilience.

Chapter 9
Resilience Best Practices

Purpose of This Document

The purpose of this document is to present a curated compilation of resilience best practices intended to inform and facilitate the implementation of *Resilient Rhody 2025*. Although these practices were developed to support the objectives of this Plan, they are designed to serve as a comprehensive reference for Rhode Island stakeholders and other entities engaged in adaptation and resilience planning.

This document constitutes a point-in-time assessment of approaches and emerging models from across the United States and internationally. These examples are illustrative and are not intentioned to represent a comprehensive list. It is provided as a resource for guidance and inspiration, enabling users to evaluate and adapt these practices within their respective local contexts, priorities, and available resources prior to implementation.

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1. Data Tools to Support Local Adaptation Capacity
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6. Nature-Based Cooling Strategies in Heat-Vulnerable Communities
7. Coastal Resilience Through Local Ordinances and Adaptation Design
8. Embedding Climate Justice in Adaptation Planning
9. Regional Resilience Collaboratives & Capacity Models Across State and Local Government
10. State Managed Retreat Programs and Funding
11. Statewide Resilience Standards and Metrics for Climate-Informed Governance
12. Resilience Ordinances and State Support for Forest Management and Drought Response

Best Practice #1
Data Tools To Support Local Adaptation Capacity

Description

Interactive, university or state-supported platforms that go beyond static websites by providing centralized, decision-ready access to localized climate data, dynamic mapping, future projections, and actionable planning tools. These tools are designed to help municipalities update zoning, prioritize investments, and secure funding by translating climate science into locally relevant decisions; complementing, but distinct from, informational pans like *Resilient Rhody*.

Precedents

University of Washington Climate Impacts Group (CIG) Data Hub
Location: Washington, USA
Scale: Regional

Interactive digital platform offering downscaled climate projections, mapping, and planning tools that help municipalities incorporate climate science into land use, infrastructure, and hazard mitigation decisions.

Outcome: Used by 20+ municipalities and tribal nations to integrate climate projections into comprehensive plans, energy infrastructure, and hazard mitigation strategies. Helped secure $16.7M in FEMA BRIC and FMA grants by aligning local projects with science-based risk data.

Takeaway for RI: Link climate data with state planning and decision-making tools.

University of Michigan Great Lakes Integrated Sciences + Assessments (GLISA)
Location: Michigan, USA
Scale: Regional

Regional decision support tool providing localized climate data, visuals, and strategies to help plan for climate impacts via informed zoning, stormwater, and climate action policies.

Outcome: GLISA informed resilience planning in 20+ Great Lakes cities, including Toledo's stormwater management tool and Detroit's climate action plan. Contributed to successful applications for over $10 million in adaptation and planning grants.

Takeaway for RI: Ensure municipalities can apply projections to local planning and zoning processes.

Massachusetts Acts of 2018, Chapter 209:
Location: Massachusetts, USA
Scale: State

Requires state agencies and municipalities to use future climate projections in planning and infrastructure decisions. It authorized $2.4 billion in funding for resilience, nature-based solutions, and data-driven tools.

Outcome: The law supported the launch of the Climate Resilience Design Standards Tool and expanded the Municipal Vulnerability Preparedness (MVP) Program. It formalized the use of scientific data hubs in statewide planning.

Takeaway for RI: Consider legislation that unifies climate data, design standards, and funding.

University of Oregon Climate Change in Oregon (CCO) Data Portal:
Location: Oregon, USA
Scale: State

Statewide digital resource, backed by state funding, that combines climate projections, sea level rise maps, and scenario tools to support local governments in updating resilience ordinances, zoning codes, and infrastructure plans.

Outcome: CCO supported updates to zoning and floodplain ordinances in coastal cities like Coos Bay and Lincoln City.

Takeaway for RI: Consider a climate data portal with zoning and ordinance integration.

Relevant Hazards



Relevant Actions

Action #14.11: Develops a university collaborative to provide tools and expertise.

Action #14.12: Standardizes data for uniform design and progress tracking.

Action #14.13: Maintains dedicated GIS analyst positions to integrate state climate resilience data.

Action #18.07: Develops public tools that boost flood risk awareness and close insurance gaps.

Action #19.02: Updates the state climate change website to serve as a climate resilience data hub.

Ideas for RI

- Modify existing *Resilient Rhody* website to serve as the central hub for state climate resilience data and decision support tools.
- Expand and integrate requirements for the use of STORMTOOLS and Beach SAMP, as well as other projections vetted by RI and relevant to design, into municipal zoning, permitting, and grant guidance.

Best Practice #2
Innovative Insurance Tools to Improve Flood Recovery and Reduce Risk

Description

Innovative flood insurance strategies, such as parametric insurance (which pays out based on triggers like rainfall or flood depth) and CRS incentives (which reduce premiums for communities that exceed federal flood standards), can complement existing programs to lower financial risk, improve affordability, and support faster recovery for vulnerable communities.

Precedents

Hazard Parametric Insurance

Location: Freemont, California, USA; Utah, USA
Scale: Local

Hazard, or flood-specific, parametric insurance models automatically trigger an insurance payout when a predefined hazard threshold is met (e.g., water level), unlike traditional insurance that requires damage assessments and claims processing time. Many policies, such as Fremont's, allow funds to be used adaptively for different events to supplement uninsured residents' losses or cover debris clean-up.

Outcome: Although Freemont has not yet met the qualifying trigger for parametric flood insurance payouts, the parametric insurance model has been used successfully to address earthquake damages. In 2020, the State of Utah, who has also implemented a parametric insurance model for earthquake risk, received a payout within 30 days covering expenses before traditional insurance payout deductibles were met.

Takeaway for RI: Parametric insurance can deliver rapid payouts and initiate recovery when traditional assistance lags.

Caribbean Catastrophe Risk Insurance Facility

Location: Various
Scale: International

Provides parametric coverage to Caribbean and Central American countries. Payouts, usually within 14 days after major events, support disaster response and reduce aid dependence.

Outcome: Since its inception in 2007, the CCRIF has made 78 payouts for hurricanes and climate-related events, totaling approximately $390 million.

Takeaway for RI: Regional parametric risk pools incentivize shared resilience investment and offer immediate disaster funding without reliance on federal aid.

NYC NFIP Affordability Demonstration

Location: New York City, New York, USA
Scale: Local

Federal pilot testing strategy to make flood insurance more affordable for low- and moderate-income homes under NFIP. Explored premium subsidies and tools to address insurance gaps.

Outcome: The pilot identified barriers to enrollment—including cost and awareness—and developed affordability models to inform national NFIP reforms. It helped NYC align flood risk data with social vulnerability to improve insurance equity.

Takeaway for RI: Flood insurance subsidy pilots improve access for vulnerable households and build more equitable climate resilience.

Relevant Hazards



Relevant Actions

Action #19.05: Tracks climate change impacts on Rhode Island insurance markets and develops strategies for rising costs, data sharing and modelling, and updating building codes.

Action #18.07: Develops public tools that boost flood risk awareness and close insurance gaps.

Ideas for RI

- Launch an NFIP affordability pilot with RIEMA, informed by retrospective analysis of recent flood events and NYC's demonstration program.
- Explore a regional parametric insurance model to supplement federal disaster recovery.
- Create a Flood Insurance Navigator Program to expand access and education in frontline communities.

Best Practice #3
Community Science & Workforce Training for Nature-Based Resilience

Description

Training residents and youth in nature-based resilience through community science and workforce development builds local capacity for climate adaptation. These programs empower communities to monitor wetlands, manage stormwater, and steward green infrastructure while integrating traditional and Indigenous knowledge. Combining hands-on education with career pathways advances equity and improves adaptive management.

Precedents

North Carolina Coastal Federation (NCCF)

Location: North Carolina, USA
Scale: Regional

Offers living classroom trainings to communities, schools, and property owners to teach low-impact development and provide technical guidance on installation and monitoring methods for resilient solutions to stormwater and coastal flooding.

Outcome: The NCCF trained over 400 individuals, including students and displaced workers, in wetland restoration and living shoreline installation, restoring 8,000+ feet of habitat. Rain gardens built by students diverted over 100,000 gallons of stormwater.

Takeaway for RI: Paying local residents to monitor wetlands on public lands or conservation easements builds community skills while maintaining nature-based infrastructure.

Pantanal Wetland Citizen Science

Location: Pantanal, Brazil
Scale: Regional

Citizen science program trained local fishers and residents to monitor wetland biodiversity and hydrology, integrating Indigenous and local knowledge into data collection.

Outcome: Community-led data collection dispelled overfishing myths, improved Indigenous rights and resulted in a 5,000 km² community-managed reserve. Outreach to schools and community centers boosted science literacy and strengthened local environmental governance.

Takeaway for RI: Involving Indigenous and local participants in wetland monitoring enhances ecological stewardship and community-driven conservation.

Illinois Energy Transition Assistance Act

Location: Illinois, USA
Scale: State

The 2021 bill was established to support clean job workforce training programs, pre-apprenticeships, and community grants for marginalized populations. Created clean energy incubator program for small businesses.

Outcome: Allocated over $180M per year to workforce development, including $21M+ for contractor training and $6M for EJ outreach. Established 13 workforce hubs, increasing solar jobs by 50% and expanding access to green infrastructure careers for EJ communities.

Takeaway for RI: State-backed workforce programs that fund training in climate technologies can support both equity and local green-economy growth.

Adopt-A-Wetland Program

Location: Georgia, USA
Scale: State

State-supported program that trains residents and youth to monitor wetland health through workshops, certification, and standardized data collection on water quality and ecology.

Outcome: Hundreds of certified volunteers contribute monitoring data statewide, supporting public engagement, school partnerships, and long-term wetland tracking. The program has expanded to include curriculum partnerships with schools and community groups statewide.

Takeaway for RI: Volunteer training and certification builds public ownership sentiment and generates actionable data for adaptive management of wetland resilience

Relevant Hazards



Relevant Actions

Action #18.09: Provides technical assistance and funding guidance and develops Community Assessments through partnerships with Health Equity Zones.

Action #18.10: Supports climate resilience workforce development.

Action #2.03: Establishes a workforce development program for wastewater infrastructure.

Ideas for RI

- Partner with local tribal groups, organizations (e.g., CCRI, Groundwork RI, WRWC, RIGIC), and schools to train youth in green infrastructure installation and monitoring.
- Secure legislative funding (modeled on IL's ETAA) to scale up workforce pipelines.
- Fund paid community monitoring pilots tied to green infrastructure maintenance and data collection.
- Building off of MyCoast, launch a community-led wetland monitoring program to train volunteers to track water quality and conditions in restored and at-risk wetlands.

Best Practice #4
Formal and Nonformal Educational Learning Opportunities

Description

Expanding climate change education across formal and nonformal learning environments strengthens community resilience and prepares the next generation to respond to evolving environmental challenges. Integrating climate concepts across K–12 subject areas, alongside hands-on and place-based learning, helps students understand the causes and impacts of climate change while building practical problem-solving skills.

Precedents

New Jersey 2020 Student Learning Standards

Location: New Jersey, USA
Scale: State

Requires all school districts to integrate climate change education across K–12 learning standards, equipping students with the knowledge and skills to understand climate impacts and engage in climate solutions.

Outcome: New Jersey was the first state in the United States to offer climate change-specific content in K-12 schools. The state offers plentiful resources for educators and provides hundreds of grants to schools for Climate Awareness Education.

Takeaway for RI: Embedding climate education across all K–12 standards can ensure every student gains foundational climate knowledge and skills.

New England 3CRS Hub Resource Library

Location: Virtual
Scale: Regional

Provides an accessible collection of tools, data portals, and educational materials that helps practitioners, educators, and community members explore coastal climate research and strengthen resilience across the Northeast.

Outcome: Strengthens learning and educational engagement by connecting users with curated climate resources that deepen understanding of coastal hazards and support informed resilience planning.

Takeaway for RI: Centralizing climate resources can improve access to high-quality climate data, information, and learning resources.

ClimeTime Science Teacher Professional Development

Location: Washington, USA
Scale: State

Washington State grant program that supports professional development for teaching climate science that is aligned with the Next Generation Science Standards.

Outcome: Each of Washington's nine Educational Service Districts has received funding, allowing more than 1,800 schools, 177,000 students, and 26,000 educators to access the highest quality climate education standards for science and math subject areas.

Takeaway for RI: Investing in teacher training can equip educators with the tools they need to effectively teach climate science.

Project Narragansett

Location: Rhode Island, USA
Scale: State

Save The Bay offers a year-long professional development program for Rhode Island fourth grade educators designed to expand hands-on, Narragansett Bay-focused curriculum in Rhode Island schools. Teachers learn how to create locally grounded, experiential lesson plans and educational resources aligned with state and national science standards, as well as NAAEE's Excellence In Environmental Education guidelines.

Outcome: To date, the program has served over 200 teachers and 12,000 students throughout the state of Rhode Island, connecting teachers and students with experiential education.

Takeaway for RI: Locally-focused climate resilience curriculum can be expanded across the state of Rhode Island.

Relevant Hazards



Relevant Actions

Action #18.05: Integrates climate and environmental literacy into K–12 and higher education while expanding hands-on, community-based, and informal learning opportunities that cultivate climate-informed, engaged citizens.

Action #18.10: Supports climate resilience workforce development.

Ideas for RI

- Require all school districts (regardless of coastal flood risk level) to embed climate change and environmental literacy across K-12 standards.
- Invest in large-scale climate change education training and professional development for educators.
- Fund hands-on, interactive programming that engages students in planning efforts, environmental monitoring, and climate-related field work.
- Establish paid internship and fellowship pipelines for high school and college students to work with state agencies, resilience projects, and community partners.

Best Practice #5
Community-Led Green Infrastructure Corridors for Enhanced Resilience

Description

Community-led green infrastructure corridors offer a scalable, cost-effective solution for managing stormwater while advancing equity and climate resilience. Strategies like bioswales, rain gardens, and pocket parks reduce flooding, improve water quality, and add green space in underserved neighborhoods. Designed with local communities, these projects build trust, create jobs, and deliver measurable outcomes, including diverting stormwater runoff, reducing impervious surfaces, and protecting homes from flooding.

Precedents

The Mill Creek Project

Location: Philadelphia, Pennsylvania, USA
Scale: Local

Uses rain gardens, tree trenches, and vegetated bioswales to manage stormwater and reduce sewer overflows in underserved areas. Community planning sessions and local hiring addressed environmental justice concerns and ensured the project reflected local priorities.

Outcome: Engaged local schools and residents, involving hundreds of students in resilience education and construction of two community-designed stormwater gardens.

Takeaway for RI: Integrating rain gardens, bioswales, and tree trenches in underserved neighborhoods yields both hydrological benefits and community trust.

Street Edge Alternatives (SEA Streets)

Location: Seattle, Washington, USA
Scale: Local

Redesigns residential streets with vegetated swales, permeable pavement, and native landscaping to mimic natural drainage and reduce runoff. The project blends aesthetics, traffic calming, and environmental function, and has informed citywide design standards.

Outcome: Reduced stormwater runoff volumes by 99% in a ~2-acre pilot area via vegetated swales, bioswales, and narrowed roads. Reduced impervious surfaces by 11% and attenuated 0.75 in of rainfall per event. Residents helped select plantings and supported long-term O&M.

Takeaway for RI: Reconfiguring street designs with permeable surfaces and landscaping turns urban neighborhoods into natural stormwater systems.

Proctor Creek Green Infrastructure

Location: Atlanta, Georgia, USA
Scale: Local

Funded by a $14M Environmental Impact Bond, this initiative built six green infrastructure projects, including bioretention cells and stream restoration, co-designed with residents through equity workshops. It supports flood reduction, public health, and green space goals.

Outcome: Financed green infrastructure projects, protected 500 homes from flooding, and created dozens of sustainable jobs. Community groups guided project siting and helped secure local buy-in.

Takeaway for RI: Community co-design of green infrastructure (GI) projects improves flood control and public health and restores trust in underserved areas.

Boston Water and Sewer Commission Stormwater Charge

Location: Boston, Massachusetts, USA
Scale: Local

Charges properties with more than 400 square feet of impervious surface a stormwater fee which directly funds the operation, maintenance, and upgrading of Boston's stormwater system. Properties that install approved green infrastructure can reduce their fee, incentivizing on-site stormwater management and reducing pressure on the public system.

Outcome: Strengthens and stabilizes funding for stormwater management, reduces localized flooding, and supports water-quality improvements.

Takeaway for RI: Demonstrates how a dedicated stormwater utility fee can create a reliable funding stream for green infrastructure.

Relevant Hazards



Relevant Actions

Action #4.01: Updates stormwater design rules to reflect new precipitation data and standards.

Action #4.02: Expands green infrastructure with co-benefits while streamlining funding and permitting.

Action #4.03: Works with municipalities to create sustainable stormwater funding, share best practices, and develop state-led resources for vulnerability assessments and equipment support.

Action #18.09: Provides technical assistance and develops Community Assessments through partnerships with Health Equity Zones.

Ideas for RI

- Create a Green Infrastructure Corridor Design Guide and precedent catalog to support municipalities in planning and implementing community-led stormwater and greening projects in priority neighborhoods.
- Apply equity co-design methods from Proctor Creek and SEA Streets models.
- Offer GI overlay and maintenance grants to municipalities with performance metrics for stormwater reduction.

Best Practice #6
Nature-Based Cooling Strategies in Heat-Vulnerable Communities

Description

Expanding nature-based cooling strategies in heat-vulnerable EJ communities reduces extreme heat risks through solutions like urban forests, green roofs, shaded rest areas, and resilience hubs. These interventions lower temperatures, improve public health, and deliver co-benefits such as air quality improvements, energy savings, and community engagement.

Precedents

Resilience Hubs

Location: Los Angeles, California, USA
Scale: Local

A former music studio (BHAC) transformed into an ADA-accessible resilience hub offering workforce training, senior and youth programs, and emergency cooling. Integrates shade structures, passive cooling design, and solar-powered backup systems.

Outcome: The BHAC provides year-round programming and serves over 250 residents weekly. Capable of operating independently for up to 7 days during emergencies, offering cooling, clean air, and power in a trusted community space.

Takeaway for RI: Resilience hubs offering passive cooling, backup power, and community services safeguard neighborhoods during heat waves and power outages.

Green Corridors

Location: Medellín, Columbia

Scale: Local

Since 2016, the city has planted 8,000+ trees to create shaded green corridors along 30 major roadways and waterways to address growing concerns of extreme heat and air pollution.

Outcome: Transformed 20 km of roads and waterways into vegetated corridors, lowering average air temperature by 3.5°C and surface temperature by up to 10°C, generated 75 permanent green jobs, and reduced morbidity rate from acute respiratory infections.

Takeaway for RI: Tree corridors in heat-prone neighborhoods reduce urban heat and improve walkability and air quality.

Green Roofs

Location: New York City, New York, USA
Scale: Local

Launched in 2008 and renewed in 2024, the Green Roof Tax Abatement offers property tax breaks to incentivize the incorporation of green roofs to reduce urban heat, improve air quality, enhance energy efficiency, and provide urban habitat. New York City also adopted LL92/94 that require green roofs or PV on many new roofs.

Outcome: NYC now has over 730 green roofs (as of 2022), which reduce rooftop temperatures by up to 30–40°F, and help cut building cooling costs by 20–30%.

Takeaway for RI: Tax breaks and other financial subsidies can incentivize property owners to construct cooling strategies on their property, such as green roofs.

Cool Pavements

Location: Pacoima, California, USA
Scale: Local

Municipal Pilot project that applied high-albedo cool pavement coatings across 700,000 ft² of streets in a heat-vulnerable, low-income neighborhood, aimed at reducing surface and ambient temperatures in underserved communities.

Outcome: Reduced surface temperatures by up to 3.5°F during extreme heat events, demonstrating measurable cooling benefits in a historically underserved neighborhood.

Takeaway for RI: Cool pavements in heat-vulnerable, low-canopy areas offer scalable, low-cost cooling and complement green infrastructure.

Relevant Hazards



Relevant Actions

Action #12.03: Supports urban tree planting and master planning.

Action #18.03: Resilience hubs provide cooling and shelter during heat waves

Action #18.08: Expands the Low-Income Home Energy Assistance Program (LIHEAP) program.

Ideas for RI

- Create model zoning language to require nature-based cooling (e.g., shade trees, green roofs) in high-heat and traditionally redlined areas.
- Refine existing heat maps using public health data and the Universal Thermal Climate Index (UTCI) to prioritize investments in heat-vulnerable neighborhoods.
- Fund nature-based cooling projects in frontline communities using equity and health-informed criteria.
- Launch a fund for the creation of resilience hubs in Rhode Island communities.

Best Practice #7
Coastal Resilience Through Local Ordinances and Adaptation Design

Description

Adopt and implement municipal zoning ordinances and bylaws that integrate current and projected climate risk data—such as sea level rise, precipitation trends, and storm surge zones—into land use and development standards. These regulations should establish protective measures such as coastal setbacks, floodplain restrictions, elevation requirements, and site design guidelines that reduce long-term vulnerability.

Precedents

Coastal Resilience Overlay Zone (CRO) Update

Location: Norfolk, Virginia, USA
Scale: Local

Norfolk's zoning code includes Coastal and Upland Resilience Overlay Zones that require elevated construction, prohibit basements, and encourage flood-resistant design. A Resilience Quotient scoring system incentivizes development practices that reduce flood risk and enhance sustainability.

Outcome: Zoning reform increased the number of building permits in low-risk zones compared to those in high-risk areas – Housing values were not negatively impacted.

Takeaway for RI: Overlay zones with built-in flood and elevation standards ensure consistent, future-ready coastal development across municipalities.

Transfer of Development Rights (TDR)

Location: King County, Washington, USA
Scale: Regional

Allows development rights to be transferred from ecologically sensitive or high-risk lands to urban sites, promoting retreat and conservation via zoning tools and conservation easements.

Outcome: Over 144,000 acres of rural and resource lands were conserved and protected from 2000-2019 through the King County TDR Program. As a result, 2,467 potential dwelling units have been relocated from rural to urban areas, consolidating development in desired locations.

Takeaway for RI: Using TDR programs can protect rural and flood-prone lands while steering development into resilient urban zones.

Cape Cod Commission Model Coastal Resilience Bylaws

Location: Cape Cod, Massachusetts, USA
Scale: Regional

Model bylaws promote elevation and shoreline adaptation by encouraging municipalities to adopt flexible floodplain and wetland performance standards, such as freeboard requirements and buffer zones based on future climate projections rather than historical FEMA maps.

Outcome: Cape Cod towns adopted enhanced wetlands protection or floodplain ordinance bylaws, with design strategies such as increased freeboard requirements or wetland buffers tied to modeled future storm risk instead of historic FEMA 100-year floodplains.

Takeaway for RI: Model bylaws with future-focused flood buffers help towns quickly adopt strong coastal protections.

National Park Service Guidelines on Flood Adaptation for Rehabilitating Historic Buildings

Location: National
Scale: National

Provides guidance for adapting historic buildings to withstand flood risks while maintaining their historic character and meeting federal preservation standards. The guidelines outline acceptable treatments, documentation requirements, and adaptation strategies that balance resilience with preservation.

Outcome: Establishes the nation's first standardized framework for flood-adaptation of historic buildings.

Takeaway for RI: Offers a clear, federally recognized roadmap that Rhode Island can use to help protect state and local historic buildings vulnerable to flooding and sea-level rise.

Relevant Hazards



Relevant Actions

Action #19.01: Creates incentives to support the adoption of statewide resilience standards and funding.

Action #18.02: Develops model municipal ordinances to promote resilience goals.

Action #18.08: Expands the Low-Income Home Energy Assistance Program (LIHEAP) program.

Action #18.09: Provides technical assistance and develops Community Assessments through partnerships with Health Equity Zones.

Ideas for RI

- Support towns in adopting model floodplain bylaws based on Cape Cod Commission templates.
- Enable Transfer of Development Rights (TDR) to steer development away from high-risk areas.
- Develop a coastal zoning ordinance toolkit with sample language and technical assistance for towns.

Best Practice #7
Coastal Resilience Through Local Ordinances and Adaptation Design

Description

Adopt and implement municipal zoning ordinances and bylaws that integrate current and projected climate risk data—such as sea level rise, precipitation trends, and storm surge zones—into land use and development standards. These regulations should establish protective measures such as coastal setbacks, floodplain restrictions, elevation requirements, and site design guidelines that reduce long-term vulnerability.

Precedents

Resilient Nantucket: Flooding Adaptation & Building Elevation Design Guidelines
Location: Nantucket, Massachusetts, USA
Scale: Local

Nantucket's Building Elevation Design Guidelines specifically addresses the island's many historic structures, including guidance for elevation, wet and dry floodproofing, and relocation.

Outcome: The adopted guidelines strengthened Nantucket's capacity to protect its extensive historic district by providing structured processes, public tools, and FEMA-aligned strategies for adapting historic properties to flood risk, supported by community workshops, digital documentation, and integration into broader climate-resilience planning.

Takeaway for RI: Providing clear guidance on a range of flood-resilient design strategies can strengthen the long-term resilience of historic properties while supporting sound planning and market stability.

City of Newport Design Guidelines for Elevating Historic Buildings
Location: Newport, Rhode Island, USA
Scale: Local

The City of Newport's design guidelines for elevating historic structures involves detailed documentation, adherence to specific design requirements, and careful evaluation of streetscape and contextual impacts.

Outcome: These guidelines help protect Newport's historic buildings by reducing flood risk, supporting FEMA compliance, and improving long-term documentation of preservation, while maintaining neighborhood character.

Takeaway for RI: Rhode Island can adopt similar guidelines for historic buildings by applying rigorous, resilience-focused elevation standards that both protect structures from flooding and support their preservation.

Relevant Hazards



Relevant Actions

Action #19.01: Creates incentives to support the adoption of statewide resilience standards and funding.

Action #18.02: Develops model municipal ordinances to promote resilience goals.

Action #18.08: Expands the Low-Income Home Energy Assistance Program (LIHEAP) program.

Action #18.09: Provides technical assistance and develops Community Assessments through partnerships with Health Equity Zones.

Ideas for RI

- Support towns in adopting model floodplain bylaws based on Cape Cod Commission templates.
- Enable Transfer of Development Rights (TDR) to steer development away from high-risk areas.
- Develop a coastal zoning ordinance toolkit with sample language and technical assistance for towns.

Best Practice #8
Embedding Climate Justice in Adaptation Planning

Description

Embedding climate justice into every step of adaptation planning ensures that resilience strategies address the unique needs of historically underserved and vulnerable communities. Convene inter-agency and cross-sector committees to define equity goals, reform state funding criteria to prioritize disadvantaged communities, and integrate equity into project design, implementation, and evaluation.

Precedents

Targeted Community Engagement

Location: Boston, Massachusetts, USA
Scale: Local

Initiatives to re-center equity and justice in planning. Prioritizes racial and socio-economic equity by funding grassroots climate education, partnering with community-based organizations, and engaging residents to inform adaptation strategies.

Outcome: Aligned with Climate Ready Boston, the City adopted the Coastal Flood Resilience Overlay District (CFROD) and has integrated findings from Climate Ready Boston into other plans such as the City's Hazard Mitigation Plan and Imagine Boston 2030.

Takeaway for RI: Well-structured engagement ensures adaptation investments reflect community needs and build local support for resilience projects.

Environmental Justice Fund Scoring Rubric

Location: Seattle, Washington, USA
Scale: Local

Dedicates funding to projects conducted by and benefiting historically disadvantaged and marginalized communities. A thorough scoring rubric is used to prioritize projects based on community need, community involvement, and benefits to the community.

Outcome: Seattle's Environmental Justice Fund saw a 44% increase of total grantees funded in 2022 compared to 2018. Additional funding through a Payroll Expense Tax enabled the Fund to increase the minimum award amount from $40,000 in 2018 to $90,000 in 2022.

Takeaway for RI: Equity-based grant scoring ensures climate funds reach frontline, community-led projects.

Massachusetts Environmental Justice (EJ) Grant Program

Location: Massachusetts, USA
Scale: State

Provides flexible grants to Equity Partners and community-based organizations to lead outreach, planning, and climate justice work in EJ communities. Equity Partners support subgrantees and extend technical capacity.

Outcome: Awarded over $2.3M to Equity Partners and local grantees for multilingual engagement and capacity-building in overburdened communities.

Takeaway for RI: Providing funding to trusted Equity Partners to support local grantees increases access, capacity, and equity in climate adaptation efforts across EJ communities.

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Relevant Hazards



Relevant Actions

Action #19.01: Creates incentives support the adoption of statewide resilience standards and funding.

Action #18.06: Assesses the physical and mental health risks of climate change.

Action #18.08: Expands the Low-Income Home Energy Assistance Program (LIHEAP) program.

Action #18.09: Provides technical assistance and develops Community Assessments through partnerships with Health Equity Zones.

Action #18.10: Expands climate resilience training through Real Jobs RI and CTE programs.

Ideas for RI

- Establish a Climate Justice Grant Program that funds both community-led projects and designated Equity Partners, drawing from models in Connecticut and Massachusetts.
- Use equity scoring rubrics and co-design strategies from Boston and Seattle.
- Create an equity scoring rubric for climate grants to prioritize frontline, community-led projects, based on Seattle's model.

Best Practice #8
Embedding Climate Justice in Adaptation Planning

Description

Embedding climate justice into every step of adaptation planning ensures that resilience strategies address the unique needs of historically underserved and vulnerable communities. Convene inter-agency and cross-sector committees to define equity goals, reform state funding criteria to prioritize disadvantaged communities, and integrate equity into project design, implementation, and evaluation.

Precedents

Climate & Equity Grant Program

Location: Connecticut, USA
Scale: State

Funded community-led climate resilience efforts in underserved areas with no match required, centering equity, local leadership, and capacity-building.

Outcome: Though no longer funded, the $10M pilot advanced community resilience through 21 equity-focused projects, with 87% meeting engagement goals and 70% securing follow-on funding.

Takeaway for RI: Small, no-match grants empower community and tribal groups to lead equitable climate adaptation planning

Climate Ready Together

Location: Providence, Rhode Island, USA
Scale: Local

The Providence Resilience Partnership's nine-month program provides eight cohorts of Providence residents training on how to address climate change in their neighborhoods. The series of workshop are available in both English and Spanish, and participants receive a $450 stipend.

Outcome: The program started in November 2025, and 155 individuals have signed up.

Takeaway for RI: Climate education programs rooted in community engagement are desired by Rhode Island residents, and they should be expanded across the State.

Providence Climate Justice Plan

Location: Providence, Rhode Island, USA
Scale: Local

A dedicated city plan to promote equity in sustainability and resilience planning. The plan established carbon-reduction targets and outlined near-term strategies for achieving them in an equitable way.

Outcome: Following the plan, the Mayor Brett P. Smiley of the City of Providence established $6 million in federal funding to support initiatives aligned with the Climate Justice Plan in FY24.

Takeaway for RI: Strategic planning helps move projects from vision to implementation. Equity-centered plans like this one should be expanded and adopted by municipalities across Rhode Island.

NYS Climate Resilient Farming Program

Location: New York, USA
Scale: State

A state grant program funding projects that help small and midsized farms adapt to flooding, extreme rainfall, and drought through on-farm water management, soil health systems, and climate-smart agricultural practices.

Outcome: The 8 rounds of CRF funding to date have awarded $69 million to support more than 580 farm-level adaptation projects in communities throughout the state of New York.

Takeaway for RI: Agriculture can serve as a cross-cutting climate justice strategy. Supporting small farmers and agricultural communities enhances food security, ecosystem health, rural economic resilience, and equitable access to adaptation resources.

Relevant Hazards



Relevant Actions

Action #19.01: Creates incentives support the adoption of statewide resilience standards and funding.

Action #18.06: Assesses the physical and mental health risks of climate change.

Action #18.08: Expands the Low-Income Home Energy Assistance Program (LIHEAP) program.

Action #18.09: Provides technical assistance and develops Community Assessments through partnerships with Health Equity Zones.

Action #18.10: Expands climate resilience training through Real Jobs RI and CTE programs.

Ideas for RI

- Establish a Climate Justice Grant Program that funds both community-led projects and designated Equity Partners, drawing from models in Connecticut and Massachusetts.
- Use equity scoring rubrics and co-design strategies from Boston and Seattle.
- Create an equity scoring rubric for climate grants to prioritize frontline, community-led projects, based on Seattle's model.

Best Practice #9
Regional Resilience Collaboratives & Capacity Models Across State and Local Government

Description

Supporting regional resilience at multisector levels places an emphasis on the effectiveness of implementing risk management strategies across a broader geography. Climate change impacts are not limited to neighborhood or municipal boundaries, and from a funding and co-benefit perspective, regional approaches to risk management strategies can be advantageous.

Precedents

Municipal Vulnerability Preparedness (MVP) Program

Location: Massachusetts, USA
Scale: State

Provides financial support for regional and municipal vulnerability planning and implementation, prioritizing multi-community proposals and scalable solutions.

Outcome: Between its establishment in 2017 and 2022, the Massachusetts MVP program awarded over $100 million to 341 communities and funded over 700 projects, increasing the capacity for local and regional climate adaptation planning and implementation.

Takeaway for RI: State-funded model that builds regional resilience by supporting local planning and implementation with grants and technical assistance. Municipality-led vulnerability assessments paired with implementation grants strengthen local resilience capacity through peer learning and funding. Supporting projects identified in local resilience workshops builds trust through advancing initiatives with community-wide buy-in and consensus.

California Alliance of Regional Collaboratives for Climate Adaptation (ARCCA)

Location: California, USA
Scale: State

Statewide network of eight regional collaboratives that support climate adaptation through multisector coordination, shared resources, and joint initiatives.

Outcome: Advanced State policy and program development, creating valuable tools and resources to assist local governments with overcoming common institutional barriers. Supports 8 regional collaboratives in total that encompass 80% of the state's population, facilitating shared tools, best practices, and campaigns that scale adaptation statewide.

Takeaway for RI: Regional collaboratives with state support align adaptation strategies and strengthen local capacity.

New York State Adaptation and Resilience Plan (NYSARP)

Location: New York, NY
Scale: State

Delivers a coordinated resilience strategy with regional planning, technical assistance, and funding through programs like Climate Smart Communities and Green Resiliency Grants.

Outcome: Launched in 2025, NYSARP introduced a unified statewide framework and dedicated funding streams (e.g., grants), enhancing local capacity and fostering regional planning partnerships across 10 Department of Environmental Conservation regions.

Takeaway for RI: A statewide climate adaptation plan can align agency goals and regional efforts, ensuring coordinated resilience implementation.

Relevant Hazards



Relevant Actions

Action #18.01: Supports equity-focused adaptation through regional frameworks and Regional Resilience Coordinators.

Action #19.03: Funds regional resilience projects statewide.

Action #20.01: Encourages cross-sector collaboration in resilience initiatives and grant programs.

Ideas for RI

- Formalize and expand the Municipal Resilience Program (MRP) to support regionally coordinated projects and offer increased funding for multi-municipality proposals.
- Fund regional resilience capacity through existing regional entities (e.g., conservation districts, land trusts) or by embedding regional coordinators within state agencies like the Office of Statewide Planning.
- Build upon Municipal Resilience Program and Regional Resilience Coordinator assistance to formalize a state-local resilience partnership modeled on ARCCA (CA) and NYSARP (NY).

Best Practice #10
State Managed Retreat Programs and Funding

Description

State-level resilience funding laws and grant programs provide sustained, flexible revenue to support climate adaptation via voluntary buyouts, disaster recovery, and resilience planning. Funding for high-risk communities and infrastructure can address long-term climate vulnerabilities, promote equity, and reduce future recovery costs.

Precedents

Department of Environmental Protection (DEP) Blue Acres

Location: New Jersey, USA
Scale: State

Acquires flood-prone property following a natural disaster or through proactive approaches. Voluntary program that demolishes the acquired property and permanently preserves the land through a deed restriction. Funding is dependent upon multiple factors, including federal support allotments and state revenues that are allocated pursuant to the Preserve New Jersey Act.

Outcome: Since 1995, the Blue Acres program has used state and federal funding to buy out more than 1,100 flood-prone properties. Over $190 million has been allocated to fund planning and community engagement to reduce future risks.

Takeaway for RI: State-led, voluntary buyout program that proactively reduces flood risk, preserves open space, and leverages both state and federal funding to support long-term community resilience.

California Floodplain Management, Protection, and Risk Awareness (FMPRA) Grant Program

Location: California, USA
Scale: State

State-funded program that prioritizes equity by supporting voluntary buyouts, nature-based flood mitigation, and dedicating up to 10% of funding to resilience planning and vulnerability assessments to drive data-informed local adaptation.

Outcome: Enabled voluntary property acquisitions and nature-based flood risk solutions in disadvantaged communities, with $5 million reserved specifically for planning and monitoring to guide future resilience efforts.

Takeaway for RI: State-funded competitive grant model that supports voluntary buyouts, small-community resilience planning, and equity-centered, nature-based flood risk reduction.

Proposition 4 (2024 Climate Bond)

Location: California, USA
Scale: State

Authorized $10 billion in general obligation bonds to finance projects for vulnerable community infrastructure including drinking water, wildfire prevention, coastal resilience, and flood protection. Bonds repayable through the state's General Fund and includes annual audits to ensure transparency and effectiveness.

Outcome: Proposition 4 enables long-term investment in resilience by funding over $10 billion in community-driven projects, including voluntary buyouts, wildfire mitigation, and green infrastructure. It supports hundreds of local planning efforts, prioritizes underserved communities, and strengthens accountability through required audits, advancing equity and statewide climate preparedness.

Takeaway for RI: Statewide climate bonds unlock major financing for buyouts, infrastructure, and nature-based resilience, especially in underserved communities.

Relevant Hazards



Relevant Actions

Action #11.03: Establishes state funding to acquire flood-prone and repetitive loss properties.

Action #14.07: Incorporates managed retreat into land use planning.

Action #19.03: Funds buyouts through launching the *Resilient Rhody* Infrastructure Fund.

Action #19.05: Tracks climate change impacts on Rhode Island insurance markets and develops strategies for rising costs, data sharing and modelling, and updating building codes.

Ideas for RI

- Pass bond legislation to support voluntary buyouts, planning, and nature-based resilience projects.
- Continue to fund state resilience grant programs (MRP Action Grants, Climate Resilience Fund, and/or OSCAR) and state revolving loan programs (RIIB's *Resilient Rhody* Infrastructure Fund) to provide long-term support for adaptation and retreat projects. Propose this funding through State Green Economy Bond and/or broader state budget.
- Foster partnership and ongoing collaboration between RIDEM State Resilience Office and funding partners such as Rhode Island Infrastructure Bank and RI Commerce to coordinate resilience bond funding requests, federal matches, and local support.

Best Practice #11
Statewide Resilience Standards and Metrics for Climate-Informed Governance

Description

Statewide Resilience Standards provide consistent practices, codes, or criteria to ensure that state agencies, municipalities, and project developers incorporate future climate projections into infrastructure and development planning. Resilience metrics establish a clear framework for tracking and reporting progress across agencies, promoting accountability and long-term implementation.

Precedents

Resilient MA Action Team (RMAT) Climate Resilience Design Standards Tool

Location: Massachusetts, USA
Scale: State

Created a digital tool with sea level rise, surge, heat, and precipitation projections. Required for planning, permitting, and grants to ensure consistent, climate-informed decisions.

Outcome: The RMAT tool has informed the design of over 150 state-funded infrastructure projects. Over $1 billion in capital project funding evaluated using RMAT standards with over 7,000 planners and practitioners trained in climate resilience design via the MVP Program.

Takeaway for RI: Mandating the use of climate data in design maintains consistency across projects and ensures infrastructure is designed to be resilient to projected climate impacts.

Climate Change Resilience Strategy & Executive Order 89

Location: New Jersey, USA
Scale: State

New Jersey's Executive Order 89 established a statewide resilience strategy and interagency council that mandates use of future climate data and tracks progress through shared metrics

Outcome: Executive Order 89 established a statewide framework for climate-informed governance by creating the Interagency Council on Climate Resilience, which coordinates 16 state agencies in adopting shared standards and metrics that integrate future climate data into planning, permitting, and investment decisions across sectors.

Takeaway for RI: Interagency coordination through executive structures and funded planning enhances statewide climate preparedness and consistency.

Community Risk and Resiliency Act (CRRA):

Location: New York, USA
Scale: State

Requires agencies and municipalities to use sea level rise, flood, and storm surge data in permitting and funding. Provides legal mandates, guidance, and model laws.

Outcome: CRRA institutionalized the use of future climate projections in permitting and land use, with over 300 municipalities adopting aligned ordinances, advancing consistent, climate-informed standards across New York.

Takeaway for RI: Mandating climate projections in permitting and zoning, paired with state guidance and model laws, enables consistent and achievable municipal resilience.

FEMA Building Code Adoption Tracker (BCAT)

Location: National
Scale: National

A digital tool to track the extent to which local jurisdictions throughout the United States have implemented current hazard-resistant building codes.

Outcome: The tool is regularly updated to track building code adoption status in all 50 states and U.S. Territories.

Takeaway for RI: Helps Rhode Island track where modern, hazard-resistant building codes are in place and focus support on communities that need stronger building standards to improve climate resilience.

Relevant Hazards



Relevant Actions

Action #14.01: Refines and shares tracking system for state resilience actions.

Action #14.03: Establishes State Resilience Office to oversee state resilience planning efforts.

Action #14.05: Strengthens municipal resilience standards across agencies.

Action #14.12: Standardizes data for uniform design and progress tracking.

Ideas for RI

- Use public projects to pilot resilience standards, demonstrate benefits, and build support for broader application in private development.
- Utilize collaboration between the Resilience EC4 Subgroup and the State Building Commission to align building codes with climate resilience, following the Massachusetts BBRS model.
- Require a Resilience Checklist for projects funded by state or quasi-state agencies to ensure climate data and equity alignment.
- Expand interagency coordination and mandate future climate data in state planning and permitting.

Best Practice #12
Resilience Ordinances and State Support for Forest Management & Drought Response

Description
Building statewide capacity to address growing wildfire and drought concerns through proactive planning, land-use policies, and accessible climate data helps reduce the likelihood and severity of future disasters. By adopting model ordinances and statewide risk mapping, communities can make informed development decisions, conserve natural resources, and better protect public safety and infrastructure.

Precedents

Wildland-Urban Interface (WUI) Building Code
Location: Austin, Texas, USA
Scale: Local

Requires property owners in high-risk zones to reduce fuels available for fire (i.e., coniferous trees, wood mulch, combustible landscape vegetation), maintain defensible space, and safe storage practices.

Outcome: 45,000+ parcels in Austin designated within the WUI zone. New construction now requires fire-resistant materials and defensible space buffers.

Takeaway for RI: Local WUI ordinances mandating defensible space and fire-resistant construction enhance wildfire resilience in high-risk areas.

Permanent Outdoor Water Restrictions
Location: Bozeman, Montana, USA
Scale: Local

Adopted mandatory permanent outdoor watering restrictions during specific days and times.

Outcome: Within just a few months of implementation, the city reported a reduction of 25 gallons per person per day in water usage during peak summer months. This, in turn, helped maintain reservoir levels and avoid emergency drought declarations.

Takeaway for RI: Permanent outdoor watering limits help conserve water during droughts and foster long-term drought resilience.

Wildfire Hazard Mapping & WUI Building Regulations
Location: Oregon, USA
Scale: State

Created wildfire hazard maps and established stricter building and defensible space codes.

Outcome: Oregon's 2022 legislation initiated the mapping of over 1.8 million properties in wildfire risk zones and authorized rules for fire-resistant building standards in high-risk areas.

Takeaway for RI: Wildfire hazard maps and defensible-space codes reduce risk and guide safer development.

Relevant Hazards



Relevant Actions

Action #12.01: Encourages the protection and restoration of forest cover and migration corridors.

Action #12.02: Encourages the creation and utilization of Forest Stewardship Plans.

Action #12.04: Establishes funding for needed statewide natural resource mapping.

Action #17.01: Develops and coordinates response procedures and best practices for emergency services and facilities.

Action #17.02: Supports disaster preparedness training for municipal emergency services.

Action #17.03: Creates a centralized, multilingual platform for emergency preparedness materials.

Ideas for RI

- Establish wildfire and drought programs modeled on regional and national examples, such as the APA Multihazard Planning Framework for communities in the Wildland-Urban Interface.
- Support municipal buffer and outdoor water use and conservation guidance and regulations, coordinating with RIDEM and water utilities.
- Build on RIDEM's Firewise Community Program to develop a statewide wildfire and drought plan with hazard maps and ordinance templates.

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Precedents

Forest Restoration & Wildfire Risk Mitigation Program
Location: Colorado, USA
Scale: State

Colorado's Forest Restoration & Wildfire Risk Mitigation Program provides state grants for local wildfire resilience efforts including forest thinning, invasive species control, and restoration projects.

Outcome: Since 2017, Colorado has funded more than 200 wildfire mitigation projects, treating over 35,000 acres.

Takeaway for RI: Develop a wildfire resilience grant program for municipalities to fund vegetation management and forest health projects.

California Wildfire Resilience Program
Location: California, USA
Scale: State

The California Wildfire Resilience Program has received over $2.73 billion in funding between 2021 and 2023, supported through California Climate Investments (CCI) and other state budget packages. Additionally, $200 million annually has been committed from 2024 through 2029 under SB 1552. This funding supports a wide range of wildfire prevention and resilience efforts, including grants for forest thinning, prescribed burns, and habitat restoration.

Outcome: As of August 2024, CAL FIRE had awarded more than $450 million in its Wildfire Prevention Grants Program to over 450 projects across the state in the past five years.

Takeaway for RI: Integrate water use, water quality, and habitat restoration potential into eligible activities and grant evaluation criteria.

Relevant Hazards



Relevant Actions

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