

Adapting to Flood and Erosion Risk

Coastal adaptation is taking action to minimize risk from flooding and erosion. Communities that adapt become more resilient to storms, sea level rise, and other environmental impacts.

STEPS TO RESILIENCE

The U.S. Climate Resilience Toolkit, developed through a partnership of federal agencies and organizations led by NOAA, describes a general 6-step process that can lead to adaptation actions. This general process can be combined with existing programs and planning in New York State such as Climate Smart Communities, Local Waterfront Revitalization Program, Hazard Mitigation Planning, Stormwater Phase 2: MS4 Program, and the Community Rating System. The steps are summarized below. Consult the U.S. Climate Resilience Toolkit website for more information (<https://toolkit.climate.gov>)

1) Getting Started. Identify a climate champion. An effective champion, whether inside government or a member of the community at large, works with a planning team to assess climate risk and makes recommendations on how to address it. Often, this leader is an elected official, a sustainability coordinator, or someone who works in a local government office. Other steps to get started include: build a representative team, consult existing planning documents, commit to centering equity in your plan, check alignment of your developing goals with community values, and announce your efforts to the public.

2) Understand Exposure. Consider the things your community cares about and determine what weather and climate-related hazards have occurred in the past and what hazards might occur in the future while considering climate change. Refer to the New York State Climate Impacts Assessment for a comprehensive look at how climate change is impacting New York (<https://nysclimateimpacts.org>).

3) Assess Vulnerability and Risks. Some groups handle this step themselves; others hire professionals to help them conduct vulnerability and risk assessments. In New York State, there are a range of existing tools and planning processes that can assess vulnerabilities and risks. Check out Climate Smart Communities Action P7: Vulnerability Assessment to learn more. (bit.ly/NYSCSCPE7VulnerabilityAssessment)

Resilience is the capacity of a community, or natural environment to prepare for, withstand, respond to, and recover more quickly from a disruption, such as flooding and extreme storms.

Climate Smart Communities (CSC) Program: New York State's Climate Smart Communities is both a community certification system and a grant program. The program includes both mitigation (for greenhouse gas reduction) and adaptation actions. The adaptation actions can be taken to move a community towards flood resiliency and when combined with the mitigation actions, can help achieve certification at the bronze, silver, or gold level. Technical support is available to help communities achieve actions. (<https://climatesmart.ny.gov>)

Vulnerable Populations: Vulnerable people do not have the material or social resources to respond or recover from hazardous events and often include the elderly, children, people with disabilities, and families in poverty. Certain neighborhoods within a community may be more vulnerable and less resilient due to socioeconomic factors and legacies of disinvestment. Extra efforts should be taken to engage and invest in these communities to reduce risk to climate and weather hazards.

4) Investigate Options. Consider possible solutions for your highest risks. Brainstorm and research how other communities have responded to similar issues. Build a list of potential options. Then, through inclusive community discussions, you'll reduce your list to the actions that are feasible.

5) Prioritize and Plan. Evaluate costs, benefits, and your team's capacity to implement the solutions you identify. Rank the expected value of each action, and integrate the highest-value actions into a step-by-step plan. Once complete, you'll have a plan to implement your favored solutions as funds become available.

6) Take Action. Secure funds and begin implementing the first task in your plan. When possible, move to the next task. As you complete each task, check to see if your actions are producing the results you expect. Continue to monitor, review, and report on your project.

ADAPTATION STRATEGIES

The following menu, and the accompanying figure, lists general adaptation strategies that your community might consider during the Investigate Options step of planning for resilience (see page 1). Work with technical experts to hone in on which actions within each strategy are appropriate for your community. Staff time, funding, community input, and political will are needed to plan for, prioritize and implement different adaptation strategies. Strategies and actions can be used alone or in combination, and will vary across communities. They should be revisited on a regular basis as community needs change over time.

- **Raise Awareness:** Communicate internally and with residents about flood risk. Examples include: developing emergency preparedness and evacuation plans, and conducting education and outreach.
- **Plan and Enforce:** Engage in planning processes to update and enforce policies and regulations that protect infrastructure, private property, and natural resources. Examples include: zoning code amendments, limiting impervious cover, and flood code enforcement.
- **Conserve and Restore:** Evaluate the ecosystem benefits of natural shorelines and floodplains and work to conserve or restore them. Examples include: wetland protection, dune conservation, and using native plants in restoration projects.
- **Accommodate:** Upgrade infrastructure to accommodate more water. Examples include: elevating structures and roads, installing flood vents in foundations, and removing, modifying, or replacing bridges, culverts, and dams.
- **Relocate:** Eliminate physical risk by moving assets away from hazardous areas. Examples include: explore land acquisition, voluntary buy-out programs, and innovative financing options.
- **Defend:** Use natural, nature-based, or structural methods to defend community assets along the shoreline that can not be relocated. When possible, prioritize natural and nature-based solutions to preserve and improve habitat along the shoreline before considering structural methods. All shoreline modifications need to be monitored and maintained over time, particularly after storm events. Examples include: living or sustainable shorelines and revetments.
- **Do Nothing:** This is appropriate if the risk is low and damage occurs in manageable intervals. Continue to monitor as conditions may change over time.

Note: Proposed construction activities within the coastal areas of New York require permits. Check the regulations of all agencies who have jurisdiction before beginning construction. Refer to the New York Sea Grant's Guide to Permitting for Shoreline Modification Projects in New York's Tidal Waters ([bit.ly/NYSGShorelinePermitGuide](https://www.nysg.org/resources/permitting)) for more information.

The following figure shows how different adaptation strategies can be implemented across a community based on different factors over time after completing a resilience planning process.



Adaptation strategies: Adaptation strategies should be tailored to the unique needs of each community. This hypothetical community is bordered by tidal waters and a tributary entering on the north side of town. There is a downtown area, residential neighborhoods at different densities, and various natural and recreational assets. The callouts describe examples of how adaptation strategies can be implemented in different locations within a community.

Along the shoreline, a dune area is conserved and a floodplain along a tributary is restored while creating a nature path. Another area of the shoreline is using nature-based features to defend from erosion. The neighborhood to the top right is participating in a buy-out program, while another waterfront neighborhood closer to downtown is prioritizing elevating homes and utilities. Tidal backflow valves, replacing bridges and culverts, and using permeable materials for parking lots and sidewalks are examples of ways to accommodate more water. This community is also taking steps to raise awareness for residents around flood risk, flood preparedness, and flood mitigation on private property. Finally, this community has chosen to limit new development in high hazard areas through planning and enforcement.

ACHIEVE MULTIPLE BENEFITS

Adaptation strategies can have multiple benefits for human and natural systems. Conserving and restoring floodplains and using nature-based approaches can slow down water, reduce pollution by filtering runoff, and contribute to groundwater recharge. Natural approaches provide habitat for fish and wildlife, recreational opportunities for people, and contribute to overall ecosystem health.

Adaptation strategies, such as climate smart land-use (Plan and enforce), can achieve goals under several state and federal programs focused on water and coastal management while earning credit under the NYS Climate Smart Communities program or the NFIP's Community Rating System.

STEPS TO RESILIENCE RESOURCES

- U.S. Climate Resilience Toolkit: <https://toolkit.climate.gov/>
- Resilience Principles (NYS DOS): bit.ly/NYSDOSResiliencePrinciples
- Climate Change Adaptation and Resilience Planning webpage (NYS DEC): bit.ly/NYSDECCCARP
- Inclusive Planning for Community Resilience (NYS WRI): bit.ly/NYSWRIInclusivePlanning

RESOURCES

Understanding Risk

- NYS Climate Impacts Assessment (NYSERDA, 2024): <https://nysclimateimpacts.org/>
- Mitigate NY (DHSES) https://mitigateny.org/state_mitigation/planning_process

There are several online mapping tools that can be used for viewing projected sea level rise and flood risk. Climate hazards can also be displayed by census tract or political boundary to understand social vulnerability.

- NYS Department of State Geographic Information Systems Gateway
 - Hydrography and Flooding
 - Layer: Hudson River Coastal Risk Areas
 - Layer: Sea Level Rise
- Neighborhoods at Risk: <https://nar.headwaterseconomics.org/>

Adaptation Strategies

- Reduce Flood Risk website (ASFPM): <https://www.reducefloodrisk.org/>
- Disaster Resilient Design Concepts (EPA): bit.ly/USEPADisasterResilientDesign

Resilient Shorelines - State Guidance

- Shoreline Stabilization Techniques webpage (NYS DEC): bit.ly/NYSDECShorelineStabilization
- Hudson River Sustainable Shorelines webpage (NYS DEC & HRNERR): bit.ly/HRNERRSustainableShorelines
- Flood Resilience Handbook for Public Access Sites Along the Hudson River (NYS DEC & NIEWPCC): bit.ly/FloodResilienceAccessHudson

- Using Natural Measures to Reduce the Risk of Flooding and Erosion (NYS DEC) bit.ly/NYSDECCRRANaturalMeasuresGdnc
- NYS Flood Risk Management Guidance (NYS DEC): bit.ly/NYSDECCRRAFloodRiskMgmtGdnc
- Tidal Wetlands Guidance Document: Living Shoreline Techniques in the Marine District of New York State (NYS DEC): <https://bit.ly/NYSDECTidalWetlandsGuidanceDocument> (For communities south of Governor Mario M. Cuomo Bridge only.)

Resilient Shorelines - Additional Resources

- 10 Questions to Ask When Building Defenses to Protect Hudson River Shorelines [Guide] (Cary Institute): bit.ly/10QuestionsShoreGuide
- Managing Shore Zones for ecological Benefits [Handbook] (Cary Institute): bit.ly/ManagingShoreZonesGuide
- Natural and Structural Measures for Shoreline Stabilization [Guide] (SAGE): <https://coast.noaa.gov/data/digitalcoast/pdf/living-shoreline.pdf>
- Softening Our Shorelines: Policy and Practice for Living Shorelines Along the Gulf and Atlantic Coasts (The National Wildlife Federation): <https://www.nwf.org/SofteningOurShorelines>

Planning Tools

- Adaptation Tool Kit: Sea-Level Rise and Coastal Land Use (Georgetown Climate Center): bit.ly/GCCAdaptationToolKit
- Model Local Laws to Increase Resilience (NYS DOS): bit.ly/NYSDOSCRRAMLL
- Best Practices for Adopting Conservation Inventories and Plans (HREP): https://extapps.dec.ny.gov/docs/remediation_hudson_pdf/nriospadoption.pdf

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