FRN Hudson Valley Flood Resilience Network: Using the 4Ps Framework to Identify and Implement Actions to Improve Local Flood Resilience

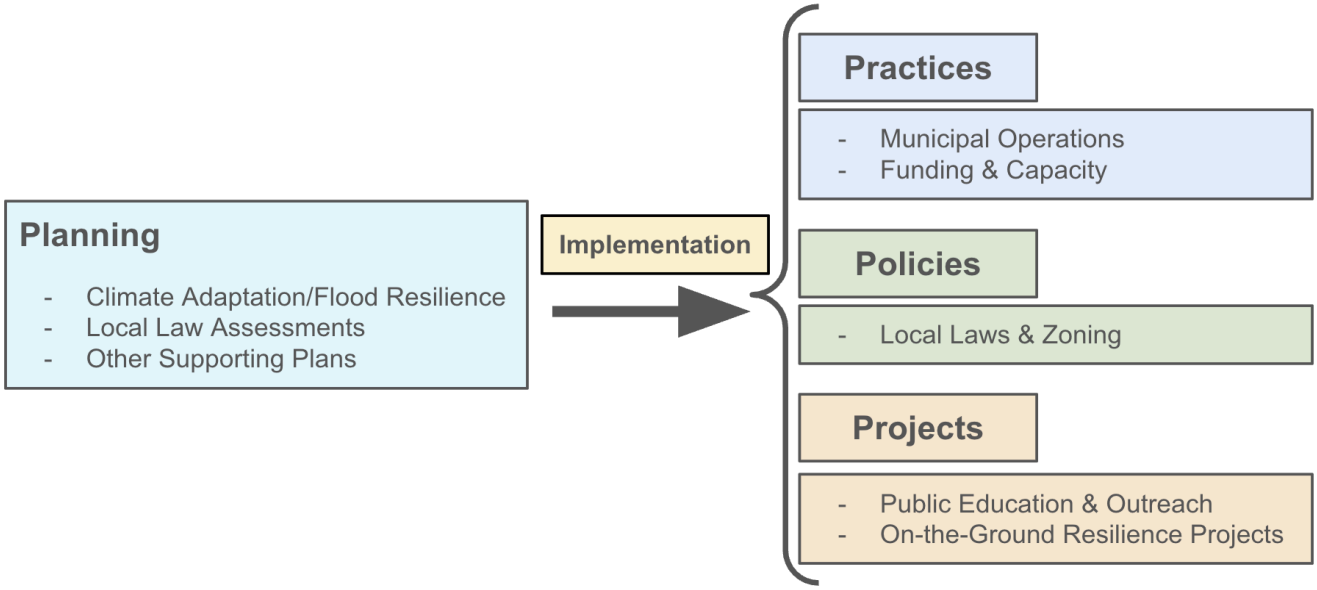
The **"4Ps" framework** represents actions that municipalities can take to improve local flood resilience under four strategies: **Planning, Practices, Policies, and Projects**. Each "P" represents a specific type of **strategy** that municipalities can implement. These 4Ps, and their subcategories, represent opportunities for municipalities to utilize their specific roles in local governance, land use, and protecting public safety.

Each bullet represents a specific **action** that can be tracked to better understand work to date and progress moving forward. *This is not an exhaustive list of possible actions under each of the 4P strategies, but shares examples of the types of actions that these strategies may include.* Actions that may be eligible for points through the New York State Climate Smart Communities (CSC) Certification Program are noted in parentheses, with their Pledge Element number. These CSC Certification Actions are included in Pledge Elements (PEs) 6: Implement climate-smart land use and 7: Enhance community resilience to climate change.

The Hudson Valley Flood Resilience Network (HV FRN) connects local governments who are committed to taking actionable steps to manage current and future flood risk. HV FRN centers municipal governments and the unique roles they play in supporting local flood resilience. Our goal is to support municipalities in implementing flood resilience strategies and actions through HV FRN programming, with a focus on actions that have been prioritized as specific next steps through planning processes.

The Hudson Valley Flood Resilience Network catalyzes flood adaptation actions by:

- Convening communities for peer learning on projects and strategies
- Coordinating local and regional efforts
- Sharing opportunities for funding and training
- Facilitating communication between local governments and regional partners
- Communicating on challenges and barriers as a unified voice



The Hudson Valley Flood Resilience Network is co-facilitated by New York Sea Grant and the Hudson River Watershed Alliance, and supported by the NYS DEC Hudson River Estuary Program and the NYS Water Resources Institute at Cornell University, with funding from the NYS Environmental Protection Fund.

Planning

Planning is an important step, often a first or foundational step, to understand flood resilience, establish a resilience vision, and identify specific actions/strategies to support local resilience goals. Planning can create valuable maps and document conditions through reports, and can also build municipal consensus and support for priority actions for next steps. Plans themselves may be considered flood resilience actions, and they also provide a framework for prioritizing strategies (including Practices, Policies, and Projects) that can lead to the implementation of more specific/targeted flood resilience actions.

Planning can be broken down into specific categories: plans specifically focused on flood vulnerability or climate adaptation, local law assessments to evaluate municipal policies, or other types of plans that include valuable information related to flood resilience.

- **Flood vulnerability assessment**
    - Vulnerability assessment that highlights flood hazards and incorporates future projections *(CSC PE7 Action: Climate Vulnerability Assessment)*
- **Local law assessments to evaluate policies for climate resilience**
    - Climate Smart Resiliency Planning Tool *(CSC PE7 Action: Evaluate Policies for Climate Resilience)*
    - Resilience Implementation and Strategic Enhancements (RISE) planning tool *(CSC PE7 Action: Evaluate Policies for Climate Resilience)*
- **Climate adaptation and resilience plan focused on flood adaptation/resilience**
    - Climate adaptation and resilience plan that highlights flooding, especially with community engagement component *(PE7 Action: Climate Adaptation Plan)*
- **Other supportive plans**
    - Watershed-based flood study *(CSC PE7 Action: Watershed-based Flood Mitigation Plan)*
    - Watershed Plan *(CSC PE7 Action: Watershed Plan for Water Quality, CSC PE7 Action: Source Water Protection)*
    - Natural resource inventory *(CSC PE6 Action: Natural Resources Inventory)*
    - Open space plan/index/inventory *(CSC PE7 Action: Conserve Natural Areas)*
    - Community Preservation Plan *(CSC PE7 Action: Climate-resilient Hazard Mitigation Plan)*
    - Flood resilience explicitly addressed in comprehensive plan *(CSC PE6 Action: Comprehensive Plan with Sustainability Elements)*
    - Flood resilience explicitly addressed in Local Waterfront Revitalization plan
    - FEMA-approved Hazard Mitigation Plan *(CSC PE7 Action: Climate-resilient Hazard Mitigation Plan)*
    - Flood resilience explicitly addressed in Local emergency preparedness/response plan (e.g. Comprehensive Emergency Management Plan)
    - Locally-based flood study
    - Stream, sediment, and/or debris management plan

Practices

Practices are improvements to internal municipal systems. These can include the presence and/or capacity of staff, committees, or other structures to organize people advancing this work; how municipalities communicate or coordinate internally; and funding applied for or received to implement other actions. Practices can be broken down into two categories: municipal operations and funding & capacity.

Municipal Operations

- Local task force or committee focused on flood resilience or related topics
- Local flood resilience champion(s) identified and given role in local planning and decision-making
- Floodplain administrator receives training on floodplain management best practices
- Certified Floodplain Manager on staff
- Training for municipal employees, elected officials, planning & zoning board members or other municipal leaders on flood resilience best practices
- Flood resilience-related tasks included in position description for municipal staff member(s)
- Develop/update municipal emergency communications and/or response procedures
- Implement demonstration practices and projects on municipally-owned properties
- Participate in National Flood Insurance Program Community Rating System *(CSC PE7 Action: National Flood Insurance Program Community Rating System)*
- Formation of stormwater district, utility or similar mechanism for coordinated funding & management of stormwater

Funding and Capacity

- Grant funding secured to implement flood resilience activities
- Annual municipal budget for flood resilience established or increased
- Municipal incentives established for landowner implementation of flood resilience strategies

Policies

Policies are regulations enacted by municipalities that govern their jurisdiction within town, city, or village boundaries. These include local laws, codes, ordinances, zoning regulations, and other policy tools.

Local Laws, Zoning, and Code Enforcement

- Implement local laws for increased flood resilience *(CSC PE6 Action: Smart Growth Policies)*
- Implementing zoning improvements for increased flood resilience *(CSC PE6 Action: Smart Growth Policies, CSC PE6 Action: Zoning for Protection of Natural Areas)*
- Building code requires strategies to reduce damage to buildings in flood-prone areas during floods (e.g. elevation flood proofing basements, elevating HVAC systems, elevating buildings)
- Tracking cumulative substantial improvement for buildings in the mapped floodplain
- Increase required freeboard elevation for buildings in flood-prone areas *(CSC PE7 Action: Design Flood Elevation & Flood Maps, CSC PE7 Action: Freeboard Policies)*
- Implement floodplain overlay district
- Local regulatory protection of floodplains, wetlands, riparian areas, steep slopes (e.g. through buffers, setbacks, size)
- Limit impervious surface *(CSC PE6 Action: Green Parking Lot Policies)*
- Approvals for new development in flood-prone areas require addition of flood storage capacity (compensatory storage, green space, green infrastructure, greater setbacks from rivers, etc.)
- Fluvial erosion hazard zoning
- Critical Environmental Area designations
- Transfer of development rights program (flood-prone sending & flood-resilient receiving areas)

Projects

Projects are specific public-facing initiatives undertaken by municipalities. These include public education campaigns and outreach projects that can increase knowledge of flood risks, communications systems, actions that residents and businesses can take, and municipal flood resilience work. These can also include on-the-ground flood resilience projects that can reduce flood risk or reduce anticipated flood conditions. When possible, on-the-ground projects that include natural and nature-based features are preferred, especially those that support multiple community and environmental benefits.

Public Education and Outreach

- Develop and implement a public emergency communications and/or warning system
- Organize neighborhood networks for emergency preparedness, planning and training
- Strategies to educate and engage community members about flood risk, anticipated climate and weather pattern changes, flood resilience actions and municipal initiatives
- Strategies to educate and engage developers and builders about flood risk, anticipated climate and weather pattern changes, flood resilience actions and municipal initiatives

On-the-Ground Resilience Projects

- Local- or site-scale planning, engineering studies, or designs for implementation of 'On-the-Ground Resilience Projects' (see below)
- Floodproofing municipal building(s)
- Relocation or elevation of critical infrastructure
- Raising roads
- Culvert right-sizing, modification, or removal *(CSC PE7 Action: Culverts & Dams)*
- Bridge right-sizing, modification, or removal
- Dam removal *(CSC PE7 Action: Culverts & Dams)*
- Implementation of stormwater management practices, including green infrastructure *(CSC PE7 Action: Green Infrastructure)*
- Stormwater detention
- Protection of flood-prone and/or flood-attenuating land via acquisition or conservation easement
- Floodplain reclamation, creation or enhancement
- Stream restoration or modification
- Riparian buffer or wetland restoration *(CSC PE7 Action: Riparian Buffers)*
- Sustainable shorelines implementation for Hudson River waterfronts *(CSC PE7 Action: Nature-based Shorelines)*
- Buyouts for flood-impacted properties *(CSC PE7 Action: Strategic Relocation)*

This is not an exhaustive list of possible actions under each of the 4P strategies, but examples of the types of actions that these strategies may include.

Drafted by Emily Vail, Hudson River Watershed Alliance and co-facilitator of the Hudson Valley Flood Resilience Network, and Jessica Kuonen, New York Sea Grant and co-facilitator of the Hudson Valley Flood Resilience Network, based on the "Hudson Valley Flood Resilience Network Evaluation Strategy" (2025) and "Local Practices, Plans, Policies and Projects to Reduce Flood Vulnerabilities" (2024), both created by Julia Solomon of Shadbush Consulting, LLC. Last updated 9/11/26.