

An aerial photograph of the Victory Bridge, a multi-lane highway bridge spanning the Raritan River. The bridge is illuminated with warm lights, and several cars are visible on the roadway. The surrounding landscape includes marshy areas and distant industrial buildings under a dark, twilight sky.

02 - PROJECT BACKGROUND AND OBJECTIVES

What is Resilient NJ?
Our Planning Process
Purpose of this Plan

ROUTE 35 (VICTORY BRIDGE) OVER RARITAN RIVER
Image Credit: Christy Lang Photos Via Adobe

WHAT IS RESILIENT NJ?

Resilient NJ is a planning program, administered by the New Jersey Department of Environmental Protection (NJDEP) Bureau of Climate Resilience Planning, that supports regional climate resilience planning.

Resilient NJ has brought together planners, engineers, designers, and other experts to address flood-related and other hazards at a regional scale in order to develop a targeted set of strategies and actions with clear pathways to implementation. The process has been fundamentally guided and driven by local community input, particularly from underserved and under-resourced populations.

Resilient NJ was funded through the U.S. Department of Housing and Urban Development (HUD). HUD established the National Disaster Resilience Competition (NDRC) after Hurricane Sandy to help communities impacted by natural disasters plan and implement resilience projects to prepare for future storms. The State of New Jersey was awarded funding as part of the competition in 2016, \$10 million of which is being used to fund Resilient NJ and the development of regional resilience action plans. This report focuses on the Raritan River and Bay Communities (RRBC) Region. Similar plans have been developed for [Northeastern New Jersey](#), [Long Beach Island](#), and the [Atlantic County Coastal Region](#).

Why does RRBC need a Resilience Action Plan?

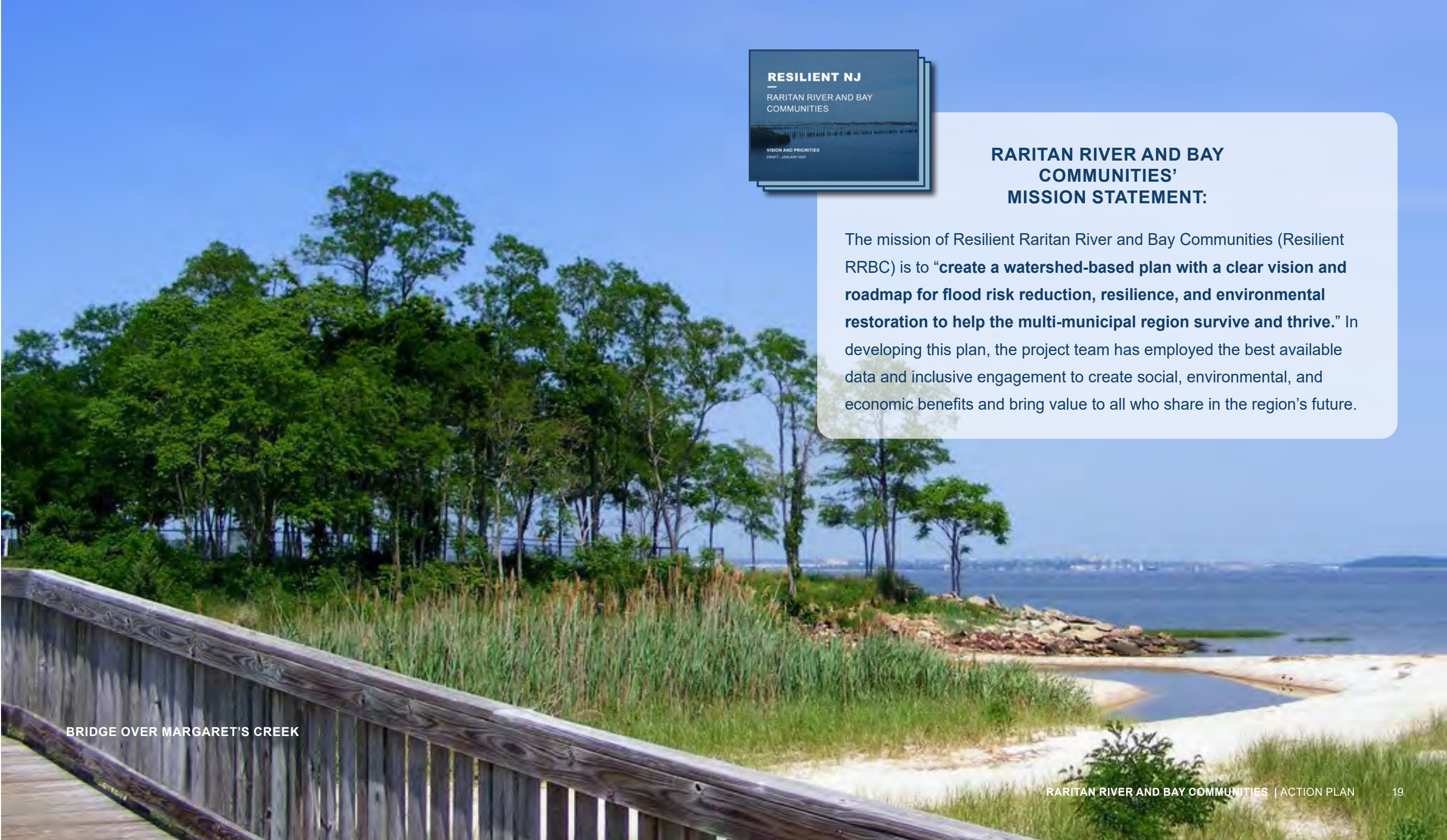
Climate change poses a serious threat to the region and those who live in and depend on it, demanding meaningful, regionwide planning. Already, RRBC is plagued by unpredictable, sometimes severe flood events, in addition to extreme heat and other dangerous hazards. Changes in precipitation, sea level rise, increasing temperatures, and habitat shifts will place increasing stress on the region’s infrastructure, natural resources, and social and economic systems. These same impacts directly affect public health and healthcare systems. For many communities—especially those with limited access to resources to prepare for, respond to, and recover from extreme events—the risks these hazards pose to their health, safety, and livelihoods cannot be overstated.

Decisions about zoning, redevelopment, housing, open space, and other investment decisions made by local and regional governments will alter the impacts of climate change on their own and neighboring communities. Integrating climate change considerations into these decisions is imperative to ensure that investments made today are designed to withstand the conditions of tomorrow. This *Action Plan*, guided by input from a diverse range of members of RRBC communities, provides a roadmap for addressing climate hazards in the region while simultaneously meeting other community needs by identifying avenues to integrate flood resilience and climate change considerations into policies, programs, and projects in RRBC.



RARITAN RIVER AND BAY COMMUNITIES’ MISSION STATEMENT:

The mission of Resilient Raritan River and Bay Communities (Resilient RRBC) is to “**create a watershed-based plan with a clear vision and roadmap for flood risk reduction, resilience, and environmental restoration to help the multi-municipal region survive and thrive.**” In developing this plan, the project team has employed the best available data and inclusive engagement to create social, environmental, and economic benefits and bring value to all who share in the region’s future.



BRIDGE OVER MARGARET’S CREEK

RESILIENT NJ: RARITAN RIVER AND BAY COMMUNITIES

The RRBC region includes seven municipalities in Middlesex County that were impacted by Hurricane Sandy: Carteret, Old Bridge, Perth Amboy, South Amboy, Sayreville, South River, and Woodbridge. The region is home to approximately 310,000 residents, 76,000 jobs, and numerous transportation and environmental assets of regional importance.

The mission of the Resilient NJ RRBC region is to **create a watershed-based plan with a clear vision and roadmap for reducing flood risk, increasing resilience, and achieving environmental restoration to help the multi-municipal region survive and thrive.** In developing this plan, the project team has employed the best-available data and inclusive engagement to identify a actionable roadmap that will yield social, environmental, and economic benefits for all who share in the region’s future. Throughout the project, the team has brought together the people who live, work, and play in the area, alongside government, business, infrastructure providers, engineers, scientists, and environmental and community organizations to create a clear and equitable action plan that addresses current and future climate risks while improving quality of life.

Steering Committee

The project has been guided by a Steering Committee that includes representatives from each municipality, as well as Middlesex County and the YMCAs of Middlesex County. The Steering Committee has been meeting regularly over the course of the project to provide feedback on project priorities and public materials.

Multiple local YMCAs, as part of a coalition, serve as community partners on this project, helping to promote additional community input on the *Action Plan*. The Raritan Bay Area YMCA leads this coalition, which also includes the YMCA of Metuchen, Edison, Woodbridge, South Amboy (MEWSA); the Gateway Family YMCA – Rahway Branch (Carteret); the Old Bridge Family YMCA; and the Raritan Valley YMCA.

These Middlesex County YMCAs have been actively involved in the planning process through participation in the Steering Committee and additional efforts to enhance community engagement across the region. These YMCAs have experience working with historically underserved populations in the region and have worked with the project team to represent these populations in the planning process by sharing information about the project with their constituents and ensuring community priorities are clearly reflected in the planning process.

Project Goals



Build off ongoing resilience planning by identifying and addressing gaps and opportunities within the region.



Ensure representation and participation from socially vulnerable populations to address their needs and risks.



Develop innovative and implementable solutions that increase resilience in both the short- and long-term.

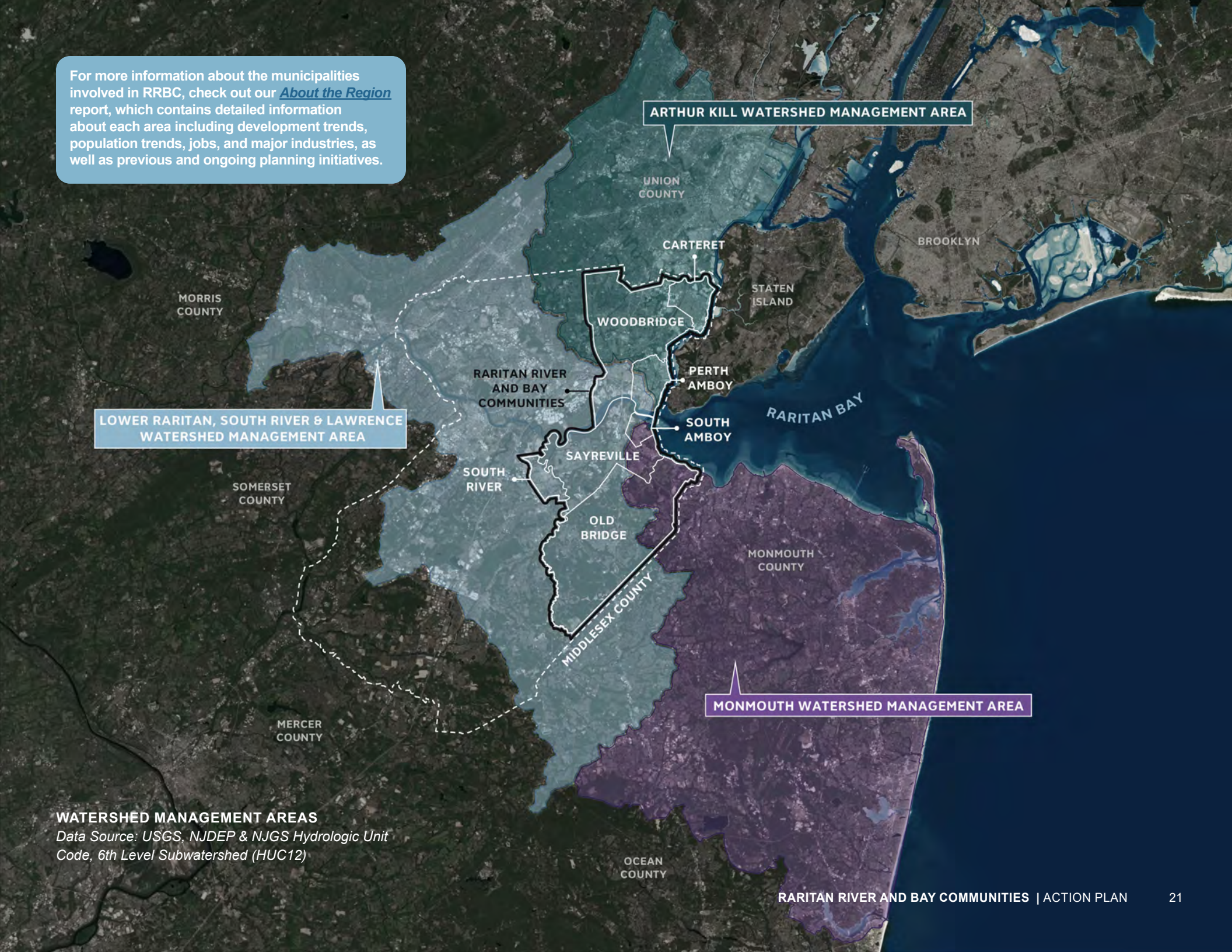


Enhance the value and integrity of the ecological, recreational, and economic resources in the region.



Ensure collaboration among a wide variety of stakeholders.

For more information about the municipalities involved in RRBC, check out our [About the Region](#) report, which contains detailed information about each area including development trends, population trends, jobs, and major industries, as well as previous and ongoing planning initiatives.



OUR REGION'S HISTORY

In looking towards the future, the project team first sought to understand how the region has been shaped by its past to provide context on the existing strengths of the region as well as the challenges it currently faces. Located in Middlesex County in central New Jersey between New York City and Philadelphia, the Resilient NJ—Raritan River and Bay Communities region has been shaped geographically and culturally by the Raritan Bay.

The region was first settled 3,000 years ago by the Lenape. The Bay’s rich sediment fostered diverse marine ecosystems with plentiful oysters and other shellfish. Its large intertidal zone also made the bay an attractive spot for other food sources that drew people to live and work nearby. The Lenape created an extensive system of trails that later became roads and developed into a major transportation network. The Lenape migrated seasonally and likely practiced small-scale agriculture along with hunting, gathering, and fishing the abundant shellfish in surrounding waters. Dutch colonists arrived in the 17th century, uprooting Lenape livelihoods through armed conflicts and the spread of contagious diseases. Dutch settlers grew Perth Amboy into a prominent port that enabled more commerce and trade in the region.

The settlement of this region was expedited by its position as a transportation hub, leading to further development. The Raritan River, which is the area’s predominant geographic feature, flows the entire width of the county from west to east. This allowed the area to serve as an entrance

point to the rest of Middlesex County, as well as a connection point with New York City and New England. Until the addition of a new rail network through Middlesex County in the 19th century, the area relied mostly on farming. Today, the region is characterized by a transportation network that connects New York City to the Jersey Shore with the North Jersey Coast Line operated by NJ TRANSIT, as well as connections to the Northeast Corridor to travel into Philadelphia on NJ TRANSIT or Amtrak. There are several primary roadways including the New Jersey Turnpike (I-95) and the Garden State Parkway.

As the region grew, the coast was dominated by large scale industrial uses, filling in much of the historic wetlands to make space for development. The RRBC region was a major producer of hosiery, musical strings, playing cards, ice, refrigeration equipment, and horseshoes. Although many of those industries have since left, their legacy of contamination remains. These areas are highly vulnerable to flooding today and contain contaminated soil due to both the fill material and industrial uses. While significant portions of the waterfront are still industrial, especially in Carteret, Perth Amboy, and Woodbridge, many parts of the industrial corridor are now recreation and preservation areas, commercial and residential neighborhoods, or brownfields in the process of being remediated and redeveloped.

The growth of manufacturing over the twentieth century in Middlesex County attracted many immigrants, increasing the size and diversity of the population. In 1900, the county’s population

reached almost 80,000. By the year 2000, this had expanded to over 750,000. Middlesex is now the second most populous county in New Jersey. The population grew as suburban residential communities proliferated, connected to job centers through regional rail and the Garden State Parkway. More recently, high density housing, mixed-use developments, and new types of industrial uses focused on warehousing and logistics have emerged.

Today, the RRBC region is varied and diverse with a population of over 300,000. The region is heavily interconnected along major transportation networks and waterbodies, home to a wide variety of cultures and industries. There is a mix of land uses, including large areas of residential development, active industrial corridors, greenways, and mid-sized parks. The region’s largest employers are in the healthcare, pharmaceutical, financial, and goods distribution industries.

The region lies at the intersection of three major watersheds—the Arthur Kill; the Monmouth; and the Lower Raritan, South River, and Lawrence—which can be subdivided further into smaller watershed areas based on topography. Watersheds often cross municipal and state boundaries, which can present a challenge when planning for flooding and risk reduction. Throughout the process of developing this plan, the project team examined issues and developed strategies at the watershed or regional scale to promote effective flood risk reduction.

The Resilient NJ RRBC region has been shaped geographically and culturally by the Raritan Bay. Its settlement was expedited by its positioning as a transportation hub, leading to further development. It serves as an entrance point to the rest of Middlesex County as well as a connection point with New York City and New England. The extensive wetlands, shown in blue hatched areas, line the coastline from Arthur Kill to Cheesequake State Park and beyond. The Bay continues to influence and shape the region today.

ROAD MAP OF THE STATE OF NEW JERSEY (1913)

PAST AND ONGOING FLOOD RISK

Thousands of residents in RRBC live in areas vulnerable to flooding. Related hazards include tidal flooding from coastal storm surge, coastal erosion, high tide flooding from sea level rise, riverine flooding, flooding from heavy rainfall, and for some areas, combined sewer overflows. The region has been experiencing flooding for decades, much of it caused by flash flooding from heavy rainfall and storm surges, oftentimes originating from tropical storms and hurricanes. Some notable pre-Hurricane Sandy flood events in the region over the past half a century include heavy rainstorm flooding in 1971, 1973, and 1975; Hurricane Gloria in 1985; severe storm and heavy rainfall flooding in 1992 and 1996; Hurricane Floyd in 1999; severe storms causing both inland and coastal flooding in 2007; severe storm flooding in 2010; and Hurricane Irene in 2011. In 2012, municipalities in the region experienced a major flood disaster during and after Hurricane Sandy. Hurricane Sandy caused power outages, damaged businesses and homes, and forced the evacuation of thousands of people. Since then, RRBC has experienced flooding from other storms, including multiple nor’easters in addition to Hurricanes Irene and Isaias. During Hurricane Ida, flash flooding from heavy rainfall overwhelmed the stormwater system. These recent major floods—combined with chronic flooding issues—have sparked more interest in increasing resilience in the region.

There have been numerous resilience-related planning efforts in RRBC since Hurricane Sandy, including the purchase of properties severely and repetitively damaged by storms and flooding through the state’s Blue Acres program. Since 2012, there have been more than 70 studies, reports, and action plans focused on the region, covering a wide range of topics. However, many residents, businesses, and community assets remain at high risk of flooding.

Climate change will increase risk as sea levels rise and the frequency and intensity of heavy precipitation events increases. Sea level rise will mean that when a coastal storm comes, the storm will reach further inland with higher flood depths. Increased heavy precipitation, meanwhile, will lead to more flooding in urban areas and the overflowing of rivers. While flooding will impact people of all types across the region, those with fewer resources or additional vulnerabilities face additional hardships. To help address these increasing risks, under the Governor Phil Murphy Administration, New Jersey has taken a proactive approach in preparing for climate change by introducing Executive Orders that create new statewide planning and policy mechanisms and require municipalities to consider climate change and resilience in their state-mandated master planning process. However, there is more work to be done to protect and transform these communities in response to changing climate conditions.

As part of the Resilient NJ program, the project team developed a detailed [Flood Impact Assessment](#) that summarizes what is likely to happen if nothing is done to protect the region from current and future flooding. This assessment evaluates the exposure of the region and expected impacts due to six different flood events representing a range of flood hazards including heavy rainfall flooding, coastal storm surge flooding, and high tide flooding.

Through the engagement process—detailed in the [Vision and Priorities report](#)—the project team collected an abundance of information about the region’s experiences with flooding. This feedback was integral to the development of this plan in a variety of ways, including by validating the results of the [Flood Impact Assessment](#) and helping finetune the recommended resilience actions.

Who and What May Be Impacted by Flooding?

Across All Flood Events Evaluated



1 of every 5 residents



14,000 buildings worth \$15 B



3,900 acres of park space



17% of daily economic output

WHAT FLOODING LOOKS LIKE IN RRBC: IDA IMPACTS

The RRBC region was substantially damaged by Tropical Storm Ida. Middlesex County declared a county-wide state of emergency due to widespread flooding and storm damage to every municipality. Streets were closed and barricades were put in place to ensure safety and monitor traffic. The Raritan River reached new highs that have not been seen in over 50 years. Recovery from the storm and its impacts continues and will take years.

Carteret Flooding



Source: *The Lakewood Scoop*

Hurricane Ida flooded the Carteret Yeshiva and surrounding areas. The Yeshiva, an important community asset in Carteret, experienced severe basement and first-floor flooding in its Main Building and dormitories. Carteret as a whole experienced 9” of rainfall.

Woodbridge Flooding



Source: *News 12*

As parts of the Raritan River flooded during Hurricane Ida, this image from Woodbridge shows the rising water levels submerging neighborhood backyards. Nearby in New Brunswick, residents were evacuated.



Source: *NJ Spotlight News*

In the aftermath of the September flooding devastation that Ida caused in Woodbridge, several flood victims have considered state buyouts of their properties. When Woodbridge asked homeowners there if they would consider selling their flood-prone houses through New Jersey’s Blue Acres program, many applied.

South River Flooding



Source: *Youtube*

In South River, the Causeway area of South River experienced significant flooding during Hurricane Ida. Barricades were placed to close the area to traffic. The road flooding due to the hurricane also limited area evacuation route access.



Middlesex County Flooding



Source: *News 12 Bronx | CBS New York*

Overall, Hurricane Ida impacted Woodbridge, Carteret, and South River most within the RRBC region. Throughout New Jersey, though, 30 people died as a result of the floods.



OUR PLANNING PROCESS

To develop an actionable roadmap for building resilience in the region, as outlined in the project’s mission statement, the project team took a multi-phase approach for the development of this Action Plan.

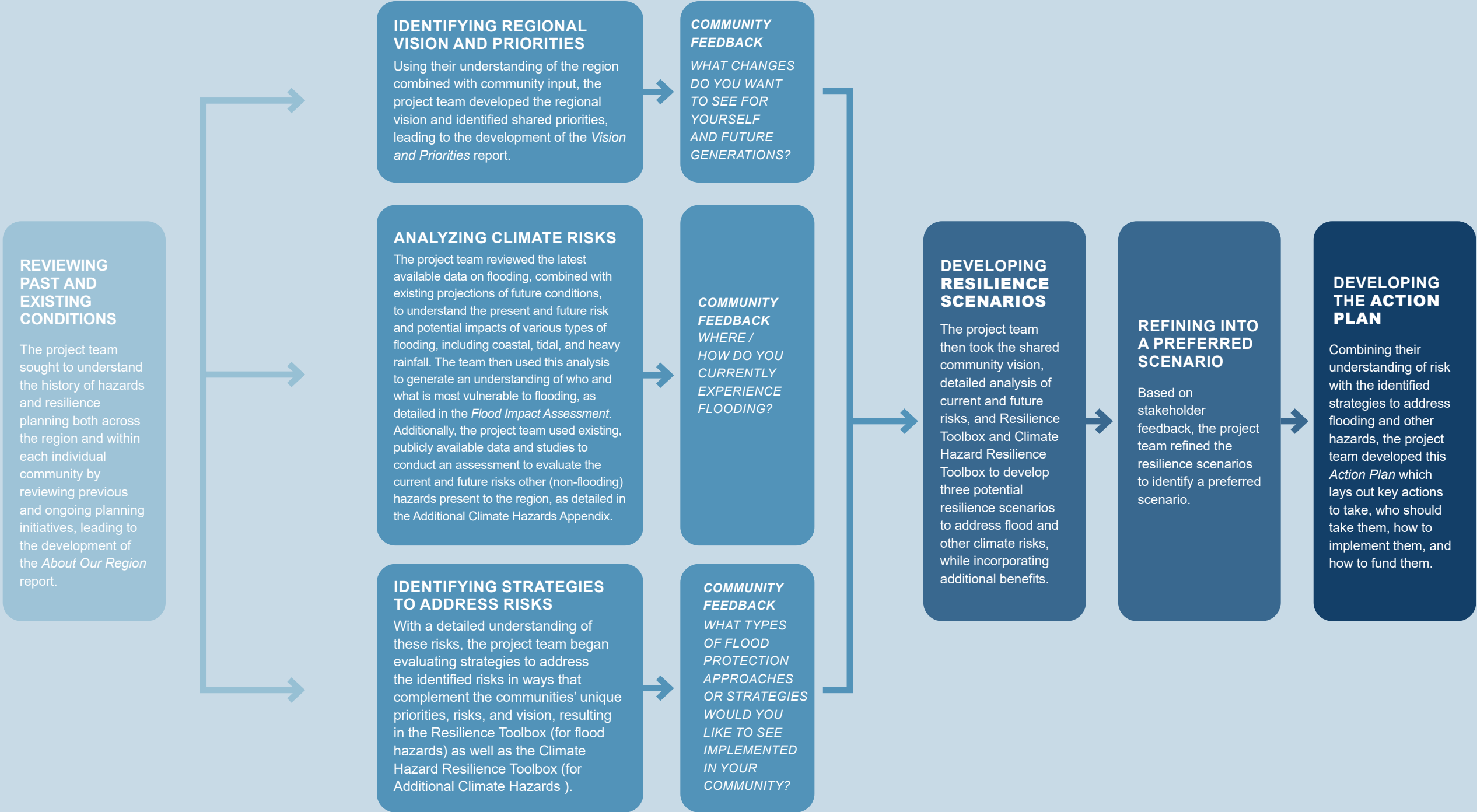
The planning process began in December 2020 with project kick-off, information gathering, and an existing conditions analysis. These steps informed the *Flood Impact Assessment* and the launch of the scenario development and evaluation process. In the spring and summer of 2022, the project team finalized the preferred scenario and recommended actions, with *Action Plan* development concluding the planning process. Throughout the planning process, community and stakeholder engagement guided the incorporation of community preferences, priorities, and values at every stage.

This *Action Plan* focuses in on the development of risk reduction actions and their implementation. Additional details about earlier project phases can be found in the following reports:

- *About Our Region*
- *Vision and Priorities*
- *Flood Impact Assessment*

These reports can be found online at <https://resilientnewjersey.com/resource-library>.

The RRBC resilience planning process included the steps outlined in the following diagram.

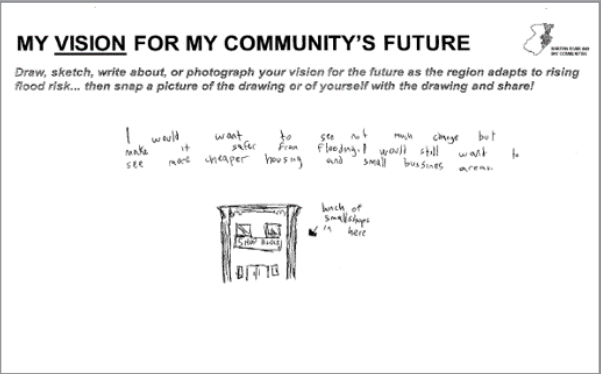


COMMUNITY ENGAGEMENT

Community engagement was an essential part of the planning process described above. Community members, local leaders, business owners, and other stakeholders in the RRBC region are the foremost experts on their communities. The project team actively sought community feedback during every step of developing this *Action Plan*, working to identify, reach out to, and incorporate feedback from diverse groups of people whose voices may have been unheard or undervalued in the past.

Throughout the RRBC engagement process, the support of the Steering Committee and the Middlesex County YMCAs has been critical for the project team in collecting valuable community feedback. In coordination with the Steering Committee and the YMCAs, the project team reached out to potential partner organizations the ensure the engagement effectively reached and spoke to a broader audience on a basis of mutual trust, collaboration, and joint knowledge production.

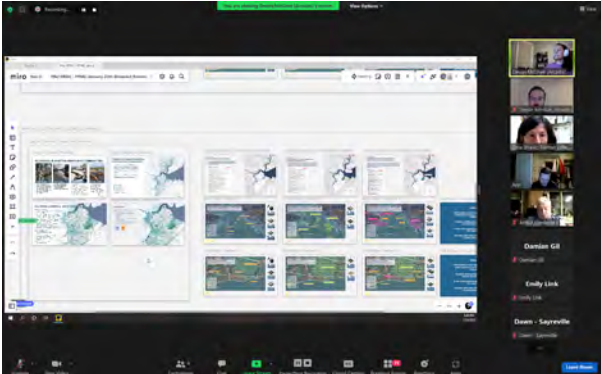
Review the [Vision and Priorities report](#) to learn more about community engagement efforts in the region through January 2022. See page 80 to learn more about community engagement in the region from February through June 2022.



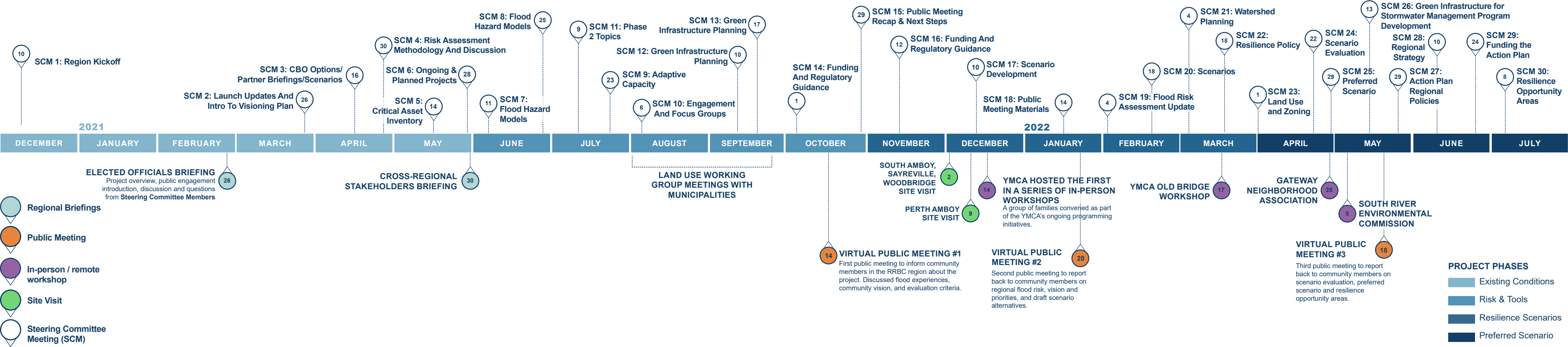
YMCA WORKSHOP WITH STUDENTS
Community-based organization YMCA hosted visioning workshops with students in December 2021.



OLD BRIDGE SCENARIO WORKSHOP
YMCA hosted workshops to discuss scenario alternatives with residents and city planners in March 2022.



VIRTUAL COMMUNITY MEETINGS
The project team organized three virtual community meetings to receive feedback on key project milestones.



To maximize community input and reach a diverse audience, the project team undertook a multi-pronged engagement strategy, which included:

- Hosting virtual community meetings
- Offering opportunities to get and receive information in multiple languages and multiple platforms
- Hosting community conversations at local community centers, like schools and neighborhood associations
- Handing out flyers and playing an informational video series on flood risk in the Raritan River YMCA's lobby
- Partnering with the YMCAs to host workshops with local organizations, including supporting a table at Healthy Kids Day, a presentation to the Weather Club at Perth Amboy Middle School, and a presentation to the Gateway Neighborhood Association in Perth Amboy
- Using Anytime Engagement platforms, which meet people where they are and expand public involvement opportunities beyond public meetings and facilitated conversations. This included an app for people to identify key locations in their communities, a project website with surveys and other information, and a project hotline and email address to submit questions and comments.

Through these engagement opportunities, the project team collaborated with RRBC communities to develop a shared regional vision for the future centered on community priorities. This vision ultimately guided the development of the strategies and actions recommended in this *Action Plan*. Further, much of the information gathered as part of this process was vital to the development of this report. Community members shared their specific experiences with flooding, their concerns about certain flood risk reduction strategies, other community concerns, and their ideas on how to address flooding. The project team learned that RRBC is a diverse region, with a range of cultural, racial, and ethnic groups, as well as a diversity of density, from rural areas to urban spaces. Many communities have strong social networks and deep roots, as many families have lived in the area for generations and developed a strong sense of community connectiveness that they hope to preserve. There are also many spaces that are essential to the communities in the region, including waterfront areas, parks, schools, firehouses, and libraries. These assets provide critical services and play important roles in how the region functions. The community expressed a desire to first and foremost addressing flooding concerns, but also placed strong value on the environment and expressed interest in preserving and expanding green spaces, increasing waterfront

access, reducing impervious surfaces, and remediating brownfields. The community also expressed a desire for the waterfront areas to serve as economic drivers with better access, amenities, and resilient development. Underpinning these concerns, the project team heard a desire to address quality of life issues, especially those associated with nearby industrial areas, access to community resources, and engaging and supporting under-resourced and historically marginalized populations.

REGIONAL RESILIENCE VISION



RARITAN RIVER AND BAY COMMUNITIES' VISION FOR THE FUTURE IS:

“A thriving region of interconnected watersheds, with complementary environmental, social, economic, and governance systems working together to reduce flood risk of communities and infrastructure, restore natural systems, and adapt to a changing climate.”



FLOODING

- Reduce risk in repetitive loss areas
- Implement resilience strategies that work with natural systems
- Improve communication for existing programs and policies
- Encourage grassroots advocacy and education



ENVIRONMENT

- Restore natural systems, including riparian and tidal zones
- Create more green spaces and conservation zones that support resilience
- Support green infrastructure investment



ECONOMY

- Create high quality green jobs and training opportunities
- Economic diversity and preservation of small businesses



SOCIAL

- Preserve sense of home, community, and cultural diversity
- Better access to parks and public spaces
- Improve environmental quality and well-being



INSTITUTIONAL GOVERNANCE

- Watershed-based planning in the multi-municipal region
- Greater public involvement and investment in relationship between government and community members



PHYSICAL INFRASTRUCTURE

- Flood proof critical utilities
- Improve access to transportation
- Improve pedestrian and biker infrastructure

PURPOSE OF THIS PLAN

Through the Resilient NJ program, the Raritan River and Bay Communities region has engaged in a stakeholder-guided process to become more resilient and improve quality of life for its more than 300,000 residents.

A culmination of these efforts, this *Action Plan*:

1. Summarizes the Resilient NJ program and resilience planning process undertaken in RRBC
2. Shares the outcomes and results of the program and process; and
3. Provides a roadmap for reducing flood and other climate risks and addressing critical issues in the region through identified resilience strategies and actions.

What This Plan Includes

This plan is intended to be an actionable roadmap, providing clear next steps that should be taken to implement the identified resilience actions. It builds off ongoing resilience planning within the region and incorporates the voices and needs of all members of the region, including the most vulnerable, to provide innovative and implementable strategies and actions that increase long- and short-term resilience and enhance the value and integrity of the ecological, recreational, and economic resources of the region.

The plan is organized into the following chapters:

- **Project Background & Objectives** – Provides an overview of the Resilient NJ program, our understanding of the RRBC region and its history, and a summary of the planning process undertaken to complete this plan
- **Summary of Climate Impacts in the Region** Summarizes key findings of the flood impact and additional climate hazards assessment which provided the basis of our understanding of current and future risks in the region
- **Three Pathways to a More Resilient Region Scenario Development and Evaluation** Details the scenario development and evaluation process undertaken to weigh the pros and cons of three potential approaches and develop the preferred scenario
- **Resilience Action Plan Implementation Framework** – Provides an overview of the preferred scenario, details recommended strategies and actions at the regional and sub-watershed scales, and outlines a roadmap to implement the identified actions

CHEESEQUAKE STATE PARK, OLD BRIDGE



To help strengthen RRBC communities’ resilience to future storms and other extreme events, this plan equips the public, community-based organizations, RRBC municipalities, Middlesex County, and the State of NJ with targeted strategies and actions. The strategies and actions included in this plan were informed by community feedback solicited throughout the project and are responsive to community priorities by aiming to provide multiple benefits beyond flood risk reduction. Recommended strategies span three broad approaches:

- 1. Policy and governance
- 2. Physical and nature-based infrastructure
- 3. Outreach, education and capacity building

Strategies and actions included in this plan are presented at three scales:

- 1. **Regional** – Regional strategies are relevant across the region, may be led by a county or state entity, and/or likely benefit from ongoing coordination of various entities within the region. Within the regional strategies included in this *Action Plan*, priority actions have been identified that should be implemented in the near-term. The regional resilience strategies recommended fall under 9 strategy types that have applicability across the region, such as coastal resilience, stormwater management, and zoning and land use. Within the regional strategies, the project team has identified priority actions that should be implemented in the near-term.
- 2. **Sub-Watershed** – Various combinations of regional strategies can be applied at the sub-watershed scale, based on unique land use characteristics and shared risks within each sub-watershed. Strategies can work together at this scale to address multiple risks and

provide additional benefits. Sub-watersheds cross municipal jurisdictional boundaries, demonstrating how collective regional action is necessary to proactively address shared flood risks.

- 3. **Resilience Opportunity Areas** – Within the sub-watersheds, the project team zoomed in on local Resilience Opportunity Areas as specific geographies where there are significant risks to populations and critical assets. Within these Opportunity Areas, this *Action Plan* recommends a series of targeted actions to be implemented by multiple entities. The intent of these areas is to demonstrate how coordinated actions across jurisdictions can result in improved resilience and other improvements. Taking actions in these areas can also be a catalyst to advancing additional related actions across the region.

The magnitude of flood and other climate risks in the RRBC region both today and in the future demands coordinated action at multiple scales by every level of government. To aid in the implementation of the many actions identified, this plan identifies immediate next steps, lead entities, necessary partners, costs, and potential funding sources for each action.

The strategies and actions included in this plan equip the RRBC region with the projects, programs, and policies needed to build resilience and adapt to a changing climate. As the strategies and actions included in this plan are implemented over the next 3, 5, or 10 years, RRBC will reduce flood and other climate risks to communities and infrastructure, restore natural systems, and realize the vision of a thriving region of interconnected watersheds with environmental, social, economic and governance systems that work together to meet shared goals.

REGIONAL

Strategies applicable across the region

SUB-WATERSHED

Strategies requiring municipal coordination

RESILIENCE OPPORTUNITY AREA

Strategies implemented by multiple entities to systematically build resilience



AERIAL VIEW OF RARITAN RIVER AND BAY
Image Credit: Doc Searls Via Flickr