New York State
Climate Smart Communities

Climate Smart Resiliency Planning

A Planning Evaluation Tool
for
New York State Communities

Climate Smart Communities is a program of the New York State departments of Environmental Conservation, Health, State and Transportation; State Public Service Commission; and State Energy Research and Development Authority.

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New York State Climate Smart Communities: Climate Smart Resiliency Planning

A Planning Evaluation Tool for New York State Communities

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Introduction

As disaster response and recovery have become increasingly more expensive, federal and state policies can be expected to mandate strong coastal and floodplain construction standards and pre-disaster mitigation planning in order for municipalities to secure hazard mitigation funding. However, local decision makers have the greatest capacity to influence the resiliency of their communities. Typically, they are the first to respond to a disaster, and understand the physical and social characteristics of the community. They also have the most direct authority and responsibility to ensure the health, safety and welfare of their constituents. Historically, communities have merely responded to the effects of natural hazards, but now more than ever, local governments have the responsibility to take a more aggressive stance toward reducing their vulnerability to disasters.

Increasingly, communities–especially those in coastal areas–are moving from a strategy of response to a proactive stance of planning, public education, and disaster preparedness to ensure their infrastructure and community members are capable of coexisting with the dynamics of the environment. Communities can work toward climate resilience through strong leadership, citizen engagement, interdepartmental collaboration, and interdependence. Unfortunately, building resilience is often a challenge because the responsibilities of limiting hazard exposure, reducing vulnerability, assessing risk, and responding and adapting quickly to changes are dispersed among many local departments and offices. Because communities often struggle to identify opportunities to improve resilience, the New York State Climate Smart Communities program[1] has developed *Climate Smart Resiliency Planning*, a facilitated questionnaire that is designed to stimulate ideas and collaboration among local decision makers[2].

Many municipal planning documents attempt to identify and mitigate the hazards of coastal flooding, storm surge and other climate hazards. This document is intended to be used by municipal decision makers who are familiar with the planning documents in their community. The tool will be most useful to a team, led by a knowledgeable facilitator, to identify the planning documents that already exist, necessary modifications and missing plans that should be completed. Individual staff members could complete some aspects of the assessment independently; others likely require a facilitated group discussion so that team members can understand the content, overlaps and gaps of the various planning documents.

The desired outcome is for the municipal staff to work collaboratively across departments to recognize the opportunities to enhance community resilience in existing documents and to begin to create a set of integrated planning documents that identify vulnerabilities, assess risk and mitigate hazards. Resources to help in this effort are provided throughout the document and in the final section. Resources explain plans, tools, training courses, model ordinances, best management practices and grant programs that can help lead communities to resilience.

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[1] The New York State Climate Smart Communities program in a joint effort of the State Energy Research and Development Authority, Public Service Commission, and departments of Environmental Conservation, Health, State, and Transportation.

[2] *Climate Smart Planning* is based on Getting to Resilience: A Coastal Community Resilience Evaluation Tool, New Jersey Department of Environmental Protection. http://www.nj.gov/dep/cmp/docs/gtr-resilience.pdf

Make Your Planning Climate Smart

Step 1. Identify climate hazards. Online flood mappers will help you visualize your community's susceptibility to flooding and sea level rise. Other resources are available to help you understand other climate-change effects.

Step 2. Assemble municipal plans. The community plan checklist in Section 1 includes a list of municipal plans and other documents that may assist you in completing your evaluation.

Step 3. Complete the evaluation. Identify planning, hazard mitigation and adaptation opportunities to reduce vulnerability to flooding and other climate hazards and build capacity for community resilience.

Step 4. Explore related resources. The *Climate Smart Resiliency Planning* questionnaire includes active links to helpful resources. Additional resources are provided in the Resources section.

Frequently Asked Questions

Why should I care about future vulnerability?

Higher tides and more frequent flooding incidents are becoming more and more regular. Sea level rise will intensify the effects of coastal storms. Other climate hazards, e.g., extreme heat are projected to occur more frequently and severely. Planning for future impacts will enable our communities to be prepared and more resilient.

Why is this worth my time?

Planning for the future and being prepared is always a good practice for municipalities. The results of the questionnaire can strengthen all-hazards, emergency-operations and other plans by ensuring they incorporate the best information available about future climate hazards. Ultimately being prepared will save lives and money.

What is the purpose of the self-assessment tool?

Climate Smart Resiliency Planning was developed as a non-regulatory tool to help local decision makers identify planning and adaptation opportunities to reduce their community's vulnerability to climate hazards, such as including extreme precipitation, flooding, storm surge, sea level rise, extreme heat, heat waves and drought. The tool is intended to initiate a facilitated discussion among local decision makers with the objective of identifying opportunities to improve local planning through incorporation of climate change considerations. The self-assessment tool highlights the importance of local plan integration and consistency with municipal building codes and ordinances. By completing this self-assessment, local leaders can identify means to improve their resilience through existing planning, outreach, hazard mitigation, and response mechanisms.

Who should use the self-assessment tool?

Climate Smart Resiliency Planning was designed to assist local decision makers in identifying opportunities to improve resilience through existing planning mechanisms, public engagement,

and disaster preparedness; the following individuals should be involved in the completion of the self-assessment tool:

-Land-use Planners
-Hazard-mitigation Planners
-Floodplain Managers
-Emergency Managers
-Drinking Water Managers
-Stormwater Managers
-Natural Resource Planners
-Municipal Engineers
-Town Administrators
-Wastewater Managers

A community may also include municipal leaders, zoning and permitting officials, public works officials, and civic and business organizations in the completion of the self-assessment tool. All participants should be well informed of local plans, ordinances, and hazard outreach efforts.

What will I need?

To complete this questionnaire your community will need access to your local plans e.g., land-use plans, emergency-operations plan, evacuation plan, hazards-mitigation plan. The checklist reviews the documents that may assist in the completion of the questionnaire.

What if I don't know all the answers?

It is not expected that one person from a municipality will know all the answers. The questionnaire is structured to be completed by a team of individuals, each of whom has knowledge about at least one of your community's plans and documents.

How will I know my community's vulnerability?

Planners should review the information in the section, Understanding Current and Future Risk, to understand future vulnerability, map future flood-risk areas and use those maps to help plan and prepare for the future.

How do I use the self-assessment tool?

The *Climate Smart Resiliency Planning* self-assessment tool is designed to be completed as part of a facilitated exercise among a diverse team of local decision makers. Local land-use planners, hazard-mitigation planners, floodplain managers, emergency managers, stormwater managers, and natural-resource planners are especially important to include within the team. In some cases, county officials may participate on municipal (i.e., town, city and village) teams as they are responsible for the creation of inter-jurisdictional plans. In the case where one local decision maker plays multiple roles within the community, fewer people would be included on the team. Ultimately, participants should have the knowledge and skill sets that coincide with the sections of the self-assessment tool.

Municipal officials should be made to understand that they are responsible for not only participating in the dialogue but for addressing planning gaps and vulnerabilities discovered during the *Climate Smart Resiliency Planning* process.

The municipal chief executive officer or person with similar authority should designate the facilitator. The facilitator should be able to help the members recognize planning gaps and community vulnerabilities. To expedite the completion of the self-assessment tool, the facilitator should share the self-assessment tool with the team prior to the initial meeting and ask them to

gather as much information prior to the meeting as possible. The facilitator should begin the initial meeting by describing the purpose of the self-assessment tool: to facilitate a dialogue among community leaders and identify options to improve local resilience to coastal hazards. The facilitator should identify how each section contributes to building local community resilience. Each question can be answered with a 'yes' or 'no' response. The form also provides a "Notes" column in which members can indicate that the question is not applicable to their community, do not know the answer or are presently pursuing the action identified in the question. The self-assessment tool is divided into six parts, and each section may be completed in as little as fifteen minutes or as long as two hours, depending upon the generated group dialogue. The facilitator and team may opt to administer the self-assessment tool over a series of meetings.

After the completion of each section, the facilitator should provide the participants with a brief summary of their responses, and identify positive local actions and opportunities to improve resilience. The responses within each section should clearly identify opportunities to improve resilience through planning, public engagement, emergency preparedness, response and recovery, and hazard mitigation. Participants should use the results of *Climate Smart Resiliency Planning* to inform future decision making and identify plans that should be updated. Participants can also use the hyperlinks within this self-assessment tool to explore existing decision-support tools, training courses, model ordinances, best management practices, and grant programs that can help lead communities to resilience.

How was this self-assessment tool developed?

Climate Smart Resiliency Planning represents the compiled efforts of many academics, international, federal and state agencies, planning practitioners and other experts in land-use plan development and design, hazard mitigation and planning, and coastal resilience. While there are many checklists, self-assessment tools, and guidebooks that focus on a specific aspect of building resilience, few of these tools focus on the necessary interrelationships among land-use planning, hazard mitigation, emergency management and resource management. *Climate Smart Resiliency Planning* highlights many of the key components of existing local government planning, hazard, and emergency response evaluation tools in a brief and easy to administer self-assessment tool.

How is this self-assessment tool organized?

Climate Smart Resiliency Planning is comprised of six sections: Preparing for the Assessment, Risk and Vulnerability Assessments, Public Engagement, Planning Integration, Emergency Preparedness and Recovery, and Hazard Mitigation and Implementation. Questions are numbered in outline form so that questions related to a question at one level are "nested" below that question at a slightly indented lower level. If the answer to a question is "no," users may skip any following lower level questions nested under that question.

Section 1: Preparing for the Assessment

Organizing the correct team and locating necessary documents before beginning the self-assessment will make the process much more efficient.

Section 2: Risk and Vulnerability Assessments

Identifying risks and vulnerabilities within a community is the first step in reducing hazards. This section addresses mapping risks and vulnerabilities. Floodplain managers and the local emergency manager will likely be the representatives to spearhead this discussion. The goal of this section is to introduce a dialogue about the importance of having baseline hazard-assessment data and ensuring this information is shared among various decision makers within the community.

Section 3: Public Engagement

Establishing a rapport with local residents and business owners is an integral part of reducing vulnerability within a community. Residents and business owners not only have an array of local knowledge on previous storm and natural hazard effects; they are also the target audience to educate about disaster preparedness, recovery and mitigation. Including stakeholders in planning processes is yet another way to build capacity for a resilient community.

Section 4: Planning Integration

New York communities are responsible for completing numerous planning documents that have various update frequency requirements. By incorporating hazard-assessment knowledge into existing long-range planning documents, local governments can substantially reduce their vulnerability to climate hazards.

Section 5: Emergency Preparedness and Recovery

Making pre-disaster decisions to improve the effectiveness of response and recovery is especially important to reducing the loss of lives and decreasing the amount of time it takes to recover from hazard events, like nor'easters or hurricanes. The involvement of emergency managers will be crucial to the completion of this section, but other community leaders should be involved in completing this section as well.

Section 6: Hazard Mitigation

In the past, floodplain and emergency response managers have taken the strongest lead in reducing vulnerability. Today, it is widely accepted that reducing vulnerability is the responsibility of numerous municipal decision makers, from building code officials to resource managers pursuing restoration projects. The completion of this section will involve all participants.

Climate Change in New York

In 2011, the New York State Energy Research and Development Authority (NYSERDA) released the first comprehensive assessment of the projected effects of climate change on the state's critical systems and natural resources over the next century.[3] *ClimAID: the Integrated Assessment for Effective Climate Change Adaptation Strategies in New York State* was compiled by more than 50 scientists to serve as a critical tool for planners, policymakers, farmers, local governments and residents planning for New York State's future.

The report provides projections of several key climate variables in seven geographic regions of New York, assesses the projected effects of climate change in eight sectors (water resources, coastal zone, ecosystems, agriculture, energy, transportation, telecommunications and public health), and provides recommendations for adapting to the predicted changes.

Among ClimAID's most important findings:

Observed Climate Change

- Annual average temperatures have risen about 2.4 °F. since 1970, with winter warming exceeding 4.4 °F.
- Sea level along New York's coastline has risen about a foot since 1900.
- Intense precipitation and heavy downpours have increased in recent decades.

Climate Projections

Without a dramatic decrease in the global generation of greenhouse gases like carbon dioxide, critical changes can be expected in New York's climate over the next century:

- Annual average temperatures in New York State will rise by 4 to 9 °F. by about 2080.
- Average precipitation will increase five to 15 percent by about 2080, with most of the increase in winter. Intense downpours will become more frequent.
- Short-term droughts will become more frequent.
- The number and duration of extreme heat events will increase.
- Along the seacoast and tidal portion of the Hudson River (to the Federal Dam at Troy), sea level could rise more than four feet by 2090.

Climate Change Effects

The projected changes in climate will have effects on New Yorkers and many New York State natural and economic resources:

Natural resources (ecosystems, agriculture and water resources)

- Increased flooding affecting ecosystems, communities, and infrastructure.
- Reduced summer flows and lowered groundwater leading to water-use conflicts.

[3] http://nyserda.ny.gov/Publications/Research-and-Development/Environmental/EMEP-Publications/Response-to-Climate-Change-in-New-York.aspx

- Negative effects on native coldwater fish due to increased water temperatures.
- Widespread shifts in species composition in the state's forests and expansion of some invasive species into New York.
- Diminished recreational opportunities because of reduced snow cover and reduced water supply and quality.
- Lost agricultural and forest productivity from temperature stresses, summer drought and invasive species.

Coastal zone

- Sea level rise, leading to permanent inundation of low lying areas, increased beach erosion, reduction of coastal wetland area and species, and flood events that are more frequent and more destructive.

Infrastructure (energy, transportation, telecommunications)

- Disruption of water, transportation, communication and energy systems due to extreme weather.

Public health

- Expansion of vector-borne diseases affecting humans, livestock and wildlife.
- Heat waves leading to increased illness and deaths from heat stress.
- Increased levels of air pollution, causing asthma and other respiratory illness.

All of these effects will be felt most strongly in the local communities where New Yorkers live, work and play. Response to extreme events, especially coastal storms, riverine flooding, and extreme heat will require increasing investment of municipal resources. Determining how these effects are likely to affect your community is discussed in the Climate Change and Coastal Flooding, and Understanding Current and Future Risk sections.

Climate Change and Coastal Flooding

Increased temperatures are predicted to lead to increasing rainfall intensity during severe storms. Additionally, warmer ocean temperatures could increase the intensity of tropical storms and hurricanes that, in turn, could increase flood and wind damages. Factors such as rising sea levels, disappearing wetlands and increased coastal development threaten to intensify the damage caused by hurricanes and tropical storms.

Increasing rainfall intensity during severe storms is also predicted to lead to increased flooding of interior rivers and streams. Flood levels once considered the 100-year flood (i.e., occurring, on average, once every 100 years or having a 1-percent chance of occurring in any given year) are now occurring with much higher frequency. Factors such as increased impervious surface and floodplain development lead to even more intense flooding and vulnerable human populations.

Is Sea Level Rising?

Yes, sea-level rise is a physical reality that is affecting New York and the entire Mid-Atlantic coastline. The historical rate of sea level rise along the New York coast over the past half century was 3-4 mm/yr (or 0.12 -0.16 in/yr), while future rates of rise are expected to increase. This

means that by mid-century sea level is expected to rise by as much as 29 inches and by up to six feet by 2100 along the New York coast.

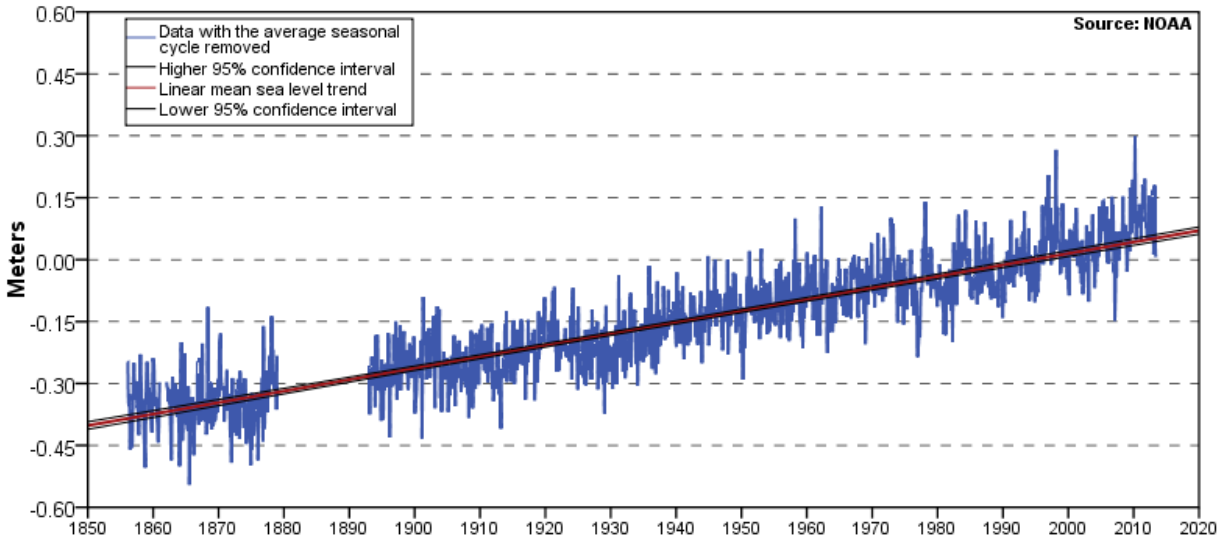

Fig. 1. The trend in sea level at the Battery, New York City. Graphic Credit: NOAA (http://tidesandcurrents.noaa.gov/sltrends/sltrends_station.shtml?stnid=8518750)

Sea-level rise increases the vulnerability of coastal areas to flooding during storms for several reasons. First, a given storm surge from a hurricane or northeaster builds on top of a higher base of water. Second, greater shoreline erosion increases vulnerability to storms by removing the beaches and dunes that would otherwise protect coastal property from storm waves.

Why is Sea Level Rising?

Global sea level and the Earth's climate are closely linked. The Earth's climate has warmed about 1.8°F during the last 100 years. The two major causes of global sea level rise are thermal expansion of the oceans (water expands as it warms) and the loss of land-based ice due to increased melting. Portions of the New York coast, in particular the area south of Kingston, New York City and Long Island, are subsiding, further exacerbating sea-level rise. In addition, oceanographic effects due to shifting of the Gulf Stream will potentially affect sea level in this region.

Global sea level is projected to rise during the 21st century at a greater rate than during 1961 to 2003. Thermal expansion is currently contributing about half of the average rise, but land ice will lose mass increasingly rapidly as the century progresses. It is uncertain how much of the current land ice located in the Antarctic and Greenland ice sheets may melt.

How Do Tidal Cycles Affect Coastal Flooding?

Each month at the time of the new and full moons, especially strong tides (called spring tides) occur resulting in higher highs and lower low waters. A king tide is an especially high tide that occurs when the gravitational pull of the sun and moon reinforce one another. This extra-high

tide happens twice a year at the times when the moon is closest to the earth. King tides can be 2-3 feet above mean higher high water and further exacerbate coastal flooding.

For Additional Information

Federal Emergency Management Agency. 1991. Projected Impact of Relative Sea Level Rise on the National Flood Insurance Program. 70 pp. http://www.gpo.gov/fdsys/pkg/CZIC-hg9983-p76-1991/html/CZIC-hg9983-p76-1991.htm

IPCC, 2007: Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M.Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA. http://www.ipcc.ch/publications_and_data/publications_and_data_reports.shtml#1

National Oceanic & Atmospheric Administration. Ocean & Coastal Resource Management Coastal Issues: Climate Change. http://coastalmanagement.noaa.gov/climate.html

Rignot, E., I. Velicogna, M.R. van den Broeke, A. Monaghan and J. Lenaerts. 2011. Acceleration of the contribution of the Greenland and Antarctic ice sheets to sea level rise. Geophysical Research Letters 38: L05503.

U.S. Environmental Protection Agency. Climate Change Impacts and Adapting to Change. http://www.epa.gov/climatechange/impacts-adaptation/

Understanding Current and Future Risk

Answering the questions posed by the Climate Smart Resiliency Planning questionnaire will require you to know your community's current and future risk of flooding and other climate hazards. Although the science of projecting future climate change and likely effects is not perfect, it is improving and can provide a sound basis for adaptation planning.

The ClimAID report[4] provides the most comprehensive assessment of climate hazards likely to affect New York State. The report provides projections of changes in temperature, precipitation, sea-level rise and frequency of extreme events for seven regions of the state. ClimAID tables showing baseline and projected mean annual changes, and projections of extreme events are provided below.

[4] *ClimAID: the Integrated Assessment for Effective Climate Change Adaptation Strategies in New York State*. www.nyserda.ny.gov/climaid

Table 1. Baseline climate and mean annual changes for the seven ClimAID regions of New York State.

Region Stations		Baseline[1] 1971-2000	2020s	2050s	2080s
1 Buffalo, Rochester, Geneva, Fredonia	Air temperature Precipitation	48°F 37 in	+1.5 to 3.0°F[2] 0 to +5%	+3.0 to 5.5°F 0 to +10%	+4.5 to 8.5°F 0 to +15%
2 Mohonk Lake, Port Jervis, Walton	Air temperature Precipitation	48°F 38 in	+1.5 to 3.0°F 0 to +5%	+3.0 to 5.0°F 0 to +10%	+4.0 to 8.0°F +5 to 10%
3 Elmira, Cooperstown, Binghamton	Air temperature Precipitation	46°F 38 in	+2.0 to 3.0°F 0 to +5%	+3.5 to 5.5°F 0 to +10%	+4.5 to 8.5°F +5 to 10%
4 Central Park, LaGuardia Airport, Riverhead, Bridgehampton	Air temperature Precipitation	53°F 47 in	+1.5 to 3.0°F 0 to +5%	+3.0 to 5.0°F 0 to +10%	+4.0 to 7.5°F +5 to 10%
5 Utica, Yorktown Heights, Saratoga Springs, Hudson Correctional Facility	Air temperature Precipitation	50°F 51 in	+1.5 to 3.0°F 0 to +5%	+3.0 to 5.5°F 0 to +5%	+4.0 to 8.0°F +5 to 10%
6 Boonville, Watertown	Air temperature Precipitation	44°F 51 in	+1.5 to 3.0°F 0 to +5%	+3.0 to 5.5°F 0 to +10%	+4.5 to 9.0°F +5 to 15%
7 Wanakena, Indian Lake, Peru	Air temperature Precipitation	42°F 39 in	+1.5 to 3.0°F 0 to +5%	+3.0 to 5.5°F 0 to +5%	+4.0 to 9.0°F +5 to 15%

[1] The baselines for each region are the averages of the values across all stations in the region.
[2] Shown is the central range (middle 67%) of values from model-based probabilities; temperature ranges are rounded to the nearest half-degree and precipitation to the nearest 5%.
Source: Columbia University Center for Climate Systems Research. Data are from USHCN and PCMDI.

Table 2. Baseline and projected changes in frequency of severe weather events in seven ClimAID regions of New York State.

Rochester (Region 1). Full range of changes in extreme events: minimum, (central range), and maximum.					
	Extreme event	Baseline	2020s	2050s	2080s
Heat Waves & Cold Events	Number of days per year with maximum temperature exceeding				
	90°F	8	8 (10 to 17) 23	12 (17 to 30) 44	16 (22 to 52) 68
	95°F	0.8	0.9 (2 to 4) 6	2 (3 to 9) 17	3 (6 to 22) 38
	Number of heat waves per year	0.8	0.9 (1 to 2) 3	2 (2 to 4) 6	2 (3 to 7) 8
	average duration	4	4 (4 to 5) 5	4 (4 to 5) 5	4 (4 to 5) 7
	Number of days per year with min. temp. $\leq$ 32°F	133	76 (90 to 103) 108	76 (90 to 103) 108	53 (75 to 97) 106
Intense Precipitation	Number of days per year with rainfall exceeding				
	1 inch	5	3 (4 to 5) 6	3 (4 to 6) 7	3 (4 to 6) 7
	2 inches	0.6	0.4 (0.5 to 0.7) 0.9	0.3 (0.5 to 0.8) 1	0.2 (0.5 to 1) 1

Port Jervis (Region 2). Full range of changes in extreme events: minimum, (central range), and maximum.

	Extreme event	Baseline	2020s	2050s	2080s
Heat Waves & Cold Events	Number of days per year with maximum temperature exceeding				
	90°F	12	12 (14 to 24) 34	16 (22 to 40) 53	21 (28 to 65) 75
	95°F	2	2 (2 to 5) 10	3 (5 to12) 20	4 (7 to 28) 39
	Number of heat waves per year	2	2 (2 to 3) 5	2 (3 to5) 7	3 (4 to 9) 10
	average duration	4	4 (4 to 5) 5	5 (5 to 5) 6	5 (5 to 6) 8
	Number of days per year with min. temp. ≤ 32°F	138	101 (111 to 121) 128	70 (91 to 111) 115	57 (70 to 101) 112
Intense Precipitation	Number of days per year with rainfall exceeding				
	1 inch	12	10 (11 to 13) 14	10 (12 to 14) 14	10 (12 to14)15
	2 inches	2	1 (2 to 2) 3	1 (2 to 3) 3	1 (2 to 3) 3

Elmira (Region 3). Full range of changes in extreme events: minimum, (central range), and maximum.

	Extreme event	Baseline	2020s	2050s	2080s
Heat Waves & Cold Events	Number of days per year with maximum temperature exceeding				
	90°F	10	11 (14 to 19) 25	15 (21 to 33) 45	19 (26 to 56) 70
	95°F	1	2 (2 to 4) 7	2 (4 to10) 18	4 (7 to 24) 38
	Number of heat waves per year	1	1 (2 to 3) 3	2 (3 to 4) 6	2 (3 to 8) 9
	average duration	4	4 (4 to 5) 5	4 (4 to 5) 5	4 (5 to 5) 7
	Number of days per year with min. temp. ≤ 32°F	152	116 (122 to 124) 145	86 (106 to 122) 168	68 (87 to 114) 124
Intense Precipitation	Number of days per year with rainfall exceeding				
	1 inch	6	5 (6 to 7) 8	5 (6 to 7) 8	5 (6 to8)10
	2 inches	0.6	0.5 (0.6 to 0.9) 1	0.5 (0.6 to 1) 1	0.4 (0.7 to 1) 2

New York City (Region 4). Full range of changes in extreme events: minimum, (central range), and maximum.

	Extreme event	Baseline	2020s	2050s	2080s
Heat Waves & Cold Events	Number of days per year with maximum temperature exceeding				
	90°F	19	20 (23 to 31) 42	24 (31 to 47) 58	31 (38 to 66) 80
	95°F	4	4 (9 to 18) 28	6 (9 to18) 28	9 (12 to 32) 47
	Number of heat waves per year	2	3 (3 to43) 6	3 (4 to 6) 7	4 (5 to 8) 9
	average duration	4	4 (5 to 5) 5	5 (5 to 5) 6	5 (5 to 7) 8
	Number of days per year with min. temp. ≤ 32°F	72	48 (53 to 62) 66	31 (45 to 54) 56	22 (36 to 49) 56
Intense Precipitation	Number of days per year with rainfall exceeding				
	1 inch	14	11 (13 to 15) 16	11 (14 to 16) 16	11 (14 to 16)17
	2 inches	3	2 (3 to 4) 5	3 (3 to 4) 5	2 (4 to 5) 5

Saratoga Springs (Region 5). Full range of changes in extreme events: minimum, (central range), and maximum.

	Extreme event	Baseline	2020s	2050s	2080s
Heat Waves & Cold Events	Number of days per year with maximum temperature exceeding				
	90°F	10	11 (14 to 20) 28	17 (20 to 35) 49	18 (26 to 60) 75
	95°F	1	1 (2 to 4) 7	3 (3 to10) 18	3 (6 to 25) 42
	Number of heat waves per year	2	2 (2 to 3) 4	3 (3 to 5) 7	3 (4 to 8) 9
	average duration	4	4 (5 to 5) 5	4 (4 to 5) 6	4 (5 to 6) 9
	Number of days per year with min. temp. ≤ 32°F	134	121 (128 to 139) 147	92 (111 to 127) 135	78 (90 to 120) 131
Intense Precipitation	Number of days per year with rainfall exceeding				
	1 inch	10	8 (10 to 11) 12	9 (10 to 11) 12	10 (10 to 12)14
	2 inches	1	1 (1 to 2) 2	1 (1 to2) 2	1 (1 to 2) 2

Watertown (Region 6). Full range of changes in extreme events: minimum, (central range), and maximum.

	Extreme event	Baseline	2020s	2050s	2080s
Heat Waves & Cold Events	Number of days per year with maximum temperature exceeding				
	90°F	3	2 (4 to 7) 11	5 (8 to 17) 27	8 (12 to 36) 52
	95°F	0	0 (0.1 to 0.9) 2	0.2 (0.6 to3) 7	0.8 (2 to 11) 23
	Number of heat waves per year	0.2	0.2 (0.4 to 0.9) 1	0.6 (0.8 to 2) 4	0.6 (1 to 4) 6
	average duration	4	3 (4 to 5) 5	3 (4 to 4) 5	4 (4 to 5) 7
	Number of days per year with min. temp. ≤ 32°F	147	114 (120 to 130) 140	93 (108 to 121) 126	78 (91 to 114) 122
Intense Precipitation	Number of days per year with rainfall exceeding				
	1 inch	5	5 (6 to 8) 9	6 (6 to 8) 9	5 (7 to 10)11
	2 inches	0.8	0.4 (0.6 to 0.9) 1	0.5 (0.6 to1) 1	0.3 (0.6 to 1) 2

Indian Lake (Region 7). Full range of changes in extreme events: minimum, (central range), and maximum.

	Extreme event	Baseline	2020s	2050s	2080s
Heat Waves & Cold Events	Number of days per year with maximum temperature exceeding				
	90°F	0.3	0.3 (0.5 to 1) 2	0.5 (1 to 5) 7	1 (2 to 13) 23
	95°F	0	0 (0 to 0.1) 0.2	0.1 (0.1 to 0.3) 0.6	0.1 (0.2 to 2) 6
	Number of heat waves per year	0	0 (0 to 0.1) 0.2	0 (0.1 to 0.6) 0.7	0.1 (0.2 to 2) 3
	average duration	3	3 (3 to 3) 4	3 (3 to 4) 4	3 (4 to 4) 5
	Number of days per year with min. temp. ≤ 32°F	193	155 (166 to 177) 184	125 (146 to 163) 173	108 (124 to 156) 166
Intense Precipitation	Number of days per year with rainfall exceeding				
	1 inch	7	6 (7 to 8) 10	6 (7 to 9) 10	6 (7 to 10)11
	2 inches	0.8	0.4 (0.7 to 1) 1	0.6 (0.7 to1) 2	0.6 (0.8 to 1) 2

Notes:
The values in parentheses indicate the central 67% range of the projected model-based changes to highlight where the various global climate model and emissions scenario projections agree. The minimum values of the projection are the first number in each cell and maximum values of the projections are the last numbers in each cell.

The central range refers to the middles 67% of values from model-based probabilities across the global climate models and greenhouse gas emissions scenarios.

Decimal places shown for values less than 1, although this does not indicate higher precision or certainty. The high precision and narrow range shown here are due to the fact that these results are model based. Due to the multiple uncertainties, actual values and ranges are not known to the level of precision shown in this table.

Heat waves are defined as three or more consecutive days with maximum temperature exceeding 90°F.

Source: Columbia University Center for Climate Systems Research. Data are from USHCN and PCMDI.

In 2013, the New York Panel on Climate Change updated the ClimAID projections for the five boroughs of New York City as part of the city's post-Sandy Special Initiative for Rebuilding and Resiliency[5]. These updated projections of baseline and mean annual climate changes, and extreme events are provided in tables 3 and 4, respectively.

Table 3. Updated baseline climate and mean annual changes for New York City.

Air temperature **Baseline (1971 -2000) 54°F**	Low estimate (10th percentile)	Middle range (25th to 75th percentile)	High estimate (90th percentile)
2020s	+1.5°F	+2.0 to +3.0°F	3.0°F
2050s	+3.0°F	+4.0°F to 5.5°F	6.5°F
Precipitation Baseline (1971 -2000) 50.1 in.	**Low estimate** **(10th percentile)**	**Middle range** **(25th to 75th percentile)**	**High estimate** **(90th percentile)**
0	-1 percent	0 to +10 percent	+10 percent
3	+1 percent	+5 to +10 percent	+15 percent

Based on 35 general circulation models and two representative concentration pathways. Baseline date are from the National Oceanic and Atmospheric Administration Nation Climatic Date Center United State Historical Climatology Network, Version 2 (Menne et al., 2009). Shown are the 10th percentile, 25th percentile, 75th percentile and 90th percentile 30-year mean values from model-based outcomes. Temperature values are rounded to the nearest 0.5°F, precipitation values are rounded to the nearest 5 percent, and sea-level rise values are rounded to the nearest inch.

[5] New York City Panel on Climate Change, 2013: Climate Risk Information 2013: Observations, Climate Change Projections, and Maps. C. Rosenzweig and W. Solecki (Editors), NPCC2. Prepared for use by the City of New York Special Initiative on Rebuilding and Resiliancy, New York, New York.

Table 4. Updated baseline and projected changes in frequency of severe weather events for New York City.

			2020s			2050s		
		Baseline (1971 - 2000)	Low-estimate (10th percentile)	Middle range (25th to 75th percentile)	High-estimate (90th percentile)	Low-estimate (10th percentile)	Middle range (25th to 75th percentile)	High-estimate (90th percentile)
Heat waves and cold weather events	Number of days/year with maximum temperature at or above 90°F	18	24	26 to 31	33	32	39 to 52	57
	Number of heat waves/year	2	3	3 to 4	4	4	5 to 7	7
	Average heat wave duration (in days)	4	5	5 to 5	5	5	5 to 6	6
	Number of days/year with minimum temperature at or below 32°F	72	50	52 to 58	60	37	42 to 48	52
Intense Precipitation	Number of days/year with rainfall at or above 2 inches	3	3	3 to 4	5	3	4 to 4	5
Coastal Floods at the Battery*	Annual chance of today's 100-year-flood	1.0 percent	1.1 percent	1.2 to 1.5 percent	1.7 percent	1.4 percent	1.7 to 3.2 percent	5.0 percent
	Flood heights associated with 100-year-flood (stillwater + wave heights)	15.0 feet	15.2 feet	15.3 to 15.7 feet	15.8 feet	15.6 feet	15.9 to 17 feet	17.6 feet

*Baseline period for sea level rise is 2000-2004. Based on 35 GCMs and two Representative Concentration Pathways. Data are from the National Oceanic and Atmospheric Administration (NOAA) National Climatic Data Center (NCDC) United States Historical Climatology Network (USHCN), Version 2 (Menne et al., 2009). The 10th percentile, 25th percentile, 75th percentile, and 90th percentile values from model-based outcomes across the GCMs and Representative Concentration Pathways are shown. Decimal places are shown for values less than 1, although this does not indicate higher precision/certainty. Heat waves are defined as three more consecutive days with maximum temperatures at or above 90 °F. The flood heights include the effects of waves.

Disclaimer: Like all projections, the NPCC climate projections have uncertainty embedded within them. Sources of uncertainty include data and modeling constraints, the random nature of some parts of the climate system, and limited understanding of some physical processes. The NPCC characterizes levels of uncertainty using state-of-the-art climate models, multiple scenarios of future greenhouse gas concentrations, and recent peer-reviewed literature. Even so, the projections are not true probabilities, and the potential for error should be acknowledged.

The ClimAID report generated projections of sea-level rise for two regions of New York State: the area south of Kingston, including New York City and Nassau and Suffolk counties and the tidal portion of the Hudson River between Kingston and Troy. ClimAID provides these regionalized sea-level rise projections for each of three ten-year time slices using two different methodologies. The lower projections are based on models of the relationship between sea levels and global temperatures and do not include factors related to possible rapid melt of land-based ice. The rapid ice-melt scenario includes consideration of recent observed rates of melting of land-based ice. All ClimAID projections are provided in Table 5. See Chapter 1 of the ClimAID report for a more complete discussion of the sea-level rise projections.

Table 5. ClimAID projections of sea-level rise in New York State.

New York City and Long Island	2020s (inches)	2050s (inches)	2080s (inches)
GCM-based	+2 to +5	+7 to +12	+12 to 23
Rapic ice-melt scenario	+5 to +10	+19 to +29	+51 to +55
Hudson River (north of Kingston)	2020s (inches)	2050s (inches)	2080s (inches)
GCM-based	+1 to +4	+5 to +9	+8 to +18
Rapic ice-melt scenario	+4 to +9	+17 to 26	+37 to +50

The 2013 New York Panel on Climate Change update described above included updated sea-level rise projections for New York City (Table 6).

Table 6. Updated sea-level rise projections for New York City.

Sea level rise Baseline (2000-2004) 0 inches	Low-estimate (10th percentile)	Middle range (25th to 75th percentile)	High-estimate (90th percentile)
2020s	2 inches	4 to 8 inches	11 inches
2050s	7 inches	11 to 24 inches	31 inches

Based on 35 GCMs (24 for sea level rise) and two Representative Concentration Pathways. Baseline data are from the National Oceanic and Atmospheric Administration (NOAA) National Climatic Data Center (NCDC) United States Historical Climatology Network (USHCN), Version 2 (Menne et al., 2009). Shown are the 10th percentile, 25th percentile, 75th percentile, and 90th percentile 30-year mean values from model-based outcomes.Temperature values are rounded to the nearest 0.5°F, percipitation values are rounded to the nearest 5 percent, and sea level rise values rounded to the nearest inch.

Sea-level Rise Tools

Several tools are available to assist local and regional planners in identifying areas likely to be affected by sea-level rise under various scenarios.

The National Ocean and Atmospheric Administration (NOAA) Sea Level Rise and Coastal Flooding Impacts Viewer visualizes different inundation scenarios and overlays additional data layers including social and economic vulnerability, the potential for marsh migration and percentage of confidence in sea level rise risks. This viewer uses a Google Maps platform so it is a user friendly tool to help communities visualize their risks. You can print your maps or share your maps electronically using the "share" button.
http://www.csc.noaa.gov/slr/viewer/#

The U.S. Global Change Research Program, NOAA, the U.S. Army Corps of Engineers, and Federal Emergency Management Agency have released a sea-level rise (sea-level rise) planning tool that includes interactive sea-level rise maps and a sea-level rise calculator. This tool provides information on future risk of coastal flooding in parts of New York affected by Hurricane Sandy and is intended to help state and local officials, community planners, and infrastructure managers understand possible future flood risks from sea-level rise and use that information in planning decisions. This tool uses the 2013 New York City Panel on Climate Change projections for New York City and projections of global sea-level rise for the remainder of the mapped area. The latter projections are likely to be fairly conservative as New York's ocean coast will experience rates of rise greater than the global average. A flood elevation calculator that provides projected site-specific sea-level elevations is included.
http://www.globalchange.gov/what-we-do/assessment/coastal-resilience-resources

The New York State Department of State prepared maps of coastal risk assessment areas with assistance from the NOAA Coastal Services Center (NOAA-CSC) and FEMA. Areas covered are New York City and Suffolk, Nassau and Westchester counties. The maps indicate relative risk (extreme, high and moderate) using the best available topography and a combination of information from FEMA flood insurance rate maps; Sea, Lake, and Overland Surges from Hurricanes (SLOSH) model inundation zones; and sea-level rise and shallow coastal flooding scenarios.
http://nysandyhelp.ny.gov/risk-assessment-maps

Scenic Hudson provides its Sea Level Rise Mapper for the Hudson River. This tool uses high-resolution LiDAR topography to produce graphics of high tide and 1-percent flood zones for sea-level rise of up to 72 inches in 6-inch increments.
http://www.scenichudson.org/slr/mapper

Climate Smart Resiliency Planning

Section 1: Preparing for the Assessment

Community Plan Checklist

The Community plan checklist includes a list of municipal and county documents that may assist in the completion of the self-assessment tool. The facilitator and participants should be well acquainted with, and have access to, the community's plans, ordinances, and codes. They will probably want to bring these documents to the assessment meeting.

	Plan, Ordinance or Code	Available?		Adoption Year	Next Update Due
		Yes	No		
1.1	Municipal Master or Comprehensive Plan				
1.2	Zoning Ordinance				
1.3	Subdivision Ordinance				
1.4	Open Space Plan				
1.5	Natural Resource Conservation Plan				
1.6	Stormwater Management Plan				
1.7	Coastal Plan or Element in Other Plan				
1.8	Shoreline Restoration Plan				
1.9	Coastal Erosion Hazard Area Ordinance				
1.10	Multi-hazard Mitigation Plan				
1.11	Floodplain Management Plan				
1.12	Flood Damage Prevention Ordinance				
1.13	Evacuation Plan				
1.14	Emergency Response and Short-term Recovery Plan				
1.15	Continuity of Operations Plan				
1.16	Disaster Recovery Plan				
1.17	Long-term Recovery Plan				
1.18	Economic Development Plan or Strategy				
1.19	Capital Improvements Plan				
1.20	Metropolitan Transportation Plans				
1.21	Historic Preservation Plan				
1.22	Local Waterfront Revitalization Plan				
1.23	Climate Action Plan				
1.24	Other:				
1.25	Other:				

While the majority of the self-assessment tool can be completed by having access to these documents, there should be a representative within the group that has thorough knowledge of specific documents, e.g., the land-use planner should have thorough knowledge of land-use plans, ordinances and codes; and the emergency manager should be aware of the emergency operations and evacuation plans. Because communities vary in size and capacity, the target community may not have all of the listed documents or they may only exist at the county level.

The facilitator should proceed with the completion of the self-assessment tool regardless of the number of plans and ordinances available. By doing so, the group may uncover future planning opportunities, or conversation may reveal that the community does in fact have some of the listed items.

Section 2: Vulnerability and Risk Assessments

While all New York communities are vulnerable to climate hazards, the likelihood and severity of these hazards vary with a community's geography and the integrity of its natural buffers. Vulnerability assessments can inform municipal officials of vulnerable populations, businesses, infrastructure and natural resources. They can also reveal the best locations for future development or land acquisition. Simply identifying the vulnerabilities and assessing the risk within one's community often help build the knowledge and capacity for planning for hazard avoidance and mitigation.

Plans and documents useful for this section:

Multi-hazard Mitigation Plan
Floodplain Management Plan
Coastal Plan
Capital Budget

Section 2–Vulnerability and Risk Assessments	Yes	No	Notes
2.1 Does the community have a localized hazard risk and vulnerability assessment?			
2.2 Have current and future climate hazards been identified?			
2.3 Have potential risks been prioritized as follows?			
2.3.1 Likelihood of a given effect, e.g., virtually certain/already occurring, high, moderate, low			
2.3.2 Magnitude of consequence, e.g., disruption of internal operations, capital and operating costs, number of people affected, public health, economy, and environment			
2.3.3 Are conditions identified that could amplify the effect of a hazard, e.g., storm surge inundation at a high tide or erosion of stabilized shorelines?			
2.4 Have municipal employees utilized any of the following vulnerability assessment methodologies?			
2.4.1 Risk and Vulnerability Assessment Tool			
2.4.2 Hazard Assessment Tool			
2.4.3 HAZUS-MH			
2.4.4 Other:			
2.5 Are municipal employees trained in the use of FEMA's HAZUS-MH?			
2.6 Have adaptation strategies been identified and categorized as follows:			
2.6.1 Type			

Section 2–Vulnerability and Risk Assessments	Yes	No	Notes
2.6.2 Administration			
2.6.3 Condition			
2.6.4 Timing			
2.6.5 Geography			
2.7 Have adaptation strategies been evaluated and prioritized as follows:			
2.7.1 Strategy cost			
2.7.2 Strategy feasibility			
2.7.3 Timing of implementation			
2.7.4 Efficacy			
2.7.5 Co-benefits			
2.8 Have stakeholders linked adaptation strategies to the capital budget and rehabilitation cycles?			
2.9 Are maps used to spatially define the following vulnerabilities in relationship to risks?			
2.9.1 Populations, e.g., elderly, children, poor, disabled			
2.9.2 Buildings, e.g., business and residential			
2.9.3 Infrastructure, e.g., roads, schools, wastewater treatment facilities, hospitals, public works, power plants, drinking water treatment facilities			
2.9.4 Natural resources, e.g., wetlands, critical habitats, rare species, dunes, beaches, bluffs			
2.9.5 Cultural resources, e.g., historic districts, properties, and landmarks, libraries, museums, recreational areas			
2.10 Have the following been identified as climate risks to the community?			
2.10.1 Extreme precipitation and riverine flooding			
2.10.2 Sea-level rise			
2.10.3 Coastal storms, storm surge and coastal flooding			
2.10.4 Extreme heat and heat waves			
2.10.5 High winds			
2.10.6 Heavy snow and/or ice storms			
2.11 Are municipal planners and emergency managers trained in use of the following risk-mapping tools?			
2.11.1 Flood insurance rate maps			
2.11.2 Sea, Lake, and Overland Surges from Hurricanes			
2.11.3 Shoreline change analysis			
2.11.4 Cumulative risk assessments			
2.11.5 Sea level rise inundation maps			
2.11.6 Other:			
2.12 Have risk and vulnerability assessments been directly shared with municipal planners, public works officials, transportation planners, and other appropriate municipal, county, or state officials?			

Section 2–Vulnerability and Risk Assessments	Yes	No	Notes
2.13 If inland (riverine) flooding has been identified as a hazard in the community (2.10.1) …			
2.13.1 Are emergency managers and planners aware of potential riverine flooding extents in their community?			
2.13.2 Are local planners, emergency managers, and public works officials aware of the location of riverine repetitive loss properties?			
2.13.3 Does the community track riverine repetitive loss properties within the National Flood Insurance Program?			
2.13.4 Do any plans or reports describe the damage and cost of previous storms, riverine floods, or erosion?			
2.13.5 Do any plans or reports estimate future financial losses that may result from riverine flooding?			
2.14 Is the community in a tidal coastal area?[6] (If yes, complete the following questions.)			
2.14.1 Have sea-level rise, coastal storms, storm surge and coastal flooding have been identified as hazards (2.10.2, 2.10.3)?			
2.14.1.1 Are emergency managers and planners aware of potential coastal flooding extents in their community?			
2.14.1.2 Are local planners, emergency managers, and public works officials aware of the location of coastal repetitive loss properties?			
2.14.1.3 Does the community track coastal repetitive loss properties within the National Flood Insurance Program?			
2.14.1.4 Do any plans or reports describe the damage and cost of previous coastal storms, floods, or erosion?			
2.14.1.5 Is a significant part of the community in a V-zone or A-zone as defined on a FEMA flood insurance rate map?			
2.14.1.6 Does the community contain lands within the Coastal Erosion Hazard Area			
2.14.1.7 Have the areas of the coastline most prone to erosion hazards been identified?			
2.14.1.8 Has the community used all available authorities to restrict or prohibit any activities, development or other actions in such erosion hazard areas, in order to minimize damage to property, and to prevent the exacerbation of erosion hazards?			
2.14.1.9 Has the community developed a build-out analysis using existing zoning ordinances?			
2.14.1.9.1 If so, has the build-out analysis been compared to the extent of storm-surge scenarios?			

[6] Tidal coastal areas include the ocean coast and the Hudson River south of Troy. See http://www.dos.ny.gov/communitieswaterfronts/atlas/ for the coastal area definitions and map.

Section 2–Vulnerability and Risk Assessments	Yes	No	Notes
2.14.1.9.2 Has the build-out analysis been compared to projected sea-level rise scenarios?			
2.14.1.10 Do any plans or reports describe the damage and cost of previous coastal storms, floods, or erosion?			
2.14.1.11 Are emergency managers and planners aware of potential storm-surge heights in the community?			
2.14.1.12 Do any plans or reports estimate future financial losses that may result from sea-level rise?			
2.14.1.13 Has the community undertaken vulnerability and risk assessments using the Department of State's Asset Inventory Worksheet and Risk Assessment Tool?			
2.14.1.14 Has the community adopted the projections of sea-level rise from the State Sea Level Rise Task Force report or more recent studies for planning purposes?			

Section 3 Public Outreach and Engagement

Public outreach and engagement are crucial to the development of a community that is resilient to climate hazards. Local residents and business owners often have extensive knowledge of past storm, flood and erosion effects. By engaging local stakeholders in the identification of hazards, risks and vulnerabilities, municipal officials can build support for risk-averse land-use planning, ordinances and hazard mitigation.

While it is important to involve local stakeholders in the identification of coastal hazards, it is also important to communicate vulnerabilities and risks to the public. Engaging local residents and visitors in storm preparedness is essential to ensuring their safety. In some places, full-time residents are outnumbered by vacationers during months when hazards, e.g., coastal or winter storms, are at their peak. By educating the public on the threat of climate hazards, municipal officials can reduce the exposure and vulnerability of their community.

Plans useful for this section:

Natural Resource Conservation Plan
Stormwater Management Plan
Coastal Plan
Coastal Erosion Hazard Area Ordinance
Shoreline Restoration Plan
Multi-hazard Mitigation Plan
Floodplain Management Plan
Evacuation Plan

	Section 3 – Public Outreach and Engagement	Yes	No	Notes
3.1	Has the public been involved in the identification of historic storm effects, such as storm-surge elevations, flood-prone streets, beach erosion and overwash, or property loss through any of the following means?			
3.1.1	Participatory mapping			
3.1.2	Public surveys			
3.1.3	Stakeholder meetings			
3.2	Does the community have publicly visible high-water mark signs?			
3.3	Has the public been involved in defining an overall acceptable level of natural-hazard risk?			
3.4	Does the community provide the public with information on the natural and beneficial functions of floodplains, wetlands and green infrastructure?			
3.5	Does the community provide easy access to floodplain maps?			
3.6	Does the community publicize the availability of floodplain information to property owners and businesses?			

Section 3 – Public Outreach and Engagement		Yes	No	Notes
3.7	Does the community publicize the availability of floodplain information to insurance agents, real estate agents and lenders?			
3.8	Does the community conduct storm-preparedness outreach to residents and businesses in the floodplain using the following methods?			
3.8.1	Website			
3.8.2	Brochures and newsletters			
3.8.3	Community meetings			
3.8.4	Television or radio			
3.8.5	Other:			
3.9	Does the community provide easy access to coastal erosion hazard area maps?			
3.10	Does the community provide residents with guidance on the development of personal or family evacuation plans?			
3.11	Does the community provide property owners information on what to include in the following?			
3.11.1	At-home emergency kit			
3.11.2	Emergency supplies			
3.11.3	Evacuation kit			
3.12	Does the community have public-information plans in place to provide residents with the following information prior to the threat of a storm?			
3.12.1	Expected inundation area			
3.12.2	Evacuation routes			
3.12.3	Evacuation bus pick-up locations			
3.12.4	Location of severe weather shelters			
3.12.5	Location of pet shelters			
3.13	Has the community informed residents of ASPCA's disaster preparedness steps for domesticated animals?			
3.14	Has the community or county informed residents of FEMA's *Are You Ready?* guide?			
3.15	Does the community actively inform property owners of FEMA suggested means to protect their homes against storm and wind damage?			
3.16	Does the community provide the public with flood-mitigation information?			
3.17	Does the community refer homebuilders to FEMA's coastal construction manual?			
3.18	Does the community employ multilingual and culturally sensitive approaches while providing residents with essential information?			

Section 4 Integration of Municipal Plans

Local governments are responsible for the development and maintenance of a number of planning documents. When planning is done in an integrated manner, it can direct future development away from high-hazard areas and identify opportunities to relocate existing development outside these same areas. Because communities vary greatly, planning and adaptation options will vary as well. Highly developed areas may want to focus on hazard mitigation, stormwater management, and redevelopment strategies, while rural areas may want to consider implementing subdivision regulations or prohibiting infrastructure investment in high-hazard areas. Municipal planners should ensure that their local planning documents reflect existing risk and vulnerability assessments. Additionally, planning efforts should coincide with one another by including the insight of various planning documents, previous hazard-mitigation recommendations and stakeholder input. By doing so, local governments will ensure they have acted appropriately to reduce hazard exposure and property loss associated with coastal flooding, erosion, and storms.

Plans useful for this section:

Master or Comprehensive Plan
Open Space Management Plan
Natural Resource Conservation Plan
Stormwater Management Plan
Coastal Plan
Coastal Erosion Hazard Area Ordinance
Stormwater Management Plan
Coastal Plan
Coastal Erosion Hazard Area Ordinance
Shoreline Restoration Plan
Multi-hazard Mitigation Plan
Floodplain Management Plan
Flood Damage Prevention Ordinance
Economic Development Plan or Strategy
Capital Improvements Plan
Local Waterfront Revitalization Plan

	Section 4 –Integration of Municipal Plans	Yes	No	Notes
4.1	Has the community adopted a comprehensive or master plan?			
4.1.1 1 2 3	Does the municipal master plan explain the support and involvement of emergency managers, floodplain managers, coastal managers and public works officials?			

	Section 4 –Integration of Municipal Plans	Yes	No	Notes
4.1.2	Does the planning process documentation describe the review and incorporation, if appropriate, of existing plans, studies, reports, and technical information, e.g., the multi-hazard mitigation plan, capital improvement plan?			
4.1.3	Did the preparation of the master plan involve a broad base of the community, such as public officials, civic organizations, businesses, and citizens?			
4.1.4	Does the master plan provide a clear explanation of participation techniques used in its development?			
4.1.5	Does the municipal master plan identify resilience within its mission, vision, or goals?			
4.1.6	Are hazards addressed listed among the elements of the municipal master plan?			
4.1.7	Does the plan identify potential coastal-hazard effects on infrastructure, land use, housing and community facilities?			
4.1.8	Does the plan make recommendations to reduce hazard vulnerability through land-use planning?			
4.1.9	Does the plan identify how often it should be updated?			
4.1.10	Are zoned land uses compatible with coastal hazards?			
4.2	Are floodways and other frequently flooded areas zoned for open space or recreation?			
4.3	Does the community use subdivision regulations to ensure low densities within the floodplain?			
4.4	Has the community adopted the concepts of *No Adverse Impact* of the Association of State Floodplain Managers?			
4.5	Does the community have a local ordinance to protect dunes, bluffs or eroding cliffs from development or disturbance?			
4.6	Does the community have a local ordinance to protect wetlands?			
4.7	Does the community have an open space or other natural resources management plan?			
4.7.1	If so, does the plan identify floodplain management as a priority?			
4.7.2	Is actively managed open space maintained in a manner that provides flood protection?			
4.7.3	Is the plan adopted as part of the municipal master plan?			

	Section 4 –Integration of Municipal Plans	Yes	No	Notes
4.7.4	Is the local open space plan updated in coordination with the state open space plan?			
4.7.5	Does the community participate in state open space plan updates?			
4.8	Does the community have a FEMA-approved multi-hazard mitigation plan?			
4.8.1	Was a certified floodplain manager included in the hazard-mitigation planning process			
4.8.2	Does the multi-hazard mitigation plan describe the support and involvement of local government departments and offices?			
4.8.3	Does the multi-hazard mitigation plan provide a clear explanation of public participation used during its development?			
4.8.4	Does the multi-hazard mitigation plan describe past mitigation efforts e.g., shoreline stabilization and land acquisition, along with their costs and effectiveness?			
4.8.5	Does the multi-hazard mitigation plan provide a general explanation of the environmental, social and economic consequences of failing to address natural hazards?			
4.8.6	Does the multi-hazard mitigation plan include municipal maps that indicate local hazard risks, such as flood zones, storm-surge inundation and erosion rates?			
4.8.7	Does the multi-hazard mitigation plan consider inland riverine erosion as a hazard?			
4.8.8	Does the multi-hazard mitigation plan consider shoreline erosion as a hazard?			
4.8.9	Does the multi-hazard mitigation plan consider sea-level rise and enhanced storm surges as hazards?			
4.8.10	Does the multi-hazard mitigation plan consider landslides as a hazard?			
4.8.11	Does the multi-hazard mitigation plan consider high winds and tornadoes as hazards?			
4.8.12	Does the multi-hazard mitigation plan consider drought as a hazard?			
4.8.13	Does the multi-hazard mitigation plan consider extreme heat and heat waves as hazards?			
4.8.14	Does the multi-hazard mitigation plan consider heavy snowfall as a hazard?			
4.8.15	Does the multi-hazard mitigation plan consider hurricanes and Nor’easters as hazards?			

	Section 4 –Integration of Municipal Plans	Yes	No	Notes
4.8.16	Does the multi-hazard mitigation plan specify timelines for completing projects and achieving goals?			
4.8.17	Do hazard-mitigation goals correspond with measurable mitigation objectives?			
4.8.18	Does the multi-hazard mitigation plan describe a process for intergovernmental coordination to mitigate natural hazards?			
4.8.19	Does the multi-hazard mitigation plan identify opportunities to incorporate hazard mitigation into existing planning mechanisms, e.g., land-use planning, capital investments, shoreline restoration projects?			
4.8.20	Does the multi-hazard mitigation plan identify the state or federally required update frequency?			
4.9	Does the community have an adopted floodplain management plan?			
4.9.1	Is the floodplain plan incorporated as an element of the municipal master plan?			
4.9.2	Is the floodplain plan incorporated in the open space plan?			
4.9.3	Is the floodplain plan incorporated in the stormwater management plan? See section			
4.9.4	Is the floodplain plan incorporated in the multi-hazard mitigation plan?			
4.9.5	Does the community have a certified floodplain manager on staff?			
4.9.6	Was a certified floodplain manager included in the planning process?			
4.9.7	Was a professional planner included in the floodplain management planning process?			
4.9.8	Does the community participate in the National Flood Insurance Program?			
4.10	Does the community have a flood damage prevention ordinance?			
4.11	Does the community have a stormwater management plan?			
4.11.1	Was a certified floodplain manager included in the stormwater management planning process?			
4.11.2	Was a professional planner included in the stormwater management planning process?			

	Section 4 –Integration of Municipal Plans	Yes	No	Notes
4.11.3	Does the stormwater management plan include green infrastructure and low-impact development regulations to decrease runoff, e.g., tree protection ordinances, impervious cover limits, riparian buffers, vegetated drainage channels and cluster development?			
4.11.4	Does the stormwater management plan identify runoff and drainage problems due to impervious surfaces?			
4.11.5	Does the stormwater management plan identify regulatory constraints to be applied if the community reaches impervious coverage levels allowed by land-use and zoning designations?			
4.11.6	Does the stormwater management plan describe the municipal responsibilities for inspection and maintenance of stormwater facilities?			
4.11.7	Does the stormwater management plan identify how often it should be updated?			
4.12	Does the community have a capital improvements plan?			
4.12.1	Were a professional planner, licensed engineer, and certified floodplain manager involved in the capital improvement planning process?			
4.12.2	Does the capital improvement plan consider the risk of flooding and coastal hazards and sea-level rise when upgrading existing municipal infrastructure?			
4.12.3	Does the capital improvement plan consider the risk of flooding and coastal hazards and sea-level rise on proposed infrastructure projects?			
4.12.4	Does the capital improvement plan incorporate projections of flooding and sea-level rise into risk assessments over the expected service life of municipal infrastructure?			
4.12.5	Does the capital improvement plan incorporate, if appropriate, existing plans, studies, reports, and technical information?			
4.12.6	Does the capital improvement plan identify how often it should be updated?			
4.13	Does the community have an economic-development plan or strategy?			
4.13.1	Does the economic-development plan identify economic vulnerabilities due to flooding, coastal storms and other climate hazards?			

Section 4 –Integration of Municipal Plans		Yes	No	Notes
4.13.2	Does the economic-development plan incorporate sea level rise and other effects of climate change into its assessment of economic vulnerabilities?			
4.14	Does the community have a local waterfront revitalization plan, special area management plan, beachfront management plan or shoreline management plan?			
4.14.1	Do these plans assess the threat of flooding, coastal storms and erosion?			
4.14.2	Do these plans incorporate sea level rise and other hazards associated with climate change?			
4.14.3	Do these plans identify the vulnerability of wildlife and habitat to coastal hazards?			
4.15	Has the community developed a coastal resilience plan?			
4.16	Has the community worked to reduce vulnerability in riverine and coastal zones through natural infrastructure whenever possible?			
4.17	Have areas of significant public investment, water dependent uses, or critical infrastructure that requires structural protection because options for relocation, elevation or employment of non-structural measures are not feasible been identified?			
4.18	Have long-term recovery plans been developed for areas vulnerable to flooding and coastal storms?			

Section 5 Disaster Preparedness and Recovery

Effective emergency response in the event of a disaster is critical to maintaining a resilient community. A community can work many ways toward resilience through planning and emergency response. While federal and state mandates have a strong influence on disaster preparedness, planning and recovery, local governments are capable of improving resilience through additional vulnerability analysis, intergovernmental cooperation, communication and planning.

Plans useful for this section:

Master or Comprehensive Plan
Multi-hazard Mitigation Plan
Evacuation Plan
Emergency Response and Short-term Recovery Plan
Disaster Recovery Plan
Long-term Recovery Plan

Section 5 – Disaster Preparedness and Recovery		Yes	No	Notes
5.1	Is the community recognized as a NOAA Storm Ready Community?			
5.2	Does the community have a general emergency warning system?			
5.3	If the community is located along a river or coast, does it have an early flood-warning system?			
5.4	Are emergency responders aware of real-time ocean and estuarine observing systems and stream gauging information?			
5.5	Does the community relay weather related threats to the public in at least two forms of communication?			
5.6	Does the community have an emergency response and short-term recovery plan and/or a flood response plan that includes coastal flooding?			
5.6.1	Does the emergency plan describe a hierarchy of authority during emergencies?			
5.6.2	Does the emergency plan identify first responders?			
5.6.3	Does the emergency plan include a list of contacts for operators of municipal facilities?			
5.6.4	Is the emergency plan a municipal (rather than county or state) plan?			
5.6.5	Does the emergency plan indicate the required update frequency?			
5.6.6	Does the emergency plan include steps for emergency protective measures, e.g., sandbagging, erecting warning devices, and search and rescue?			

Section 5 – Disaster Preparedness and Recovery	Yes	No	Notes
5.6.7 Does the emergency plan include an organizational framework to conduct a preliminary damage assessment?			
5.6.8 Are the best available projections concerning the frequency and severity of extreme storm events incorporated into the emergency plan?			
5.6.9 Does the emergency plan include coordination and communication among critical stakeholders such as community-based organizations, local businesses, local health departments, utilities and local government leaders?			
5.7 Does the community have a designated emergency operations center (EOC)?			
5.7.1 Is the EOC located outside coastal and inland flood-hazard areas?			
5.7.2 Is the EOC designed to withstand high winds?			
5.7.3 Does the EOC have elevated back-up power?			
5.8 Does the community have adequate designated storm shelters?			
5.8.1 If the community does not have a designated storm shelter within the community, is there an established memorandum of agreement with a neighboring community or county to provide constituents shelter?			
5.8.2 Are storm shelters located outside flood-hazard areas, including storm-surge inundation areas?			
5.8.3 Are storm shelters designed to withstand high-wind effects?			
5.9 Does the community have an evacuation plan?			
5.9.1 Are responsibilities for evacuation clearly defined?			
5.9.2 Does the evacuation plan estimate the time necessary to evacuate residents and vacationers from storm-hazard areas?			
5.9.3 Does the evacuation plan identify where evacuation routes are prone to flooding?			
5.9.4 Does the evacuation plan identify more than one route by which to evacuate the community?			
5.9.5 Does the evacuation plan identify the conditions that would initiate a traffic-lane reversal?			
5.9.6 Does the evacuation plan identify local and state evacuation assistance programs for the following special needs?			
5.9.6.1 Hospitals			
5.9.6.2 Nursing homes			
5.9.6.3 Prisons			
5.9.6.4 Residents without personal transportation			

Section 5 – Disaster Preparedness and Recovery	Yes	No	Notes
5.9.6.5 Elderly			
5.9.6.6 Disabled			
5.9.6.7 Schools			
5.10 Does the community maintain and promote a special needs registry?			
5.11 Does the community inform residents of the NY-Alert program?			
5.12 Does the community have a volunteer community emergency response team (CERT)?			
5.13 Does the community have a portable communications system that can operate under poor weather conditions and when electrical power is not available?			
5.14 Is there an adequate heat-warning system in place?			
5.15 Is a cooling-center program established that considers potential problems such as transportation obstacles, effects of power outages or flooding and other needs of vulnerable populations/communities?			
5.16 Does the community have a continuity of operations plan?			
5.16.1 Does the continuity plan provide guidance on post-disaster waste management and debris removal?			
5.17 Is machinery for debris removal stored outside flood-hazard areas?			
5.18 Are routes to waste-disposal facilities passable in the event of a flood?			
5.19 Are temporary waste-disposal staging areas indentified in the event of a disaster?			
5.20 In the event of a disaster, are procedures defined to conduct habitability and substantial damage assessments?			
5.21 Does the community store FEMA elevation certificates outside of flood-hazard areas?			
5.22 Does the community have a post-disaster, long-term recovery plan?			
5.22.1 Does the recovery plan identify redevelopment opportunities outside flood-hazard areas?			
5.22.2 Does the recovery plan advocate the use of advisory flood maps with projected floodplains to define post-disaster redevelopment restrictions and building elevations?			
5.22.3 Does the recovery plan identify opportunities to retrofit or relocate existing structures or infrastructure in hazard-prone areas?			
5.22.4 Does the recovery plan utilize vulnerability and risk mapping to guide the location of future development?			

Section 5 – Disaster Preparedness and Recovery		Yes	No	Notes
5.22.5	Does the recovery plan define the lines of coordination in transitioning from short-term to long-term recovery?			
5.22.6	Does the recovery plan include an organizational framework that facilitates the effective coordination and use of state, federal and non-governmental resources in a manner that provides maximum benefit for the disaster area?			
5.22.7	Does the recovery plan identify roles and functions of elected and appointed officials, state and federal agencies, and non-governmental organizations?			
5.22.8	Does the recovery plan include provisions to reduce greenhouse gas emissions from reconstructed areas through improved energy efficiency, use of renewable sources of energy and application of smart-growth principles?			

Section 6 Hazard Mitigation

Hazard mitigation had largely been the responsibility of floodplain managers. In recent years, the Robert T. Stafford Disaster Assistance and Relief Act of 2000 created the federal requirement for local governments to develop and adopt FEMA-approved multi-hazards mitigation plans in order to receive public relief dollars in the event of a disaster. The Stafford Act shifted the requirement of hazard-mitigation planning from floodplain managers to a diverse group of local decision makers and has given municipalities the ability to take proactive measures to reduce hazard exposure and vulnerability. Hazard mitigation is now fully recognized as taking sustained actions to reduce or eliminate the long-term risks to people and property from hazards. This often involves intergovernmental coordination on public education, planning, natural resource protection and funding.

Plans useful for this section:

Climate Action Plan
Master or Comprehensive Plan
Multi-hazard Mitigation Plan
Floodplain Mitigation Plan
Emergency Response and Short-term Recovery Plan
Disaster Recovery Plan
Long-term Recovery Plan

Section 6 – Hazard Mitigation		Yes	No	Notes
6.1	Has the community taken the Climate Smart Communities Pledge?			
6.2	Has the community created a climate action plan that includes an adaptation plan within it?			
6.3	Is the community active in the National Flood Insurance Program's Community Rating System?			
6.4	Has the community proposed the relocation of public buildings, critical facilities or infrastructure out of flood hazard areas as a result of the multi-hazard mitigation plan or other planning tools?			
6.5	Has the community used its multi-hazard mitigation plan to propose retrofitting public buildings, critical facilities and other infrastructure to withstand flood damage?			
6.6	Do municipal building codes exceed the state's 2-foot freeboard above base-flood-elevation requirement?			
6.7	Have building and permitting officials completed training on retrofitting flood-prone residential buildings?			
6.8	Have building and permitting officials completed training in FEMA's Coastal Construction Manual?			
6.9	Have community officials completed post-flood stream intervention training?			

Section 6 – Hazard Mitigation		Yes	No	Notes
6.10	Does the community provide property owners with guidelines to retrofit existing development for flood and wind risks?			
6.11	Does the community utilize any of the following tools to manage development in hazard-prone areas?			
6.11.1	Transfer of development rights or purchase of development rights			
6.11.2	Conservation overlay districts or cluster development			
6.11.3	Zoning for open or recreational space			
6.11.4	Protective coastal, riparian and/or wetland buffer zoning or ordinances			
6.11.5	Rolling easements			
6.11.6	Buyouts of vulnerable properties			
6.11.7	Other:			
6.12	Does the community use land-acquisition programs to purchase land-conservation easements in hazard-prone areas?			
6.13	Does the community utilize impact fees, accommodation taxes or user fees to acquire properties in hazard areas?			
6.14	Does the community have regulations, policies or plans for shoreline protection?			
6.15	Is the automatic replacement of hardened structures prohibited?			
6.16	Are sustainable enhanced methods of shoreline protection encouraged through incentives or regulation?			
6.17	Does the community inform property owners of preferred sustainable shoreline protection techniques, including non-structural and ecologically enhanced methods?			
6.18	Does the community have a plan in place to control invasive plant species, especially near the shoreline?			
6.19	Does the community engage in dune, wetland or shoreline restoration?			
6.20	Has the community established special area ordinances for habitat preservation?			
6.21	Does the community utilize impact fees, accommodation taxes or user fees to pay for shoreline protection and restoration, wetland restoration or riparian buffers?			
6.22	Are community flood control or other protective structures (e.g., levees, flood or sea walls) inspections on schedule?			
6.23	Has the community used any of the following grant programs to implement mitigation projects?			

Section 6 – Hazard Mitigation	Yes	No	Notes
6.23.1 FEMA Hazard Mitigation Grant Program			
6.23.2 FEMA Pre-disaster Mitigation Grant Program			
6.23.3 FEMA Flood Mitigation Assistance Program			
6.23.4 FEMA Repetitive Flood Claims Program			
6.23.5 FEMA Severe Repetitive Loss Program			
6.23.6 HUD Community Development Block Grant Program			
6.23.7 Other:			

Next Steps

After the *Climate Smart Resiliency Planning* questionnaire has been completed, the facilitator or person(s) selected by the municipal chief executive officer should prepare a summary report. "No" answers represent potential gaps in community planning that could affect the community's resilience to climate hazards. Since every community's needs are different from those of others, no attempt has been made to score or otherwise prioritize answers. Rather, community leaders are encouraged to review the identified planning gaps with stakeholders to identify the community's highest planning priorities.

Resources

The following resources can help communities as they review the results of the questionnaire and work to address the gaps in their planning.

Historic Rates of Sea Level Rise
http://tidesandcurrents.noaa.gov/sltrends/sltrends_states.shtml?region=ny
http://www.dec.ny.gov/energy/45202.html

Maps, Mapping Tools and Models

Flood Insurance Rate Maps
http://www.fema.gov/hazard/map/firm.shtm

Sea, Lake, and Overland Surges from Hurricanes (SLOSH) Model
http://slosh.nws.noaa.gov/sloshPub/index.php?L=7

Sea Level Rise Inundation Maps
http://www.csc.noaa.gov/digitalcoast/inundation/index.html

Shoreline Change Analysis
http://shoreline.noaa.gov/apps/index.html
http://woodshole.er.usgs.gov/project-pages/dsas/

Funding

Community Development Block Grants
http://portal.hud.gov/hudportal/HUD?src=/program_offices/comm_planning/communitydevelopment/programs

Flood Mitigation Assistance
http://www.fema.gov/government/grant/fma/index.shtm

Hazard Mitigation Grant Program
http://www.fema.gov/government/grant/hmgp/index.shtm
http://www.fema.gov/library/viewRecord.do?id=4225

Pre-Disaster Mitigation Grant Program
http://www.fema.gov/government/grant/pdm/index.shtm

Repetitive Loss Claims
http://www.fema.gov/government/grant/rfc/index.shtm

Severe Repetitive Loss Claims
http://www.fema.gov/government/grant/srl/index.shtm

Hazard Mitigation, Disaster Preparedness and Recovery

Certified Floodplain Managers
http://www.floods.org/index.asp

Climate Action Plan
http://www.dec.ny.gov/energy/67493.html

Climate Smart Communities
http://www.dec.ny.gov/energy/50845.html

Coastal Construction Manual
http://www.fema.gov/library/viewRecord.do?id=1671

Coastal Erosion Hazard Area
http://www.dec.ny.gov/permits/6064.html

Coastal and Estuarine Land Conservation
http://coastalmanagement.noaa.gov/land/

Community Emergency Response Teams
http://www.citizencorps.gov/cert/

Comprehensive Emergency Management Planning
http://www.dhses.ny.gov/planning/

Continuity of Operations Planning
http://www.fema.gov/about/org/ncp/coop/index.shtm
http://www.dhses.ny.gov/oem/planning/documents/NYS-Business-Continuity.pdf

Emergency Operations Planning
http://www.fema.gov/pdf/plan/slg101.pdf

Emergency Response and Short-term Recovery Planning
http://www.dhses.ny.gov/planning/documents/NYS-CEMP-Vol.2-Mar-2012-3-levels.pdf

Flood Mitigation
http://www.fema.gov/library/viewRecord.do?id=3184

Green Infrastructure Examples for Stormwater Management -
http://www.dec.ny.gov/lands/58930.html

Long-term Recovery Planning
http://www.dhses.ny.gov/planning/documents/Vol.3-Long-Term-Recovery-3.2012.pdf

Multi-Hazard Mitigation Planning
http://www.fema.gov/plan/mitplanning/resources.shtm

National Flood Insurance Program
http://www.fema.gov/business/nfip/
http://www.dec.ny.gov/lands/39341.html

National Flood Insurance Program Community Rating System
http://www.fema.gov/business/nfip/crs.shtm

New York State Open Space Conservation Plan
http://www.dec.ny.gov/lands/47990.html

Post-Disaster Redevelopment Planning
http://www.fema.gov/library/viewRecord.do?id=2940
http://www.pdrp.org/

Trees for Tribs
http://www.dec.ny.gov/lands/43668.html

Tree Ordinances
http://www.dec.ny.gov/lands/5276.html

Vulnerability and Risk Assessment

Climate Ready Water Utilities
http://water.epa.gov/infrastructure/watersecurity/climate/

Community Vulnerability Assessment Tool (CVAT)
http://www.csc.noaa.gov/digitalcoast/training/roadmap

Hazard Assessment Tool
http://www.csc.noaa.gov/digitalcoast/tools/hat/

HAZUS-MH
http://www.csc.noaa.gov/digitalcoast/tools/hazus-mh/

Public Outreach and Engagement

Against the Wind: Protecting your home from hurricane and wind damage
http://www.fema.gov/library/viewRecord.do?id=1641

Avoiding Hurricane Damage: A checklist for homeowners
http://www.fema.gov/library/viewRecord.do?id=3340

Coastal Services Center Roadmap
http://www.csc.noaa.gov/digitalcoast/training/roadmap

FEMA Training
http://training.fema.gov/EMICourses/

High Water Mark Signs
http://www.weather.gov/os/water/high_water

Homeowners Guide to Retrofitting
http://www.fema.gov/library/viewRecord.do?id=1420

No Adverse Impact. Association of State Floodplain Managers
http://www.floods.org/index.asp?menuid=340&firstlevelmenuid=187&siteid=1

Participatory Mapping
www.csc.noaa.gov/participatory_mapping/

Storm Ready Communities
http://www.stormready.noaa.gov/

Shoreline Protection

Engineered Approaches for Limiting Erosion along Sheltered Shorelines. Rella, A. and Miller, J., 2012a.
http://www.hrnerr.org/files/2012/08/RellaMiller2012a_EngineeringLiteratureReview.pdf

Guidebook: Making the most of your waterfront. New York State Department of State
http://www.dos.ny.gov/communitieswaterfronts/pdfs/Guidebooks/lwrp/LWRP_guidebook.pdf

Hudson River Sustainable Shorelines Project
http://www.hrnerr.org/hudson-river-sustainable-shorelines/

Managing Shorezones for Ecological Benefits
http://www.hrnerr.org/files/2012/08/shore_zones_11X17_nov2011.pdf

Shoreline Stabilization Techniques. New York State Department of Environmental Conservation
http://www.dec.ny.gov/permits/67096.html

State Coastal Erosion Hazard Area (CEHA)
http://www.dec.ny.gov/lands/28923.html

State Coastal Polices. New York State Department of State
http://www.dos.ny.gov/communitieswaterfronts/pdfs/CoastalPolicies.pdf