Post-Sandy Municipal Needs Assessment for Long-Term Recovery and Resiliency Planning

SUMMARY REPORT

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for the

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Executive Summary

The New Jersey Resiliency Network was formed in 2013, as a program of Sustainable Jersey to provide New Jersey municipalities with direct access to resiliency tools and resources provided by government, private, non-profit and academic organizations. In service to its mission of "helping to build stronger, more resilient communities," the NJ Resiliency Network conducted targeted outreach to municipalities across New Jersey's coastal area in the spring and summer of 2014.

The "Post-Sandy Municipal Needs Assessment for Long-Term Recovery and Resiliency Planning" (hereinafter "survey") was designed as a brief, online survey instrument to quickly and efficiently collect insights from local officials. Through a combination of open-ended and multiple choice responses, local officials were asked to provide examples of their top recovery and resilience issues and to identify their level of interest in support services available for a range of commonly cited municipal recovery and resilience issues. Survey responses were collected from local officials in New Jersey's coastal and tidal communities in March – October 2014.

This summary report reviews the methodology and responses to the survey, provides an overview of the most commonly cited concerns reported by respondents, and offers an interpretative analysis of the findings that is augmented by the NJ Resiliency Network staff insights, expertise and research conducted in consultation with its partners and a diverse set of county, state and regional stakeholders. In response to the needs identified, the report closes by listing several key tasks and initiatives to further assist municipal officials in their journey towards building stronger, more resilient communities.

Key findings point to three challenges for New Jersey municipalities:

1) The need to improve the rigor and quality of municipal risk and vulnerability assessments

2) The need to expand and deepen local flood hazard risk reduction and resilience efforts

3) The need to harden critical public infrastructure, particularly energy systems, to withstand shocks and stresses.

Municipal Needs for Recovery and Resilience - Key Findings

The survey indicated a wide variety of municipal needs and interests, corresponding to the municipality's extent of damage from Sandy, stage of recovery and capacity to plan, and capacity to fund and implement mitigation strategies and projects. An analysis of the most prevalent municipal needs for technical assistance and funding for disaster recovery and resilience initiatives revealed the following four key findings:

1. *Most at risk municipalities have not adequately assessed their vulnerability, and there is wide variability in the approach and depth of analysis municipalities use when conducting risk and vulnerability assessments.*

Approximately one third (35 percent) of participating municipalities indicated "[they] have identified future risks and have taken measures to minimize them through mitigation projects and land use planning" with another 41 percent responding they are "now considering measures to minimize" risks. Together, these responses suggest that 76 percent of the coastal and tidal, at-risk municipalities have assessed their risks and vulnerabilities and have pivoted toward developing solutions to reduce them. However, based upon the NJ Resiliency Network staff's outreach with local officials and knowledge of local planning initiatives, the respondents' definition of "assessing future risks and taking actions to minimize them" differs widely. While a handful of municipalities

have conducted comprehensive vulnerability assessments, a much larger number used an inventory of Sandy-incurred damages to identify mitigation projects, without analyzing projected flooding impacts. This is concerning because the best practices for risk and vulnerability assessments—both nationally and globally—stress the criticality of understanding current and future risks before identifying mitigation and adaptation strategies to protect lives and property.

2. *Municipalities seek technical expertise in all areas of flood resilience planning and projects, requiring multiple layers of expertise, facilitators to assist them with the bureaucracy and funding to construct the projects.*

Municipal needs for technical assistance run the gamut in flood resilience from planning, programs and policy development, to expert advice in hardening critical infrastructure to better withstand flood hazard impacts, to securing the necessary funding for all stages in the process.

The most commonly cited municipal need for technical assistance was for guidance and support in flood-related planning, programs and policy support. This was closely followed by technical assistance requests for hardening critical facilities and infrastructure, and support with securing the necessary funding or financial assistance to accomplish short- and long-term recovery objectives. Responses included general requests for support with flood-related policies and programs, such as model ordinances for increased freeboard, general assistance with hazard mitigation strategies and assistance with Federal Emergency Management Agency (FEMA) National Flood Insurance Program's Community Rating System. More specific responses focused on engineering and design assistance for local projects, such as beach studies, feasibility assessment, analysis of flood mitigation alternatives, and guidelines for new building and reconstruction.

The data affirm a commonly held understanding among NJ Resiliency Network staff and partners that the complexity of flood resilience issues necessitates expertise in various fields, including: municipal planning, coastal and tidal zone management, flood hazard mitigation, engineering, flood insurance policy, innovative infrastructure financing, and climate change adaptation. Additionally, some of the most popular strategies identified to address coastal flood risks, such as elevating structures or increasing freeboard, often require an extensive process of navigating through layers of newly adopted guidance documents and/or regulatory standards—available from a plethora of entities at multiple levels of governance and within several nonprofit and academic organizations—and an unprecedented labyrinth of grants programs for covering the costs of these kinds of municipal activities. Local staff and elected officials, particularly those overwhelmed with the nuts and bolts of long-term recovery, and arguably the ones with the greatest need for this kind of support, are understandably overwhelmed and are in need of assistance.

3. *Municipalities prioritize funding needs for resilience of critical infrastructure, as opposed to flood protection measures that will aid in future events.*

When posed with an open-ended question on funding needs, municipal respondents focused more on repairing and hardening critical community infrastructure than repairing or developing flood protection structures such as sea walls, revetments, bulkheads, etc. Critical infrastructure is defined here as roads, bridges, utilities and other infrastructure that perform essential municipal services. Examples of projects in need of funding included the repair, reconstruction and elevation of roads; overall improvements to water, stormwater and wastewater systems; and utility repair and hardening. Municipalities also made reference to critical community structures which serve essential functions in the days and weeks immediately following a disaster, such as police and fire stations, shelters, the municipal building and key medical facilities, although these funding requests were not as frequently cited as those for the infrastructure that services and undergirds community life on a daily basis.

The funding focus for critical infrastructure, as opposed to area flood protection and mitigation, is understandable because these facilities and systems provide essential services municipalities are responsible for providing. Also, repairs and funding for critical infrastructure typically fall under municipal jurisdiction (or quasi-municipal authorities) and rely upon municipal and/or regional funding, whereas large scale flood mitigation projects, e.g. dunes, sea walls and revetments, often include regional and federal oversight, and municipalities can count on, at least in part, some level of federal funding and oversight, e.g. the US Army Corps of Engineers. Lastly, the overall condition of New Jersey's core infrastructure systems is not unlike that of the rest of the nation where outdated facilities may well have required extensive repair, or even replacement well before Superstorm Sandy made landfall. This most recent coastal storm experience and the knowledge of projected future storms and coastal flood risks have accelerated the need for local government officials to repair, upgrade or replace their infrastructure.

4. *Municipalities prioritize needed improvements to energy supply and back-up power, but are not looking at long-term resilient strategies.*

In the multiple-choice questions, respondents considered the category of energy resilience a high priority for assistance, but a much smaller percentage seemed interested in the example offered for decreasing local dependence on fossil fuels as compared to options focused on securing immediate, post-disaster access to emergency energy sources. Also, the open-ended responses primarily focused on improved energy system reliability through grid-level investments, rather than making strategic local facilities better able to operate independently, even in the case of a broader grid failure. None of the 700+ unique responses given to the open-ended questions in the survey referenced a local interest in technical assistance or funding support for making critical infrastructure able to operate independently, or consideration of more strategic solutions such as solar with storage, combined heat and power systems for distributed energy generation, and microgrids that can separate ("island") from the grid and operate independently. When taken together, the multiple-choice and open-ended questions reflected a dichotomy of perspectives: interest in simple back-up generators with little understanding of the limitations to that technology as a resilience solution, and a lack of interest in or awareness of more strategic solutions that would enable critical facilities to operate independent of the grid indefinitely. These responses suggest that energy-supply is one of the most important areas for building local resilience, but that there is poor understanding of the strategic opportunities for making those improvements.

The focus on post-disaster energy supply is understandable given that virtually every municipality in New Jersey lost power after Sandy for some time, in some cases several weeks. The loss of power interrupted the ability of local entities to provide essential public services, resulting in failures in waste water treatment, health care provision, first responder capabilities, and the operation of other emergency facilities. Considering this backdrop, local officials are understandably eager to become better prepared for the next big storm by ensuring local energy supplies. For the most part, local officials are focused on more familiar solutions—typically, diesel generators. The experience after Sandy demonstrates, however, that those simple solutions are not necessarily effective. While many strategic facilities suffered from not having a backup generator, even those facilities that did have generators were not resilient due to shortages of fuel, failures of poor maintenance or preparation, and a general inability to operate over an extended grid-outage period. Improving back-up power is clearly a critical need, but also a huge strategic opportunity to make investments that have broader energy resiliency value. NJ Resiliency Network staff and core partners are concerned that municipalities are not looking at more effective and strategic approaches to ensuring energy supply. Municipalities are regularly requesting funding to purchase back-up diesel generators, when many could be developing islanded renewable energy systems with battery

storage, combined heat and power solutions, and micro-grid technologies. These solutions are not only better at providing back-up power than a simple diesel generator, but also reduce fuel use and greenhouse gas emissions.

Next Steps to Meeting Municipal Resilience Needs

The results of the survey and the summary report will be circulated to partners and collaborators in state and regional government agencies, nonprofit organizations and academic institutions who are involved at some level in municipal resilience. The findings will be of interest to policy and decision-makers, program administrators, funders, professional organizations, and environmental, land use and municipal organizations. The NJ Resiliency Network will collaborate with these entities to promote and encourage new resources and technical assistance to respond to the four key findings as well as other unique needs expressed by survey respondents and outlined in this summary report.

The NJ Resiliency Network will also continue to work closely with its core partners and Advisory Board to develop resources that will help address municipal needs and provide a clear path to resiliency. To begin with, the NJ Resiliency Network is promoting a definition of municipal resilience that extends beyond natural disasters to include a broader set of conditions that enable communities to adapt and thrive in the face of extreme events and stresses. The definition is accompanied by a "cycle" (see Appendix III) of local resilience that offers the steps or phases in local resilience, and the tools and strategies that accompany them.

In direct response to the key findings of the survey, the NJ Resiliency Network will promote the continuation, development and improvement of the following strategies and approaches:

- A central hub of municipal resilience resources
- Risk and vulnerability assessment assistance
- Energy resilience tools and trainings
- Flood hazard mitigation engineering and design assistance
- On-going municipal outreach and synthesis of local funding needs

Contents

Introduction

Purpose of the Municipal Needs Assessment

The NJ Resiliency Network was formed in 2013, as a program of Sustainable Jersey to provide New Jersey municipalities with direct access to resilience tools and resources provided by government, private, non-profit and academic organizations. Organized around a core mission of "helping to build stronger, more resilient communities," NJ Resiliency Network staff engaged municipal officials in New Jersey's coastal and tidal region to better understand municipal disaster recovery and resilience planning needs. The "Post-Sandy Municipal Needs Assessment for Long-Term Recovery and Resiliency Planning" (hereinafter "the survey") was designed as a brief, online survey instrument to quickly and efficiently collect insights from local officials. Through a combination of open-ended and multiple choice responses, local officials were asked to provide examples of their top recovery and resilience issues, and to identify their level of interest in support services available for a range of commonly cited post-Sandy challenges. Survey responses were collected from March – October 2014.

This report includes an overview of survey responses submitted by local officials from 86 municipalities throughout the New Jersey coastal and tidal area. The interpretive section in the latter half of the report integrates data from the raw responses along with interviews of key local, regional and statewide recovery and resilience stakeholders; observations by NJ Resiliency Network staff working directly with municipalities; and relevant literature review. The report is one of several ongoing efforts the NJ Resiliency Network has undertaken to communicate municipal needs to the NJ Resiliency Network's partners and other entities involved in municipal resilience. The NJ Resiliency Network will use the responses and insights gleaned from the surveys to match municipal officials with resources that are well-suited to their unique needs, and will help them build stronger, more resilient communities.

What is the NJ Resiliency Network?

The NJ Resiliency Network was formed in 2013 as a collaborative venture to provide municipalities with tools and resources to help them build stronger, more resilient communities. The NJ Resiliency Network serves municipalities across the state, with expanded services available to communities located in the ten most heavily Sandy-impacted counties[1] along New Jersey's Atlantic coast. Facilitated by Sustainable Jersey, and with the assistance of public, private, non-profit and academic partners, the NJ Resiliency Network connects municipalities with a broad spectrum of tools, model documents, expertise and grants that meet the individual needs of the communities. The NJ Resiliency Network provides a centralized source of municipal resilience resources at no cost to communities, and works to fill in gaps where resources are not otherwise available. The need for this type of assistance became clear within months after Hurricane Sandy when municipalities were faced with unfamiliar, complex problems and the path to resources was unclear or fragmented among a multitude of agencies and organizations. The NJ Resiliency Network works directly with municipalities through its regionally-based resiliency managers who help communities identify their needs and then schedule resources uniquely tailored to those needs. The trained managers provide both direct assistance (e.g. sea level rise mapping, coastal vulnerability assessments, model ordinances) and indirect assistance, by connecting the municipality to a partner organization that is able to provide assistance.

[1] The NJ Resiliency Network's primary area of assistance includes the nine federally designated disaster counties - Atlantic, Bergen, Cape May, Essex, Hudson, Middlesex, Monmouth, Ocean and Union counties, as well as Cumberland County. The latter was added because of the significant damage that municipalities incurred. These ten counties comprise a total of 289 municipalities.

If resources are not currently available for a particular community need, the NJ Resiliency Network will look to the Advisory Board and existing and prospective partners to locate resources or develop new tools, best practices and strategies, as needed.

The NJ Resiliency Network Advisory Board is a forum for partner organizations and resource providers to coordinate their efforts and engage in meaningful and effective collaboration. It also provides guidance and professional input on the work of NJ Resiliency Network staff and the progress of New Jersey municipalities in long term recovery and community resilience. The Advisory Board responds to emerging issues with research and recommended best practices, and evaluates new and existing community resilience tools for their effective application in New Jersey. The Board is represented by over twenty public, private, non-profit and academic organizations in New Jersey with expertise in disaster recovery and resilience planning. See Figure 1 for organizations represented on the Board.

Figure 1. NJ Resiliency Network Advisory Board

American Littoral Society
American Planning Association, NJ Chapter
Association of Floodplain Management, NJ Chapter
City of Cape May
City of Hoboken
Delaware Valley Regional Planning Commission
Federal Emergency Management Agency
Jacques Cousteau National Estuarine Research Reserve
Monmouth University – Urban Coast Institute
National Oceanic and Atmospheric Administration
New Jersey Future
NJ Department of Environmental Protection – Coastal and Land Use Planning
NJ Institute of Technology
NJ League of Municipalities
NJ Office for Planning Advocacy
NJ Recovery Fund
NJ Sea Grant Consortium
NJ Transportation Planning Authority
Partnership for the Delaware Estuary
Rutgers University – Bloustein School Environmental Analysis and Communications Group
Sustainable Jersey
The Nature Conservancy
Township of Woodbridge

A roadmap for municipal resilience

Many coastal and tidally-influenced communities across New Jersey still remain deeply engaged in on-going recovery from Sandy, often unable to engage in any meaningful process for planning ahead for future shocks and stresses. Others are working to ensure that the most effective and responsive policies, programs and infrastructure are in place so that if and when another natural disaster strikes, that community has improved its resilience for the long-term.

The NJ Resiliency Network responded to the complexity of local resilience planning by first defining resilience and then providing a path for local officials to follow. The NJ Resiliency Network's definition for municipal resilience is one that strikes a balance between near-term priorities for disaster recovery and rebuilding with longer-term, proactive strategies for building resilience into the fabric of local government:

Municipal resilience *is the ability of a community to adapt and thrive in the face of extreme events and stresses. Municipal resilience is achieved by anticipating risk, planning to limit impacts, and implementing adaptation strategies that integrate all community systems—civic, environmental, social and economic—to support recovery and growth.*

The NJ Resiliency Network promotes the idea of municipal resilience as a process, not an end-goal or a destination, and developed the Municipal Resilience Cycle (see Appendix III) to further articulate that process. The cycle begins with the initial phase of encouraging municipal leaders to increase their readiness to respond and bounce back from disasters of all kinds. The subsequent four steps outline a traditional planning process, accentuating the importance of effective planning for the localized impacts of climate change. The cycle ends with a phase promoting iterative, data-informed management, recognizing the importance of building a culture of organizational learning in the face of an uncertain future.

Methods

Survey Development

The "Post-Sandy Municipal Needs Assessment for Long-Term Recovery and Resiliency Planning" (hereinafter "survey") was developed in December 2013 to serve three purposes. First, the survey offered NJ Resiliency Network staff a way to begin collecting data from the field to shape immediate programming and work planning efforts. In most cases, data were acted on in real time, well before the complete set of responses was compiled and assessed in aggregate to inform this report. Second, the survey served as an informal application and quick way for local officials to provide the NJ Resiliency Network with a snapshot of local efforts and projects at the outset of direct engagement with a resiliency manager. Finally, the data have enabled the NJ Resiliency Network to take stock of municipal needs as its program transitions from the recovery needs immediately following Sandy to a longer perspective on local resilience.

The survey included both open-ended and multiple-choice questions to gauge the respondents' opinions on local technical assistance and funding needs as well as the level of interest in selected tools, approaches and strategies for advancing municipal disaster recovery and building local resilience. After collecting demographic and contact information, the questionnaire consisted of the following sections:

1) two open-ended questions requesting examples of unmet technical assistance and funding needs related to Superstorm Sandy recovery;
2) two multiple-choice questions asking respondents to provide a quick self-assessment of municipal progress in Sandy recovery and resilience planning to date;
3) forty multiple prompts asking respondents to share to what extent their municipality would benefit from assistance in a series of commonly cited strategies and approaches used by New Jersey municipalities engaged in Sandy recovery and resilience planning ("Yes" or "Maybe/Unsure"); and
4) three closing, open-ended questions asking respondents to detail the resources and services they considered to be most useful in advancing their recovery and resilience planning objectives and identify the organizations supporting their local efforts.

The NJ Resiliency Network will continue to gauge municipal needs through its outreach program so that NJ Resiliency Network programs and assistance meet the needs of New Jersey communities. A complete copy of the questionnaire is available in Appendix I.

Survey Dissemination

The survey was administered to local officials in three formats: on the Internet, in paper format, or as an interview. The online tool was developed using the Qualtrics online survey software, and advertised through broad-based distribution lists managed by NJ Resiliency Network partners as well as targeted outreach by resiliency managers to municipalities affected by Sandy or located in regions considered highly vulnerable to coastal flood hazards.

Figure 2, below, provides a summary of the timeframe during which the survey was disseminated, beginning with an invitation to respond after the official announcement of the program's launch at the beginning of 2014 and proceeding through a series of broad and targeted follow-up efforts to solicit participation in the Municipal Needs Assessment.

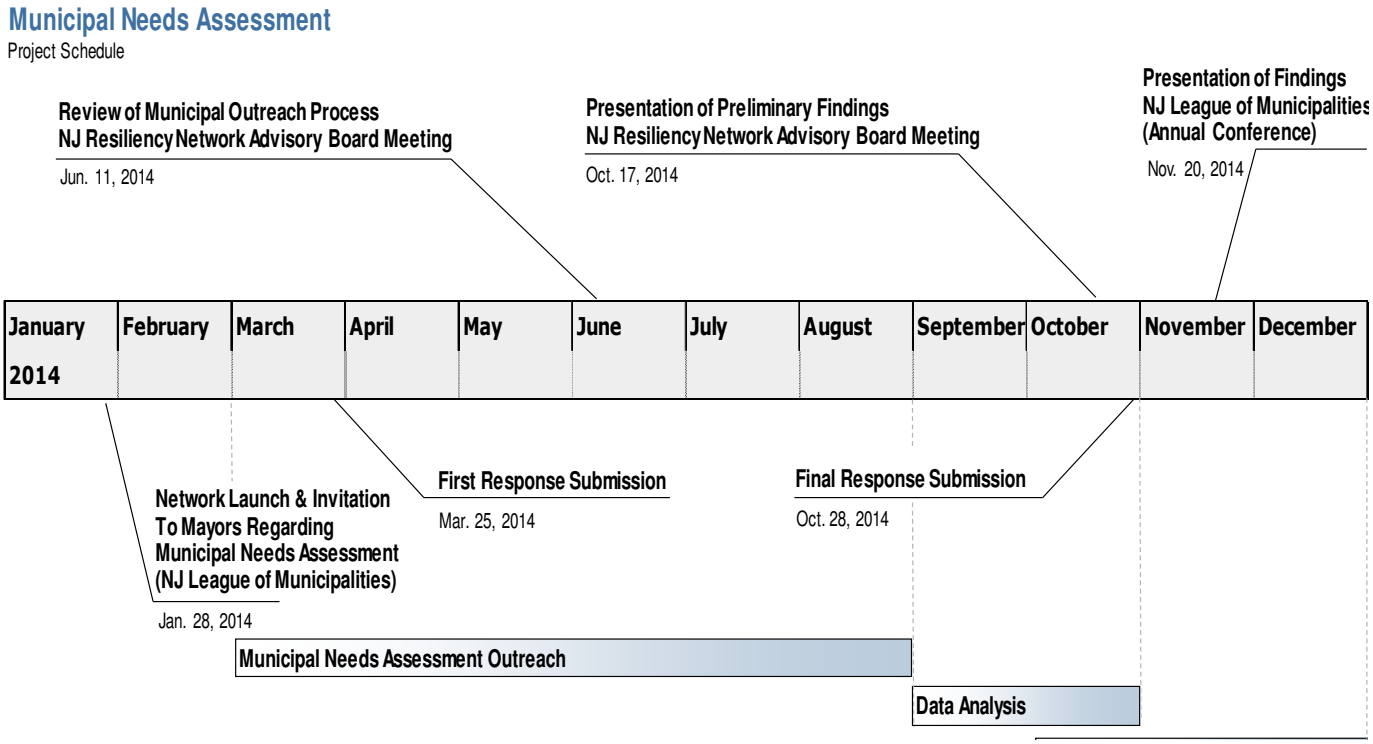


Figure 1. Municipal Needs Assessment Project Timeline.

The survey was limited to local officials[2] involved in the community's recovery and resilience planning provided responses. The initial response rate (originally targeted solely at mayors) was very low, necessitating outreach to a broader set of municipal leaders. NJ Resiliency Network staff targeted this outreach effort on the most heavily Sandy-impacted municipalities.

A total of 121 individuals began the Municipal Needs Assessment, representing 95 municipalities. Of these, 28 incomplete survey submissions were discarded from the aggregate analysis along with one response from

[2] Local officials are defined as individuals serving on the governing body, board or commission, public employees and municipal consultants.

outside of the NJ Resiliency Network region. Survey responses accepted as complete included, at a minimum, input to the two initial open-ended questions describing local needs related to technical assistance (Q3) and projects in need of funding (Q4). The final analysis included 93 individual responses, representing 86 municipalities. This represents an overall response rate of 29.8 percent of the 289 municipalities in the NJ Resiliency Network's 10-county region.

Coding Qualitative (Open-Ended) Responses

The data analysis began with a review of the responses to the open-ended questions. Over 700 unique responses were provided to these four questions:

- *Q3. In your opinion, what are the top three recovery issues in your community that would benefit from outside technical assistance?*
- *Q4. If additional private or public funds were to be available for long-term recovery and resiliency, what would be three examples of how your municipality would use those funds?*
- *Q8. Given your responses to [#6 and #7] above, what are the top five resources that you think would be most beneficial to your municipality?*
- *Q9. If there are other types of technical assistance or resources that would be helpful, what are they?*

Given the large volume of useful data generated by the open-ended questions, the responses were catalogued in a format that would best inform programming and service delivery to municipal leaders. To bring clarity to the wide-range of responses, a simple codebook was developed made up of ten categories of needs. As shown in Figure 3, every open-ended response was organized into one of three high-level themes providing an overall sense of municipal needs for technical assistance and funding for disaster recovery and long-term resilience initiatives. The three themes are:

- *Flood Risk Reduction*
- *Disaster Preparedness & Recovery*
- *Municipal Planning & Prosperity*

Figure 3. Qualitative Coding of Open-Ended Responses

Flood Risk Reduction Categories of Needs

1. Hardening & Protecting Critical Public Facilities and Infrastructure
2. Flood Risk Planning, Policies and Programs
3. Flood Control Structures and Nature-based Flood Mitigation
4. Hardening & Protecting Non-Critical Community Assets and Residences

Disaster Preparedness & Recovery Categories of Needs

5. Emergency Preparedness
6. Debris Management
7. Funding and Financial Assistance for Recovery

Municipal Planning & Prosperity Categories of Needs

8. Non Flood-risk Planning and Services
9. Natural Resources and Environmental Protection
10. (Other)

The high-level themes were used as an organizing framework during the earlier stages of reviewing the qualitative data captured in the survey. The first four needs categories (see Figure 3) captured comments focused on flood-related responses. References made with specific regards to disaster preparedness and readiness to respond after a crisis event were captured under categories 5, 6 or 7. Whenever a respondent referenced a need or issue not specific to a specific natural hazard or experience of disruption, the response was sorted into categories 8 or 9, both of which are more generally focused on a broader local governance issues and concerns. For the most part, category 10 (Other) captures

comments in which respondents indicated they did not need or were not interested technical assistance or funding support. The complete codebook is provided in the appendices to this report (see Appendix II).

For any given question, the responses were coded such that any given municipality would only be counted once for each of the ten categories of needs. For example, while certain responses sorted into one of the flood-related categories could have also been considered an emergency preparedness or municipal planning effort, the lack of specificity in the responses did not allow reviewers to make that distinction, NJ Resiliency Network staff used their best judgment to categorize responses. In cases where a respondent may have listed three different responses for a technical assistance support need under a given category of need (such as, for example, noting that they wanted to a) repair roads infrastructure, b) flood-proof a pumping station, and c) assess the capacity of their stormwater management system, all three of these individual examples were collapsed into one count for the "hardening & protecting critical public facilities and infrastructure" category of needs). Since the purpose of this report was to assess trends across all 86 municipalities, all unique examples listed by a given participating municipality that fell into one category of needs was only counted once (so as to avoid any over-representation of the needs for support in a given topic) as data were reviewed in aggregate.

Analysis of Quantitative (Multiple Choice) Responses

The survey included two general types of multiple choice questions: one series focused on respondents' demographics and self-assessment, while the latter series provided an overview of technical assistance options. The formats of the questions are show below.

<u>Demographic Information and self-assessment multiple-choice questions:</u>

- *Q2. In what capacity do you serve the municipality?*
- *Q5. How would you characterize your progress in recovering from Sandy?*
- *Q6. How would you characterize your progress in resilience?*

<u>Technical assistance multiple-choice question:</u>

- *Q7. Below are examples of recovery and resiliency needs that many communities are facing a year after Sandy. Please indicate if you think your municipality would benefit from assistance to address any of these needs.* Multiple-choice prompt headings included:
    - *Long Term Community Recovery*
    - *Housing and Neighborhoods*
    - *Economic Development and Downtown Recovery*
    - *Resiliency Planning*
    - *Vulnerability and Risk Assessment*
    - *Energy Resiliency*

Responses to demographic questions ensured a breadth of relevant perspectives and expertise among survey respondents. Municipal identification helped NJ Resiliency Network staff target its final round of outreach so as to ensure a broad sample of participating municipalities across the NJ Resiliency Network region.

Responses to Q5 and Q6 were tallied to understand overarching trends in how local officials perceive their progress in in Sandy recovery and long-term resilience planning. The NJ Resiliency Network hopes that future outreach will show improvement in the number of municipalities reporting progress on these topics.

Responses to Q7 were tallied to understand the general level of readiness and interest among municipal officials for a variety of assistance approaches and topics.

Summary of Survey Responses

The following pages provide an overview of the survey responses. An interpretive section follows on page 19.

1. Description of Respondents

Survey responses were received from officials in 86 municipalities in the NJ Resiliency Network's 10-county region, and reflect a diversity in geographic distribution, population size and type of local government. The list of municipalities represented by Needs Assessments Respondents is shown below. The seventeen inland municipalities are noted with an asterisk (*).

List of Municipalities represented in survey respondents

North Jersey

Bergen County
Bogota Boro
Ho-Ho-Kus Boro*
Little Ferry Boro
Moonachie Boro
North Arlington Boro
Oradell Boro
Palisades Park Boro*

Essex County
Belleville Twp
Caldwell Boro*
East Orange City*
Maplewood Twp*

Hudson County
Bayonne City
Hoboken City
Jersey City
Secaucus Town
Union City*

Union County
Elizabeth City
Linden City
Roselle Boro*
Summit City*

Central Jersey

Middlesex County
Dunellen Boro*
Edison Twp
Milltown Boro*
New Brunswick City
North Brunswick Twp*
Old Bridge Twp
Perth Amboy City
South River Boro
Woodbridge Twp

Monmouth County
Asbury Park City
Atlantic Highlands Boro
Bradley Beach Boro
Colts Neck Twp
Englishtown Boro*
Freehold Twp*
Highlands Boro
Holmdel Twp
Howell Twp*
Manasquan Boro
Neptune Twp
Roosevelt Boro*
Sea Bright Boro
Shrewsbury Twp*
Spring Lake Boro
Tinton Falls Boro
West Long Branch Boro

Ocean County
Barnegat Light Boro
Beach Haven Boro
Brick Twp
Eagleswood Twp
Harvey Cedars Boro
Lacey Twp
Little Egg Harbor Twp
Long Beach Twp
Ocean Gate Boro
Pine Beach Boro
Point Pleasant Boro
Seaside Park Boro
Ship Bottom Boro
South Toms River Boro
Surf City Boro
Tuckerton Boro

South Jersey

Atlantic County
Absecon City
Brigantine City
Egg Harbor City
Estell Manor City
Galloway Twp
Hammonton Town*
Linwood City
Margate City
Somers Point City
Ventnor City

Cape May County
Avalon Boro
Cape May City
Cape May Point Boro
Lower Twp
North Wildwood City
Ocean City
Sea Isle City
Upper Twp
West Wildwood Boro
Wildwood City
Woodbine Boro

Cumberland County
Bridgeton City
Greenwich Twp
Vineland City*

Table 1. Roles of participating local officials (sample titles provided)	
Title/Perspective	**Count**
Municipal Administrator (e.g., Borough Administrator, City Manager)	23
Mayor	14
Environmental Stakeholder (e.g., Green Team member, Sustainability Specialist)	13
Engineer	10
Emergency Manager	9
Planner	7
Economic Sector Stakeholder (e.g., Chief Financial Officer, Business Administrator, Tax Collector)	6
Council Member	3
Public Works Official	2
Floodplain Manager	2
Clerk	2
Community Leader (e.g., community stakeholder group liaison, Special Advisor)	2
Total	93

List of roles and perspectives represented among respondents

The respondents represent a wide range of local government roles and perspectives, as illustrated in Table 1. The survey was limited to "municipal officials", defined as individuals serving on the governing body, board or commission, public employees and municipal consultants.

Self-assessments on Sandy recovery progress and resiliency planning

Tables 2 and 3 summarize the outcome of question prompts asking respondents to self-assess their Sandy recovery status as well as the extent to which they had engaged in longer-term planning to become more resilient to climate- and weather-related natural hazards common to New Jersey.

Table 2. Responses to Q5 "How would you characterize your progress in recovering from Sandy?"		
Answer	**Count**	**%**
a) We have fully recovered, or were not impacted	41	48%
b) We are still engaged in long-term recovery, but have made significant progress	34	40%
c) We were heavily impacted and are still engaged in both short-term and long-term recovery	11	13%
Total	86	100%

Table 3. Responses to Q6 "How would you characterize your progress in resiliency, i.e. identifying future risks and being prepared to weather those risks against future disasters?"		
Answer	**Count**	**%**
a) We have identified future risks and have taken measures to minimize them through mitigation projects and land use planning	30	35%
b) We have identified our future risks, and are now considering measures to minimize them through mitigation projects and land use planning	35	41%
c) We have started to identify our future risks, but need additional time and/or assistance to fully evaluate them	20	23%
d) We have not yet identified or discussed our future risks	1	1%
Total	86	100%

The two initial open-ended questions describe local needs related to technical assistance (Q3) and projects in need of funding (Q4). These questions were posed at the very beginning of the survey, prior to having prompted respondents with specific ideas captured in the multiple choice section. As such, these qualitative responses are considered to be unbiased reflections on the top needs local officials face around Sandy recovery and long-term resilience planning.

2. Qualitative responses on municipal needs for technical assistance

Q3. "What are the top three recovery issues in your community that would benefit from outside technical assistance?"

The survey was designed to help the NJ Resiliency Network identify the direct assistance, resources and referrals that would meet the needs of a given municipality. Responses to Q3, "*What are the top three recovery issues in your community that would benefit from outside technical assistance*?", offered an efficient way for local officials to articulate in their own words the highest-priority needs for their communities. The darker blue bars in Figure 4 shows how many municipalities (n=86) indicated technical assistance needs within each of the ten categories.

The data show respondents would most benefit from technical assistance related to flood resilience programs and policies, and flood-proofing infrastructure. Technical assistance related to flood risk planning, policies and programs was the most commonly cited need, representing 37 percent (32) of participating municipalities. Representing a close second are technical needs related to hardening and protecting public infrastructure and critical facilities, representing 36 percent of the respondent pool (31). A third category that was also very close behind was a need for support service on funding and financial assistance for recovery from 35 percent (30) of municipalities. Respondents offered the fewest examples of technical assistance needs in the categories of debris management and natural resources and environmental protection.

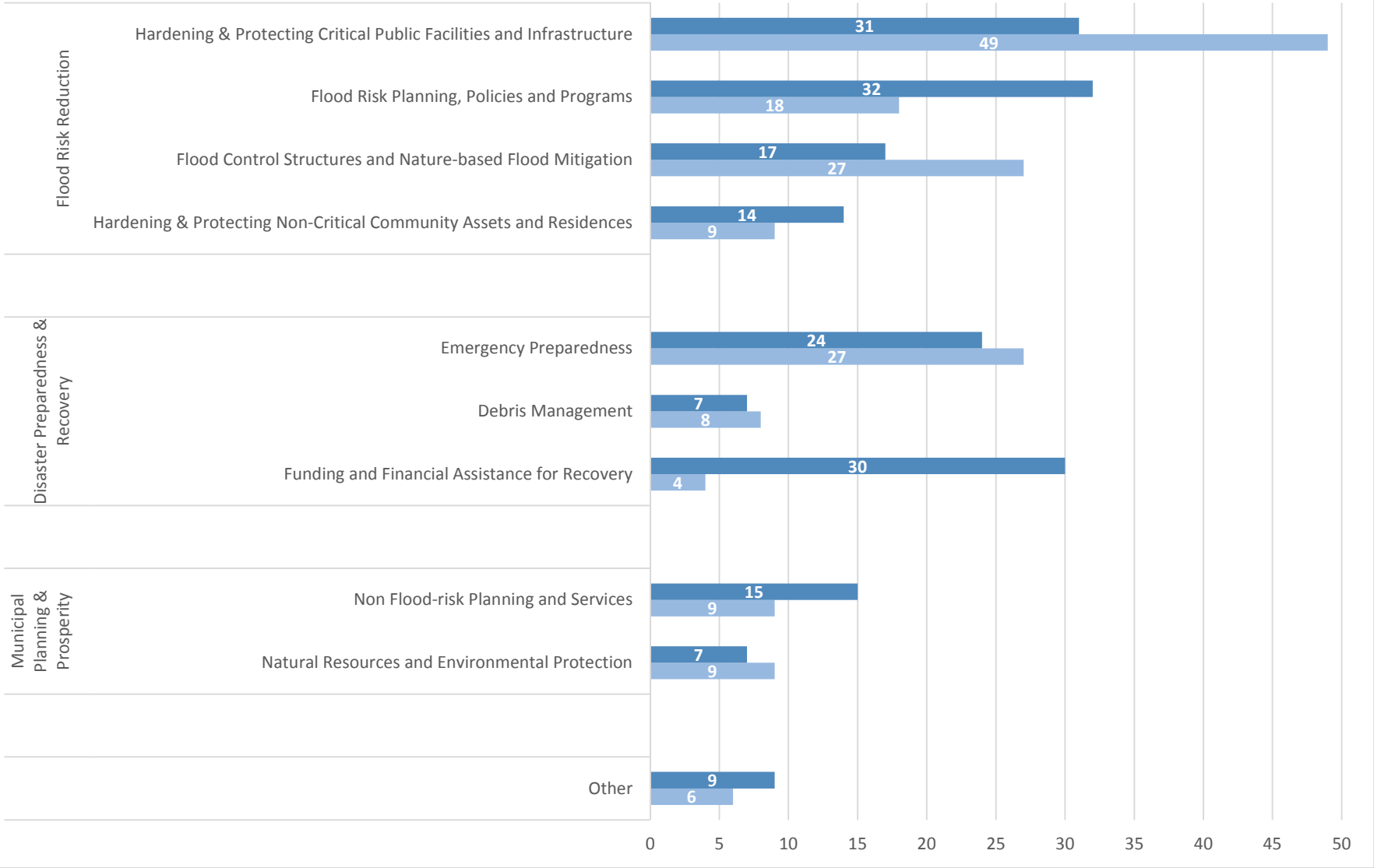
3. Qualitative responses on municipal needs for funding support

Q4. "If additional private or public funds were to be available for long-term recovery and resiliency, what would be three examples of how your municipality would use those funds?"

The second open-ended question (Q4) focused on funding: "If additional private or public funds were to be available for long-term recovery and resiliency, what would be three examples of how your municipality would use those funds?" This allowed respondents to offer indicate their most prevalent funding needs. In summary, communities prioritized funding needs for infrastructure hardening. They also offered examples of capital projects to build, repair or improve coastal flood control structures.

The lighter blue bars Figure 4 illustrate the number of communities (n=86) listing "examples of how [their] municipality would use…funds" (Q4), organized by each of the 10 categories of needs. With respect to funding, the greatest number of local project examples mentioned in response to this Q4 fall within the category of need on hardening and protecting critical infrastructure, representing 57 percent (49) of respondents. Just under one third (31 percent) of the respondents are interested in funding support for flood control structures and nature-based flood mitigation as well as funding for emergency preparedness efforts (27 each). With the exception of interest in funding for flood risk planning, policies and programs, the remaining categories of needs are mentioned by fewer than 10 percent of participating communities.

Figure 4. Coding Open-Ended Responses
for Technical Assistance and Funding Support



4. Quantitative responses regarding specific (multiple choice) technical assistance prompts

This section included one question (Q7), worded as follows. Each heading contained 5-12 multiple choice prompts for a total of 40 unique examples of a resilience tool or technique for municipalities to consider.

Q7. "Below are examples of recovery and resiliency needs that many communities are facing a year after Sandy. Please indicate if you think your municipality would benefit from assistance to address any of these needs."

Multiple choice prompt headings included:

- *Long Term Community Recovery*
- *Housing and Neighborhoods*
- *Economic Development and Downtown Recovery*
- *Resiliency Planning*
- *Vulnerability and Risk Assessment*
- *Energy Resiliency*

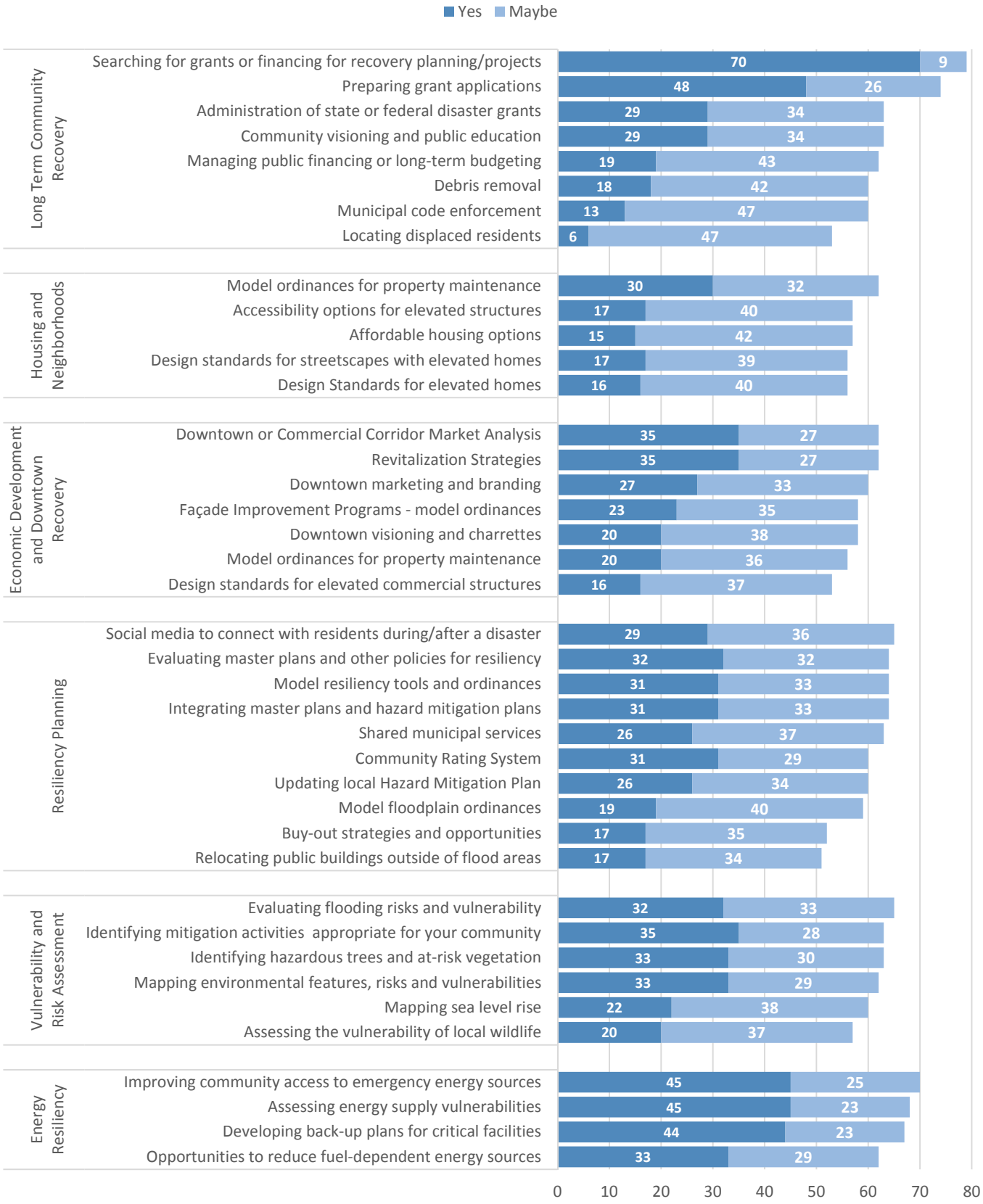
In addition to asking respondents to offer examples of technical assistance and funding support needs in their own words (previous section), the survey included multiple choice prompts for a variety of recovery and resiliency planning tools and strategies that are commonly associated with both long-term recovery and municipal resilience. This question (Q7) included forty prompts organized under six multiple choice headings: Long Term Community Recovery; Housing and Neighborhoods; Economic Development and Downtown Recovery; Resiliency Planning; Vulnerability and Risk Assessment; and Energy Resiliency.

Respondents were instructed to indicate if their municipality would benefit from assistance to address any number of specific needs by clicking "Yes" or "Maybe / Unsure" (Figures 5-12). Municipalities were not given an option to indicate a "no" response. The final column of each table shows the total number of respondents that expressed any level of desirability for a given support service or resource.

Figure 5 includes the full set of responses to provide an overview of municipal responses for sample assistance prompts under all six headings. Darker blue bars represent "Yes" answers; respondents indicating "Maybe / Unsure" are listed in the lighter color blue. Across the board there was a relatively high level of interest in the assistance examples offered in the multiple choice prompts, as indicated by the fact that at least 51 of the 86 respondents indicated some level of interest in all forty prompts. Differentiation between "Yes" and "Maybe/Unsure" votes provides an indication of the perceived benefit to a municipality; a factor that varied within, and between, the six headings. The question prompt receiving the highest response rate, representing 92 percent of 86 municipalities in the respondent pool (79), was on the topic of searching for grants or financing for recovery. The question prompt with the lowest response rate, accounting for 59 percent of participating municipalities (51), was on support for relocating public buildings out of flood-prone areas.

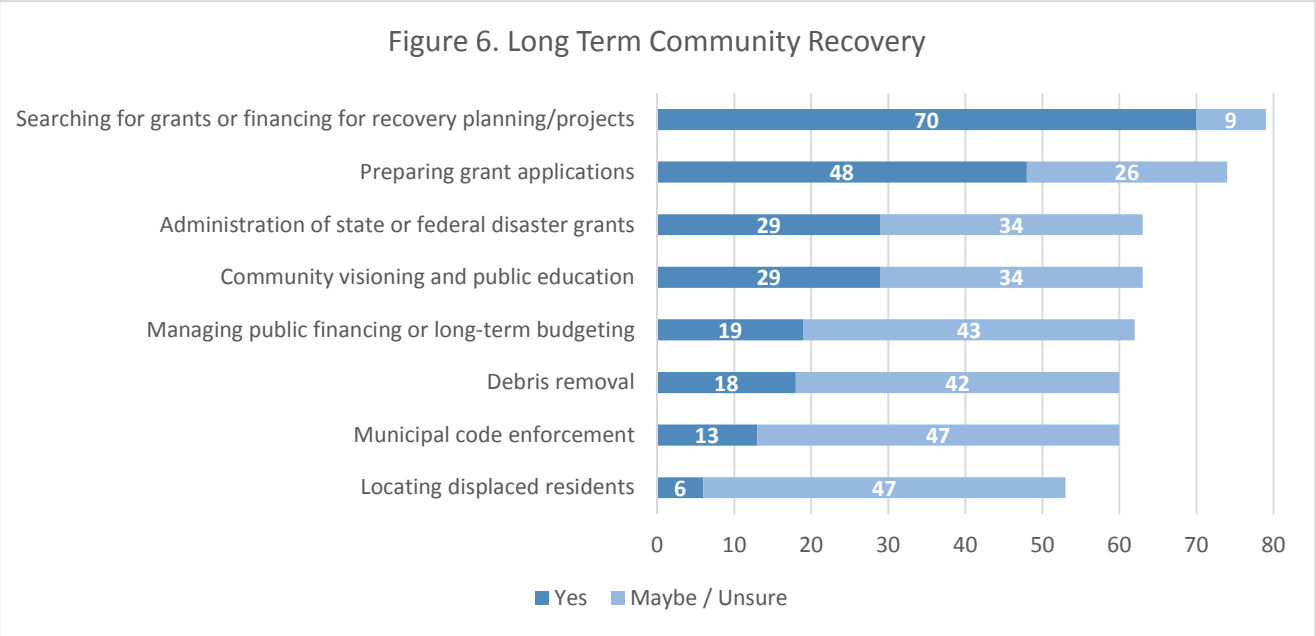
Over the next couple pages, the forty prompts are presented by heading (Figures 6-11). Response values are listed as counts for simple comparability across the six headings.

Figure 5. Perceived Benefit of Assistance Options for Addressing Common Post-Sandy Recovery and Resilience Issues



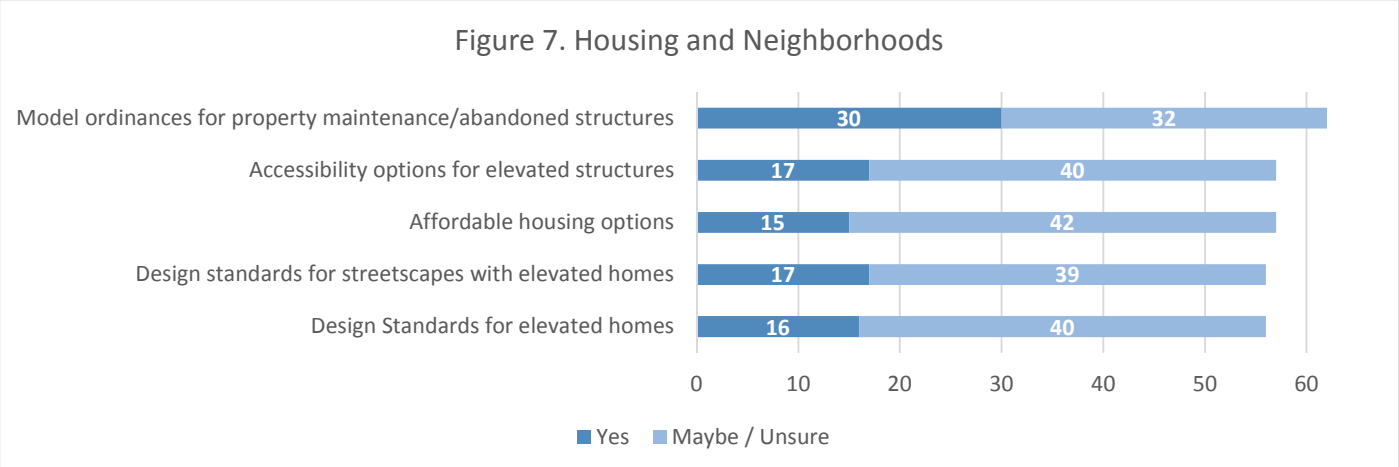
Multiple choice heading 1. Long-Term Community Recovery assistance

Under the category of Long-Term Community Recovery (Figure 6), the issue of searching for grants or financing for recovery planning and/or projects received the highest response rate out of all 40 question prompts in the multiple choice section of the questionnaire. This represents 70 municipalities out of the total respondent pool, with an additional 9 indicating "Maybe / Unsure". This also represented the greatest percentage of "Yes" votes from respondents on any prompt. By contrast, one of the lowest percentage of "Yes" votes is captured in this heading around technical support for locating displaced residents.



Multiple choice heading 2. Housing and Neighborhoods assistance

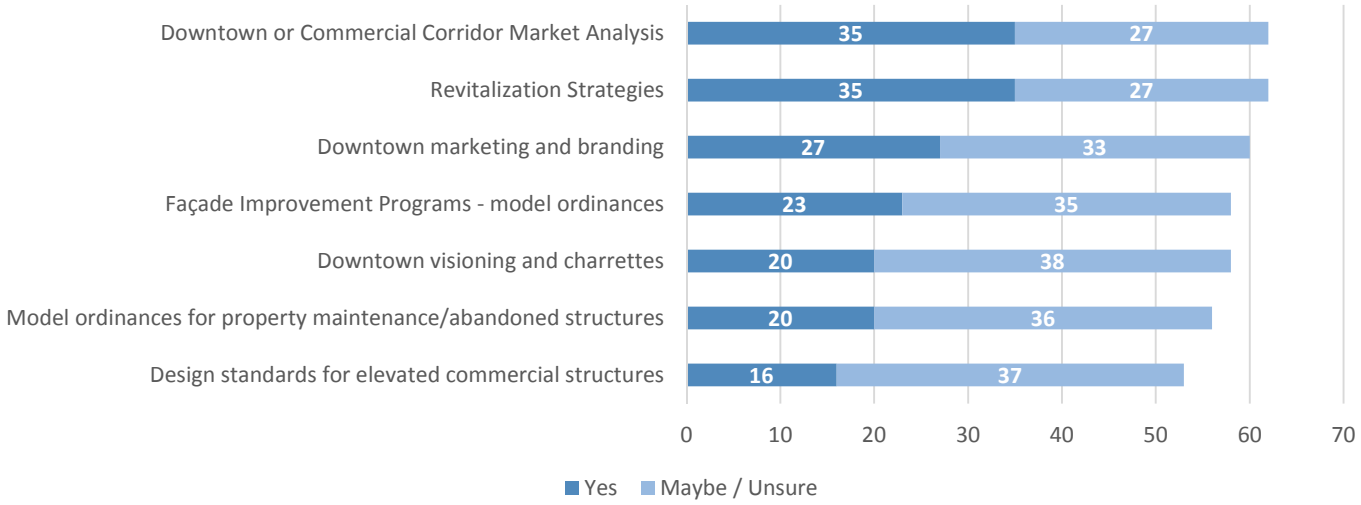
Overall, the relative benefit of support services in Housing and Neighborhoods (Figure 7) was low, especially compared to other categories. Model ordinances for property maintenance/abandoned structures had the highest response rate under this heading, yet resulted in a fairly even split between "Yes" votes (32) and "Maybe / Unsure" votes (30).



Multiple choice heading 3. Economic Development and Downtown Recovery assistance

Prompts under the heading of Economic Development and Downtown Recovery activities (Figure 8) showed a response rate comparable to the other 5 headings captured under Q7. However, on the whole, there tended to be more "Maybe / Unsure" than solid "Yes" votes. Exceptions come from respondents indicating a value in assistance with revitalization strategies and downtown or commercial corridor market analysis activities.

Figure 8. Economic Development and Downtown Recovery



Multiple choice heading 4. Resiliency Planning assistance

Resiliency Planning assistance prompts (Figure 9) represent a higher response rate than previous headings overall, but the individual prompts have mixed results. The greatest "Yes" votes were for assistance to evaluate master plans and other policies for resiliency (32), followed closely by 31 votes each for integrating master plans and hazard mitigation plans, model resiliency tools and ordinances and assistance with participation in the Community Rating System. Model floodplain ordinances, buy-out strategies and opportunities, and relocating public buildings outside of flood areas represented the lowest "Yes" votes (19, 17 and 17, respectively).

Multiple choice heading 5. Vulnerability and Risk Assessment assistance

Responses to the heading on Vulnerability and Risk Assessment (Figure 10) are varied, with similar overall response rates for the question prompts, but no clear examples of assistance that respondents found to be highly beneficial. The highest proportion of the "Yes" responses were for support identifying nature-based mitigation activities appropriate for a given community, representing 35 of the 63 municipalities responding to that question prompt. A larger number of counts are associated with the "Maybe / Unsure" option, in particular for mapping sea level rise (38) and assessing the vulnerability of local wildlife (37).

Figure 9. Resiliency Planning

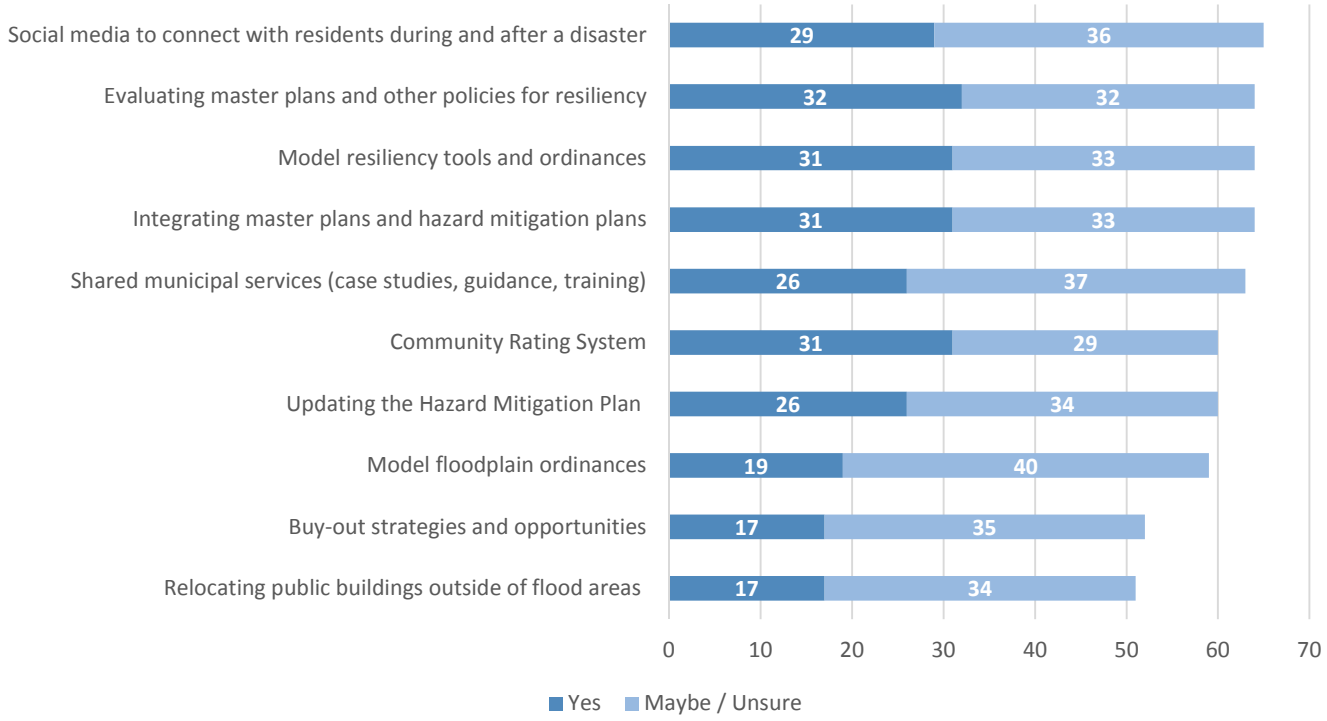
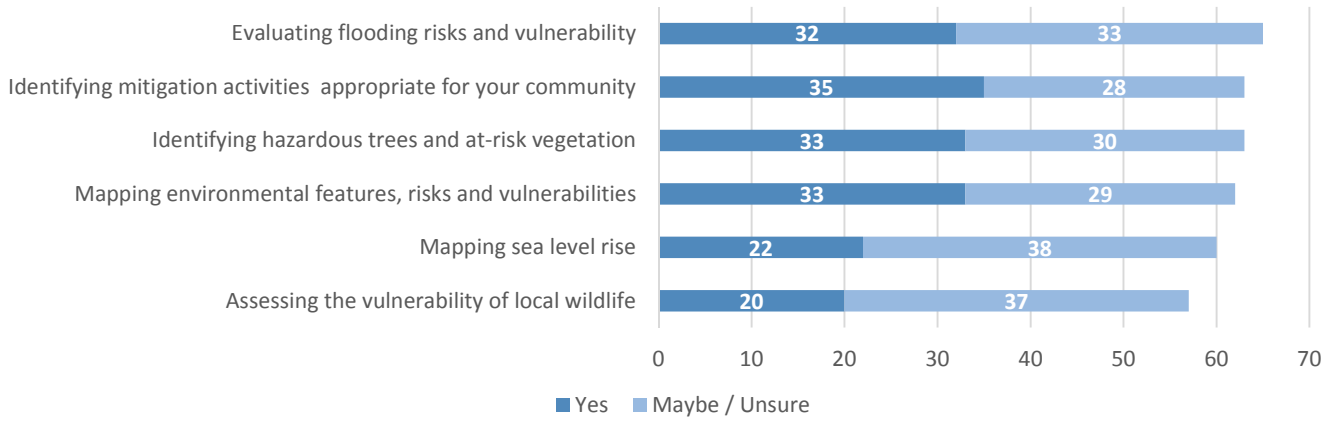


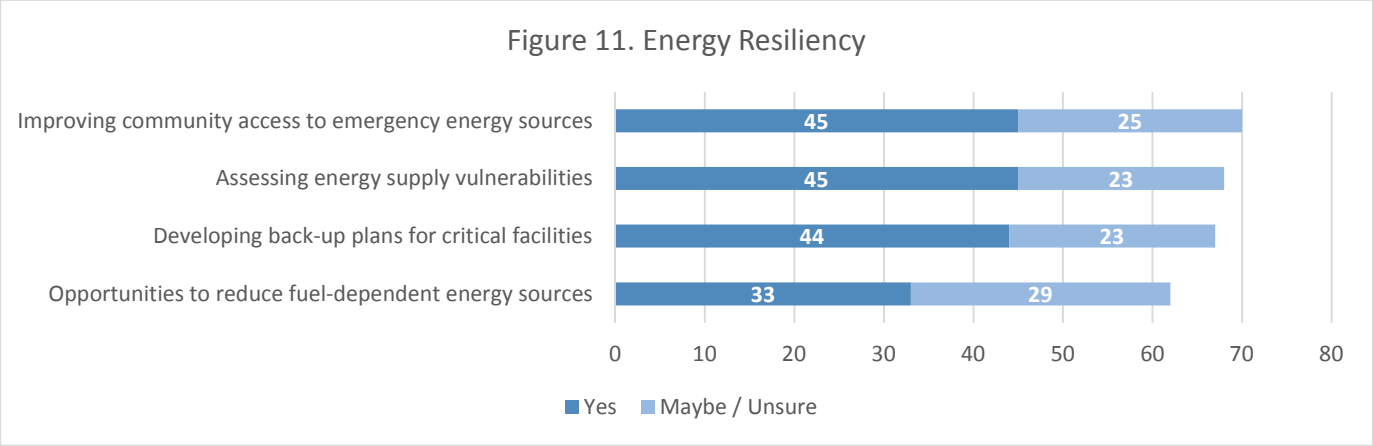
Figure 10. Vulnerabilty and Risk Assessment



Multiple choice heading 6. Energy Resiliency assistance

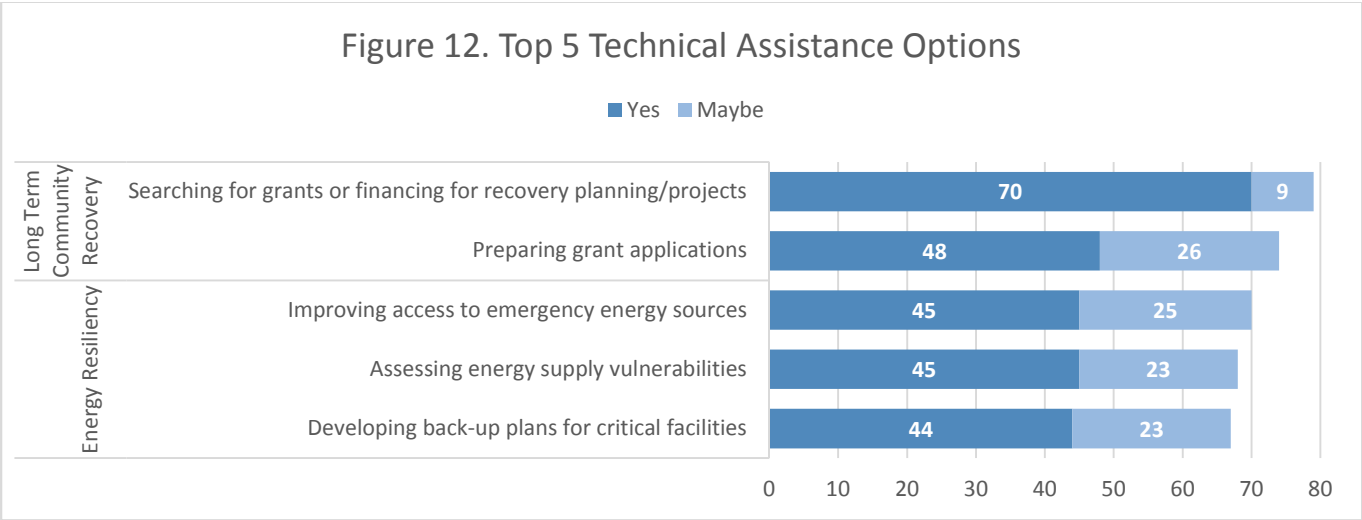
Given the overall response rate to prompts under the Energy Resiliency heading, as compared to the other 5 categories, respondents indicate they would benefit from this kind of assistance (Figure 11). Improving community access to emergency energy sources has the second highest response rate out of all 40 question prompts in this section of the questionnaire (representing 70 municipalities), followed closely by high response rates for assessing energy supply vulnerabilities and developing back-up plans for critical facilities (68 and 67

votes, respectively). For all three of those examples, approximately two thirds of respondents voted “Yes” while one third considered these support services as worthy of consideration under the “Maybe/Unsure”.



5. Quantitative responses summarizing most beneficial assistance multiple choice prompts

Of the 40 multiple-choice prompts offered for Q7 (“indicate if [your] municipality would benefit from assistance to address…needs),” the top 5 prompts can be interpreted in one of two ways. Whether considering the overall response rate for each multiple choice prompt (by adding the “Yes” votes and the “Maybe / Unsure” votes) or considering the prompts, which received the greatest number of “Yes” votes, the results are the same. See Figure 12). Municipalities are willing and ready to receive support in finding and applying for disaster recovery funding as well as support for improving the long-term resilience of community energy sources by improving access to emergency sources of power and developing back-up plans for critical facilities and assessing vulnerabilities in the community’s energy supply chain.



6. Qualitative responses summarizing most beneficial municipal resource and technical assistance needs

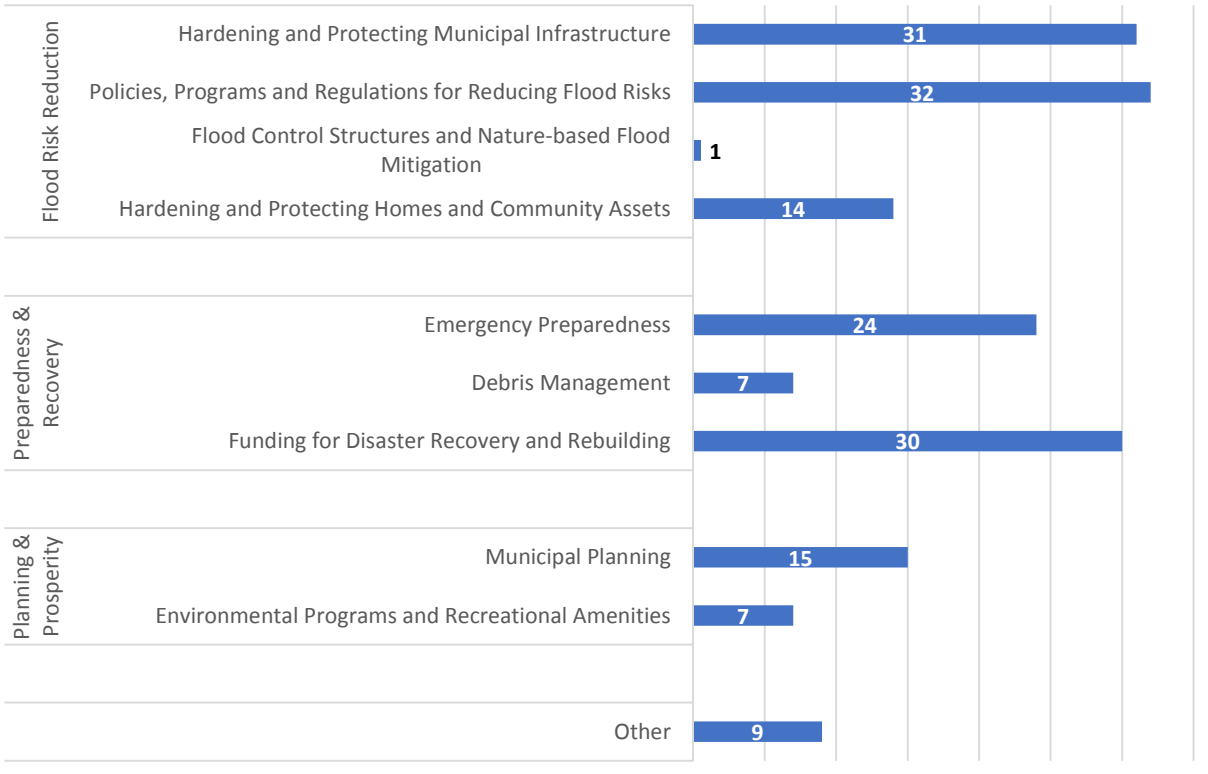
Q8. "Given your responses to #6 and #7 above, what are the top 5 resources that you think would be most beneficial to your municipality?"

Q9. "If there are other types of technical assistance or resources that would be helpful, what are they?"

At the end of the questionnaire, respondents were asked to elevate the "top 5 resources that (…) would be most beneficial to [their] community" (Q8) and were given an opportunity to list "other types of technical assistance or resources that would be helpful" (Q9). Many respondents treated these questions similarly, indicating reviewers to "see above" or simply skipping Q9. As such, responses to Q8 and Q9 were combined in the analysis. Figure 13 shows how many municipalities out of a total of 86 list their top resource needs within one of the ten categories of needs.

The data indicate that a majority of respondents find the most useful resources for their municipality would be for flood risk planning, policies and programs (37 percent or 32 municipalities), or hardening and protecting critical infrastructure (36 percent, 31). Following closely behind is a request for funding and financial assistance for recovery and rebuilding (35 percent, 30). The least commonly cited resources in response to Q8 and Q9 are in the category of capital projects for flood attenuation. The results closely mirror responses to Q3 and Q4, summarized above.

Figure 13. Categorization of Needs Listed in Response to (Q8) -- Top Five Resources & (Q9) Other Useful Resources



Key Findings and Interpretation of Municipal Needs Assessment Results

The survey reveals important information about municipal needs for technical assistance and funding for disaster recovery and long-term resilience initiatives at the time the survey was conducted. The interpretation and analysis of the survey responses was aided by NJ Resiliency Network staff knowledge of local resilience activities gleaned through municipal outreach efforts as well as the insights, expertise and research shared by a diverse set of public, private, non-profit, and academic partners and stakeholders throughout the state. NJ Resiliency Network staff also remains informed and apprised of the latest developments in New Jersey resilience efforts in general, and tracks progress on relevant issues across the Northeast and to a lesser extent across the country. This regular process of building the NJ Resiliency Network's expertise—through attendance in conferences and trainings, literature review and participation in diverse meetings and working groups related to disaster resilience and resilience planning—adds a level of nuance and depth to our interpretive process.

Overall insights from this analysis of the most prevalent municipal needs for technical assistance and funding for disaster recovery and resilience initiatives can be summarized through the following four key findings:

1. *Most at risk municipalities have not adequately assessed their vulnerability, and there is wide variability in the approach and depth of analysis municipalities use when conducting risk and vulnerability assessments.*
2. *Municipalities seek technical expertise in all areas of flood resilience planning and projects, requiring multiple layers of expertise, facilitators to assist them with the bureaucracy and funding to construct the projects.*
3. *Municipalities prioritize funding needs for resilience of critical infrastructure, as opposed to flood protection measures that will aid in future events.*
4. *Municipalities prioritize needed improvements to energy supply and back-up power, but are not looking at long-term resilient strategies*.

Following the discussion below of the four key findings is a concluding section on relevant programmatic responses NJ Resiliency Network staff, partners, and other key recovery and resilience stakeholders in New Jersey can and should take to support community resilience.

Key Finding 1: *Most at risk municipalities have not adequately assessed their vulnerability, and there* is wide variability in the approach and depth of analysis municipalities use when conducting risk and vulnerability assessments.

When asked to self-assess the extent to which their communities have identified future risks and taken actions to be better prepared to face those risks, the majority of municipalities participating in the survey felt that they had adequately assessed their risk and were turning towards strategies to address that risk.

NJ Resiliency Network staff and partners working with a large sampling of coastal communities have found that few communities have adequately assessed future risks. As such, it is difficult to reconcile the reality NJ Resiliency Network staff see on the ground with a figure that suggests over three quarters of the municipalities who responded to the survey have adequately assessed their risk and have pivoted toward developing solutions. It appears that the process of "assessing future risks and taking actions to minimize them" has a wide range of meanings to New Jersey municipalities, and includes as many different interpretations of what constitutes an adequate effort at conducting a risk and vulnerability assessment. This is a cause for concern because steps cannot be taken to protect lives and property from future threats until the threats have been fully analyzed.

New Jersey municipalities are not required by the state to conduct risk or vulnerability assessments, nor are they required for Sandy-related grants not issued by the Federal Emergency Management Agency (FEMA).

To our knowledge, New York is the only state that has required municipal vulnerability assessments and detailed guidelines were provided to the New York City municipalities that were eligible for Sandy CDBG-DR funded projects. The assessments include an analysis of both the potential impacts of future flooding as well as the ability of the structure and/or business to resume to normal working operations within a timely manner.

Absent model plans and standards for coastal community risk and vulnerability assessments that consider climate change projections, it appears that most New Jersey municipalities are conducting these kinds of assessments at their own discretion—and relying primarily on geospatial analysis of current flood hazards, and disregarding relevant climatic data to support decision-making. Numerous templates and guidance documents are available from National Oceanic and Atmospheric Administration and other climate adaptation, coastal and hazard mitigation organizations to help guide local officials through a comprehensive risk and vulnerability that incorporates future climate-related natural hazard projections. Unfortunately, few municipalities seem to be using these resources and, as such, are likely to overlook important factors needed to ensure they have conducted an adequately comprehensive risk and vulnerability assessment.

Flood risk and vulnerability assessments can take on a variety of forms. Using the New York Rising guidelines as a model, the core set of elements are:

1) *hazard and/or exposure assessment*: consideration of past conditions and future hazards that should be anticipated (including, for example, sea level rise and projected storm magnitude and frequency) along with a geospatial analysis of landscape features that can attenuate or exacerbate those hazards;
2) *vulnerability assessment*: review of the physical ability of community assets to withstand a given hazard; and the functional ability of those assets (or systems) to continue to operate in the face of a range of hazard exposure scenarios;
3) *community risk assessment*: an informed discussion which reviews the likelihood and potential severity of hazard exposure, assesses which community assets (or systems) are in greatest need of hazard risk reduction strategies, and outlines the next steps for identifying and prioritizing mitigation and adaptation strategies.

When developing a vulnerability assessment, communities will want to consider how far into the future to extend the analysis; whether to incorporate sea level rise and, if doing so, what levels to analyze; the types of community assets to be included in the analysis; and the level of detail to explore when considering potential impacts.

Risk and Vulnerability Assessments Conducted by New Jersey Municipalities

The tools that New Jersey municipalities are now using to approximate some level of vulnerabilities include the following:

a. Coastal Community Vulnerability Assessment and Mapping Protocol

In 2011, the New Jersey Department of Environmental Protection (NJDEP) developed the Coastal Community Vulnerability Assessment and Mapping Protocol (CCVAMP), which provided a template for a coastal flood hazard exposure, risk and vulnerability assessment using a handful of coastal inundation scenarios (including shallow coastal flooding due to spring tides, storm surge, and sea level rise). The CCVAMP was developed to determine coastal flood hazard threats to a variety of community assets, including the built environment, sensitive natural resources, and special needs populations. The CCVAMP tool was tested on several pilot communities including

Greenwich Township, Cape May Point, Little Silver and Oceanport. The NJ Resiliency Network is not aware of any municipalities using this tool since Superstorm Sandy.

b. "Getting to Resilience" (GTR)

NJDEP developed the "Getting to Resilience" (GTR) tool as a non-regulatory offering intended to work in concert with the CCVAMP in the identification of preparedness, planning, mitigation and adaptation actions local officials could take to reduce vulnerability to coastal storms, flooding and sea level rise. In 2013, the Jacques Cousteau National Estuarine Research Reserve (JCNERR) converted the GTR questionnaire into a web platform (www.prepareyourcommunitynj.org) and uses the "NJFloodmapper" geospatial visualization tool to facilitate local access to flood risk maps that can support the GTR. Formatted as a self-assessment questionnaire, the GTR directs users through a series of Yes/No prompts which frame a community dialogue about coastal flood risks, and provide an overview of some of the readily available programs and responses. When conducted through the expert facilitation and support from JCNERR staff and its partners, the process includes a geographic information systems (GIS) analysis and maps outputs summarizing coastal flood hazards exposure for an introduction to the community's flood risks.

To date, the JCNERR has assisted 23 municipalities with a facilitated GTR process, with nearly a dozen pending completion. The NJ Resiliency Network has assisted one municipality through a facilitated GTR process. An additional 14 cities and towns have completed, or are in the process of completing, a GTR self-assessment through the Sustainable Jersey municipal certification program's Flood Risk Action. Fourteen of the nearly 40 municipalities that have completed the GTR process (whether self-led or facilitated by the JCNERR) are represented among the survey respondents.

c. NJ Future Vulnerability Analysis Methodology

Another form of post-Sandy risk and vulnerability assessment has been completed, or are under way, in New Jersey are in the seven municipalities being assisted by NJ Future's long-term recovery managers' outreach and engagement program (four of these responded to the survey). These assessments analyze projected coastal flood risks, structural damage, and fiscal implications (in particular by reviewing the decreased value of residential properties) for projected damages in flood-prone areas due to future sea level rise and storm surge. The process and results are an essential step in identifying flood risk vulnerabilities. While the assessments do not include social vulnerability analysis or a review of the functionality of critical services, they provide a compelling starting point for municipal officials to begin a dialogue about flood risks and vulnerabilities.

d. Other types of vulnerability assessments

Some municipalities incorporate a form of risk and vulnerability assessment into specialty plans or projects. For example, Hoboken studied its flood hazard vulnerabilities as part of a resilience plan. Others are including vulnerability assessments in the long-term strategic recovery plans funded by the CDBG-DR program and administered through the New Jersey Department of Community Affairs (NJDCA). Although NJDCA indicated those plans "should serve as a guide for actions taken henceforth not only to recover from the effects of Superstorm Sandy but also to *reduce vulnerabilities to future disasters*" (author's emphasis), they are not required to actually address future risks or vulnerabilities. Therefore, the degree to which municipalities evaluated future flood impacts and analysis varies widely. Some plans limited their analysis to the review of Sandy-related damage, completely overlooking projections for future flooding and storm events.

Key Finding 2: Municipalities seek technical expertise in all areas of flood resilience planning and projects, requiring multiple layers of expertise, facilitators to assist them with the bureaucracy and funding to construct the projects.

Municipal needs for support building flood resilience span the gamut from technical assistance with planning, programs and policy development, to expert advice in hardening critical infrastructure to better withstand flood hazard impacts, to securing the necessary funding for all stages in the process.

The most commonly cited municipal need for technical assistance in the open-ended questions was for guidance and support in flood-related planning, programs and policy development. This was closely followed by technical assistance requests for hardening critical facilities and infrastructure, and support with securing the necessary funding or financial assistance to accomplish short- and long-term recovery objectives. Responses included general requests for support with flood-related policies and programs, such as model ordinances for increased freeboard, general assistance with hazard mitigation strategies and assistance with FEMA's Community Rating System. The NJDEP's Bureau of Dam Safety and Flood Control has helped to address this need by providing templates of model floodplain management ordinances and offering other technical assistance shortly after FEMA's release of the Advisory Base Flood Elevations (ABFEs) in early 2013. In addition, NJDEP and FEMA hosted community education sessions throughout the first half of 2013 to educate local leaders and constituents on the significance of the ABFEs and explain the regulatory mapmaking process.

Some responses offered more specific examples of technical assistance needs focused on engineering and design assistance for local projects, such as beach studies, the analysis of flood mitigation alternatives and guidelines for new building and reconstruction. In the case of funding requests, responses ranges from general to specific, indicating both needs with finding new funding sources as well as needs understands the complexity of post-disaster grant and loan programs, both existing and newly created.

The data affirm a commonly held understanding among NJ Resiliency Network staff and partners that the complexity of flood resilience issues necessitates expertise in various fields, including: municipal planning, coastal and tidal zone management, flood hazard mitigation, engineering and climate change adaptation. Additionally, some of the strategies to address coastal flood risks, such as elevating structures or increasing freeboard, often require an extensive process of navigating through layers of newly adopted guidance documents and/or regulatory standards (available from a plethora of entities at multiple levels of governance and within several nonprofit and academic organizations) and an unprecedented labyrinth of grants programs for covering the costs of these kinds of municipal activities.

Many, if not most, New Jersey communities facing these complex issues are already operating with very limited and inadequate capacity, both in terms of professional services and fiscal resources. In the 239 New Jersey communities classified as coastal or tidally-influenced, over one third (35 percent) are communities with a population of less than 5,000 year-round residents. Most of these communities are not staffed with engineering and planning professionals and must pay for technical consulting services on a project by project basis. Furthermore, the most heavily impacted communities have lost significant revenue from declined property values as result of storm damage and lack the ability to pay for these services without impacting other municipal projects, programs and services. Various recovery programs have been implemented to address financial burdens municipalities face as a result of Superstorm Sandy, including the NJDCA Essential Services Grant and Planning Assistance Grant programs, the FEMA Community Disaster Loan program, and technical assistance for support with local post-disaster code and zoning issues. However, both fiscal and staff capacity needs remain.

Key Finding 3: Municipalities prioritize funding needs for resilience of critical infrastructure, as opposed to flood protection measures that will aid in future events.

When posed with the question on funding needs, municipal respondents focused more on repairing and hardening critical community infrastructure than repairing or developing flood protection structures such as sea walls, revetments, bulkheads, etc. Critical infrastructure is defined here as roads, bridges, utilities and other infrastructure that perform essential municipal services. Examples of projects in need of funding included the repair, reconstruction and elevation of roads; overall improvements to water, stormwater and wastewater systems; and, utility repair and hardening. Municipalities also made reference to critical community structures which serve essential functions in the days and weeks immediately following a disaster, such as police and fire stations, shelters, the municipal building and key medical facilities, although these funding requests were not as prominent as those for the infrastructure that services and undergirds community life on a daily basis.

This funding focus for specific *critical* infrastructure, as opposed to flood protection and mitigation, is understandable because these facilities and systems provide essential services of which municipalities are responsible for providing. Local governments need to fully restore and harden these facilities so that services can be provided to all municipal constituents, including not only essential staff and first responders, but also meeting the needs of residents, landowners and business owners. Repairs and funding for critical infrastructure typically fall under municipal jurisdiction (or quasi-municipal authorities) and rely upon municipal or regional funding. Large scale flood mitigation projects, such as dunes, sea walls and revetments often include regional and federal oversight, and municipalities can count on, at least in part, some level of federal funding and oversight, e.g. the US Army Corps of Engineers. Lastly, the overall condition of New Jersey's core infrastructure systems is not unlike that of the rest of the nation, in which aged and outdated facilities may well have required extensive repair, or even replacement—well before Superstorm Sandy made landfall.

Post-Sandy, municipalities have received funding support from a variety disaster recovery assistance programs, such as the FEMA Public Assistance, CDBG-DR, and the Environmental Infrastructure Trust, among others. Many of these funding programs sought to incorporate resiliency considerations at various steps along the municipal recovery process.

Unmet needs for repairing and improving the resilience of infrastructure are estimated to be in the billions of dollars. This most recent coastal storm experience and the knowledge of projected future storms and coastal flood risks has deepened the need for local government officials to repair and replace this infrastructure.

Key Finding 4. Municipalities prioritize needed improvements to energy supply and back-up power, but are not looking at long-term resilient strategies.

The multiple-choice category of "energy resilience" received the second highest category of affirmative responses for assistance. Respondents responded overwhelmingly "yes" to receiving assistance for improving community access to emergency energy sources and assessing energy supply vulnerabilities. In addition, 51 percent of the municipalities (44) were interested in services for developing back-up plans for critical facilities. At the same time, however, an example prompt related to exploring alternative or renewable energy resiliency solutions was considered less of a need or priority for assistance. This data, taken together, suggests that emergency back-up power is a top resiliency priority, but that respondents have limited awareness or understanding of more strategic options.

Energy resilience was also a prominent theme in the open-ended questions, particularly when referring to municipal funding needs. About 13 percent (11) of municipal respondents indicated a need for back-up generators (on the ground, these are typically diesel fueled generators). This outcome is especially relevant given the timing of the survey, which was administered 18-22 months post-Sandy; the need for more resilient energy supply has retained its importance, even two years after the event. This conclusion is further reinforced by applications to the 2013 hazard mitigation grant program (HMGP) energy resilience initiatives, which overwhelmingly received funding requested for diesel backup generators. Overall, funding requests under this grant program (including both the Energy Allocation Initiative and the Lifeline Life Safety Initiative) far exceeded the $40 million total allocation by approximately $300 million.

In the multiple-choice questions, respondents considered the category of energy resilience a high priority for assistance, but a much smaller percentage seemed interested in the example offered for decreasing local dependence on fossil fuels as compared to options focused on securing immediate, post-disaster access to emergency energy sources. Meanwhile, the open-ended responses primarily focused on improved energy system reliability through grid-level investments, rather than making strategic local facilities better able to operate independently, even in the case of a broader grid failure. None of the 700+ unique responses given to the open-ended questions in the survey referenced a local interest in technical assistance or funding support for making critical infrastructure able to operate independently, or consideration of more strategic solutions such as solar with storage, combined heat and power systems for distributed energy generation, and microgrids that can separate ("island") from the grid and operate independently. When taken together, the multiple-choice and open-ended questions reflected a dichotomy of perspectives: interest in simple back-up generators with little understanding of the limitations to that technology as a resilience solution, and a lack of interest in or awareness of more strategic solutions that would enable critical facilities to operate independent of the grid indefinitely. What's more, interactions NJ Resiliency Network staff and core partners have had in recent months with local officials point to a lack of awareness among on the ground about the limitations of diesel generators in providing critical support during extended outages, or the strategic opportunities to invest in energy solutions that provide broader resilience value. This suggests that energy-supply is one of the most important areas for building local resilience, but that there is poor understanding of the strategic opportunities for making those improvements.

The focus on post-disaster energy supply is understandable given that virtually every municipality in New Jersey lost power after Sandy for some time, in some cases several weeks. The loss of power interrupted the ability of local entities to provide essential public services, resulting in failures in waste water treatment, health care provision, first responder capabilities, and the operation of other emergency facilities. Considering this backdrop, local officials are understandably eager to become better prepared for the next big storm by ensuring local energy supplies. For the most part, local officials are focused on more familiar solutions—typically, diesel generators. The experience after Sandy demonstrates, however, that those simple solutions are not necessarily effective. While many strategic facilities suffered from not having a backup generator, even those facilities that did have generators were not resilient due to shortages of fuel, failures of poor maintenance or preparation, and a general inability to operate over an extended grid-outage period. Improving back-up power is clearly a critical need, but also a huge strategic opportunity to make investments that have broader energy resiliency value. NJ Resiliency Network staff and core partners are concerned that municipalities are not looking at more effective and strategic approaches to ensuring energy supply. Municipalities are regularly requesting funding to purchase back-up diesel generators, when many could be developing islanded renewable energy systems with battery

storage, combined heat and power solutions, and micro-grid technologies. These solutions are not only better at providing back-up power than a simple diesel generator, but also reduce fuel use and greenhouse gas emissions.

For example, many municipalities already have large solar-photovoltaic generation systems on public properties, including municipal buildings and schools. With the addition of a system for local energy storage and the switchgear technology that enables “islanding”, these buildings could operate almost indefinitely—albeit at a reduced energy load—for an extended period. This is a scenario where modest incremental investments, on top of significant investments already made, could dramatically improve the ability of a strategic facility to operate independent of the central grid for an extended period. Similarly, some strategic facilities would be ideal candidates for natural gas fueled combined heat and power applications. These solutions can improve overall efficiency, reduce greenhouse gas emissions, and reduce energy costs year-round, while also being able to provide emergency back-up power if properly equipped with islanding switchgear. Piped natural gas supply is a much more resilient post-disaster solution, as it does not face the same supply challenges associated with diesel fuel.

This key finding suggests that energy supply during grid outages is a top resilience priority, but municipalities are looking only at simple (diesel backup generator) solutions that are, in fact, *not* more resilient to extreme events. Additionally, local officials are relatively unaware of opportunities to consider more strategic solutions with improved performance track records and a wider set of valuable resilience attributes. There is therefore a large unmet need regarding energy resiliency, and a significant opportunity to guide municipalities into more effective, more strategic investments that are much stronger resiliency options.

Addressing Municipal Needs for Resilience: Partnerships, Programs and Resource Development

The individual survey responses, common themes and overall trends will inform partnerships, programs and resource development aimed at enhancing municipal resilience in New Jersey. This summary report will be circulated to partners and collaborators in state and regional government agencies, nonprofit organizations and academic institutions who are involved at some level in municipal resilience. The findings elevate the post-Sandy recovery and resilience planning needs articulated by a large percentage of municipal officials from New Jersey's coastal region. As such, these data and key findings may interest policy writers and decision-makers, program administrators, funders, professional organizations, and environmental, land use and municipal organizations, as they contemplate new programs and initiatives to promote local resilience.

The survey findings affirm the need for programs and services, many of which are currently offered by the NJ Resiliency Network and its partners. The NJ Resiliency Network will continue to collaborate with its partners, and engage organizations that can help to promote and encourage new resources and technical assistance that respond to the above four key local issues as well as other unique needs expressed by survey respondents and outlined in the summary report. The NJ Resiliency Network will also continue to work closely with its core partners and Advisory Board to develop resources that will help address municipal needs and provide a clear path to resilience.

While some of the tools and resources needed by municipalities are currently available, they may not be fully accessible or affordable. Other resources do not currently exist, and should be brought to the attention of program, policy and decision makers to address those gaps. Here is a short list of tasks and initiatives that will further assist municipal officials in their journey towards building stronger, more resilient communities:

A central hub of municipal resilience resources

Resilience partners across the state are actively collaborating to collect, vet, organize and promote a broad collection of guidance materials, model documents and emerging best practices to assist municipalities with resilience planning. Other important resources are available through the websites of agencies and organizations, such as NJDEP's model ordinances, FEMA's flood-proofing design guidelines, FEMA's Community Rating System website, and countless number of grants and financing programs and websites. The NJ Resiliency Network was formed to help make these resources more accessible to New Jersey municipalities. Serving as the only statewide clearinghouse on municipally-focused resilience resources, the NJ Resiliency Network website currently offers an online grants portal and NJ Resiliency Network staff maintains a regularly updated "hot list" of timely and relevant grant and technical assistance opportunities, and are developing an online library of tools and resources.

The NJ Resiliency Network's online grants portal offers a searchable list of grants and loans available to municipalities for long-term disaster recovery and resilience plans and projects. The portal is searchable by funding source, project type and competitiveness, and is regularly updated to reflect changes in the availability of grants. The grants are limited to those that are suitable for New Jersey communities and are related specifically to recovery and resilience. NJ Resiliency Network staff carefully review regional or national programs to ensure they are not overly competitive. The larger post-Sandy funding sources for New Jersey municipalities, e.g. FEMA public assistance, hazard mitigation grants, and most CDBG programs, are not included in the portal because it was assumed that all municipalities are aware of these obvious sources. However, this is an opportunity to re-visit that assumption.

In addition to its grants portal, the NJ Resiliency Network has developed a "Hot List" of both grants and technical assistance opportunities that are currently available to municipalities for local resilience. This 2-3 page summary offers local officials a quick snapshot of funding sources and support services that are recommended because of their importance in resilience planning and immediate availability. The list includes, for example, the Planning Assistance Grants (CDBG-DR monies) administered by the NJDCA, forestry grants to combat drought and extreme temperatures and a short list of projects and programs with available agency, non-profit and academic partner expertise to meet specific local needs on assessing coastal risk and vulnerability, addressing coastal habitat protection and green infrastructure expertise. Again, this list may be expanded to include the standard post-Sandy state and federal funding sources mentioned above.

The NJ Resiliency Network will continue to improve upon its ability to provide easily accessible municipal resources through its website, list-serve, and municipal outreach. With the assistance of its partner organizations, the NJ Resiliency Network's website will soon host a library of municipal resilience tools and reference materials on municipal resilience, including topics on emergency preparedness, vulnerability assessments, hazard mitigation planning and the integration of all plans into the municipal master plan.

Risk and vulnerability assessment assistance

Although numerous mapping platforms exist to help users visualize a wide range of potential flood hazards, these web tools do not provide detailed guidance for evaluating the impact of the flooding scenarios on the community assets, vulnerable populations and critical services that may be vulnerable to those risks. While some communities have had the benefit of consulting expertise through specialized projects and/or grant programs, many more have not have this opportunity. The absence of an accepted risk and vulnerability assessment template for New Jersey municipalities and the lack of risk and vulnerability assessment requirements in strategic recovery reports have set the stage for this wide disparity in vulnerability assessments throughout the state. The lack of comprehensive risk and vulnerability assessments may lead to inadequate protection and capital planning that is needed to avoid catastrophic damage and losses in future events.

Partners in the New Jersey Resilient Coastal Communities Initiative (RCCI), a NOAA-funded project administered by the New Jersey Department of Environmental Protection, are in the process of developing a coastal vulnerability assessment (CVA) template for New Jersey municipalities. The template will provide an instructional guide for local officials and professionals to map various flood hazard scenarios, analyze landscape features that may exacerbate or attenuate the hazards, analyze the susceptibility and adaptive capacity of community assets to hazards (both "wet feet" analysis as well as operational functionality); and a "next step" overview of mitigation and adaptation strategies to reduce vulnerabilities and risks. Starting in early 2015, the NJ Resiliency Network and other RCCI partners will be available to assist municipalities with this process.

After the Coastal Vulnerability Assessment (CVA) template has been completed and "tested" in communities, on or about early spring 2015, the NJ Resiliency Network will host training seminars for local officials and planning and engineer professionals on the CVA process.

Energy resilience tools and trainings

Energy resilience tools are provided by the New Jersey Board of Public Utility's (BPU) Clean Energy Program (NJCEP), which includes municipal support services and financial support to engage in baseline energy audits and on-going benchmarking of building energy performance, performance contracting that allows municipalities to distribute the higher up-front costs for larger-scale energy improvements, and programs that support the installation of local renewable and alternative energy production systems. The NJ Resiliency Network promotes

this program as an important resilience tool in its municipal outreach, and focuses on ensuring that local officials engage in the energy audits program as a first step to engage with the more advanced NJCEP offerings.

The BPU is also actively working in concert with the New Jersey Economic Development Authority to develop an innovative program for financing distributed energy projects called the New Jersey Energy Resilience Bank (ERB). The new ERB will provide technical and financial support, including grants and low-interest loans, to critical facilities to realize energy resilience projects or enhancements to existing energy infrastructure. This is particularly important to promote as government officials at all levels of public service are examining strategies to develop backup power to increase the resilience of their energy systems for first responders, residents and businesses. Workshops and training sessions on the ERB are planned for early 2015 by the BPU and DEP, and will be co-hosted by Sustainable Jersey.

Post-Sandy, as part of the HMGP Energy Allocation Initiative, state partners evaluated all facilities proposed for funding, in partnership with NREL, and identified select facilities that were particularly suited for alternative energy technologies (e.g., combined heat and power, fuel cells, photovoltaic with dynamic inverters and storage, etc.) and engaged facilities managers to discuss ways to accomplish implement these more sophisticated technologies. Wherever possible, the program also encouraged the use of natural gas generators or tri-fuel generators instead of diesel powered generators. This kind of intervention, bringing direct technical assistance and expertise to the hands of critical infrastructure operators will be a big component of the ERB along with the funding and financing mechanisms to incentivize distributed generation.

Data from the survey suggest that local officials lack a clear understanding of the limitations of backup generators for building local resilience and would benefit from additional training opportunities to consider the strategic opportunities available for investing in energy solutions that provide a wider array of attributes for building local resilience. The NJ Resiliency Network will continue to work in concert with partners and collaborators, including the BPU, to identify and/or develop more strategic tools and messaging for municipalities to adopt cleaner, more reliable, and more sustainable energy solutions.

Flood hazard mitigation engineering and design assistance

Many municipalities have expressed a need for technical assistance (e.g. engineering design, studies and guidelines) to design or study flood protection measures for specific facilities and infrastructure. The suite of available free and/or low-cost services available to municipalities in the coastal zone do not currently include engineered design assistance for hardening facilities or critical infrastructure. One way to address this resource gap is to identify best practices and case studies with transferable concepts that can help a municipality “get started” with mitigation design and strategies. For example, six universities were recently commissioned by the State of New Jersey to prepare recommendations for specific municipal and regional flood mitigation projects in the state. These reports were a one-time effort, but should be reviewed for the transferability of design concepts to other projects and municipalities. The concepts could be synthesized by the NJ Resiliency Network and its partners and disseminated to municipalities seeking this kind of content.

On-going municipal outreach efforts and synthesis of local funding needs

Targeted referral services and a library of materials alone cannot adequately respond to the wide array of needs municipalities are citing as they work to advance and improve flood risk reduction outcomes across the New Jersey coastal and tidal area. NJ Resiliency Network staff and partners will continue to engage in outreach to local government to offer individualized support and workshops, match municipalities with resources, and share resource gaps with partners and public policy and program decision makers in the state. The NJ Resiliency

Network is ideally positioned to evaluate municipal assistance and funding needs to share this information with partners and state decision-makers. The hope is that additional funds can be allocated to meet these needs, and that technical assistance such as case studies, guidelines and expertise, can continue to be provided to help reduce municipal costs.

Conclusion

Many opportunities remain for catalyzing local resilience actions. The survey responses documented a wide array of municipal needs and interests, corresponding to the municipality's extent of damage from Sandy, stage of recovery and capacity to plan, and capacity to fund and implement mitigation strategies and projects. The key findings point to a small set of common challenges with which local municipalities continue to grapple, namely: the need to improve the rigor and quality of municipal risk and vulnerability assessments; expand and deepen local flood hazard risk reduction and resilience efforts; and harden critical public infrastructure, particularly energy systems, to withstand shocks and stresses.

These needs can be served, in part, through technical assistance from resource providers in nonprofit institutions, regional and state government agencies, academia, and private sector stakeholders. New funding streams and innovative approaches to project financing are also needed to address the capacity challenges facing New Jersey municipalities. The staff and core partners of the NJ Resiliency Network will continue to collaborate to provide tools and resources that support municipalities working to increase their resilience.