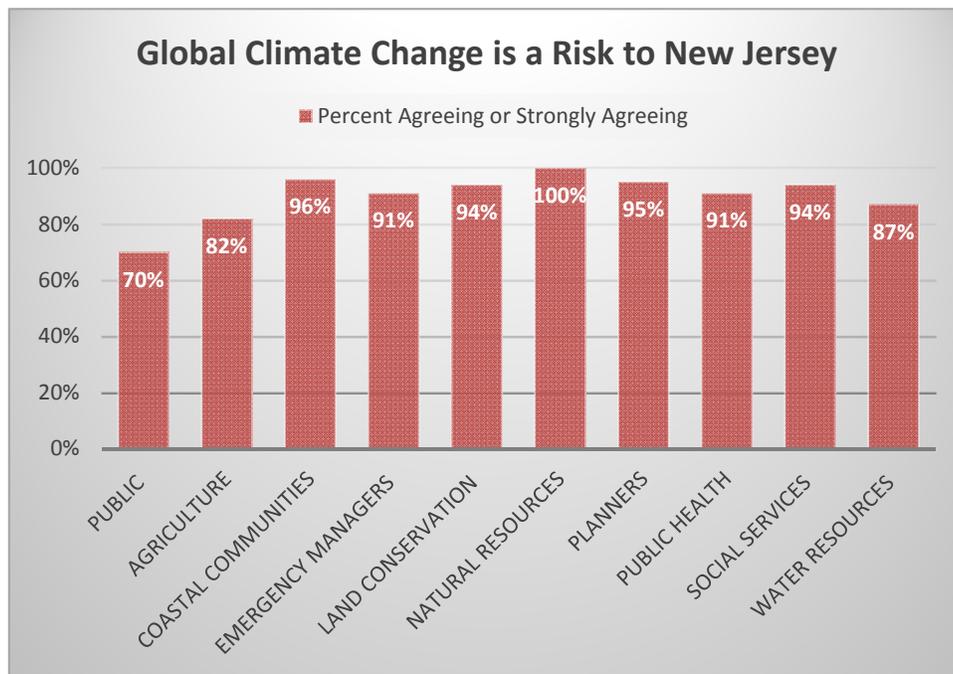


# Surveys of Stakeholder Groups

## CLIMATE CHANGE PREPAREDNESS IN NEW JERSEY



The New Jersey Climate Adaptation Alliance

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## Abstract

### Objectives

The New Jersey Climate Adaptation Alliance is undertaking a comprehensive stakeholder engagement process to solicit input from stakeholders in a variety of sectors in order to formulate public policy recommendations that will enhance climate change preparedness in New Jersey.

### Methods

The Alliance conducted a series of online surveys targeting the following stakeholder and practice-specific audiences: Agriculture, Coastal Communities, Emergency Managers, Land Conservationists, Natural Resources, Planners, Public Health Officers, Social Services, and Water Utilities. Invitations to participate in the surveys were distributed primarily via e-mail to existing membership or mailing lists, and the surveys were administered online using Qualtrics software.

### Findings

While the ability to draw comparisons between groups is limited due to variations in sample size and because many of the questions differed from survey to survey, a few patterns emerged across all the surveys:

- Large majorities of respondents in every stakeholder group were impacted by Hurricane Irene (2011), Hurricane Sandy (2012), or both. In general, respondents were more concerned about impacts from flooding and extreme weather events than they were about impacts from heat, drought, or warmer temperatures, likely as a result of the state's recent experiences with Hurricanes Irene and Sandy.
- Across all stakeholder groups, 'improved coordination', both between different agencies and levels of government, and across different sectors (e.g. transportation, emergency management, public health), ranked as an extremely high priority need at the regional, state, or federal level.
- Lack of funding, lack of political leadership, and the difficulty of motivating citizens to plan for long-term impacts that aren't immediately apparent were consistently cited as the biggest challenges to achieving preparedness for climate change.
- Respondents across all sectors indicated that assessing and addressing the resiliency of critical infrastructure such as electric, emergency communications, and transportation infrastructure is a high priority need.
- Stakeholders across all sectors expressed a high degree of support for green infrastructure such as wetland restoration, riparian buffers, dunes, and native landscaping as well as for water supply planning and conservation programs.

Additionally, some strong preferences or perceptions from certain stakeholder groups can be highlighted:

- Natural resource managers and land conservationists prioritized better science and data about climate change impacts and support for habitat conservation and restoration.
- Emergency managers and representatives from coastal communities highlighted a lack of public awareness and acceptance of climate change impacts as a major barrier to planning for climate change impacts.
- Public health and social services respondents emphasized the need for better planning, especially as relates to shelters, and an enhanced state of emergency preparedness.
- Planners focused on the need to assess and update critical infrastructure and to revise regulations to steer development away from high risk areas.
- The agricultural community indicated a need for more authoritative and reliable data on climate trends and their impacts on agriculture.

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## Introduction

The New Jersey Climate Adaptation Alliance (NJCAA) is undertaking a comprehensive stakeholder engagement process to solicit input from various stakeholder groups including agriculture, public health, emergency management, vulnerable populations, transportation, utilities, water resources, and natural resources to inform its development of public policy recommendations. A component of the outreach process involved conducting a series of online surveys targeting different stakeholder and practice-specific audiences. The surveys were administered from April through November 2013 using Qualtrics software. Some surveys are still in progress and results will be updated as additional input is received. The surveys were distributed primarily via e-mail links to membership or mailing lists by intermediaries on behalf of the NJCAA. Surveys were sent to the groups outlined on the table below. In addition, NJCAA is in discussions with several organizations representing businesses in New Jersey to identify opportunities to survey the business community.

Stakeholder Group	Administered via	Number of Respondents
Agriculture	NJ Farm Bureau, NJ Dept of Agriculture, Northeast Organic Farming Association NJ chapter, Rutgers NJ Agricultural Experiment Station, USDA Natural Resources Conservation Service-NJ	55
Coastal Communities	Jacques Cousteau National Estuarine Research Reserve contact list of municipal officials, engineers, and consultants	119
Emergency Managers	NJ Emergency Management Association	51
Land Conservation Community	Attendees of NJ Land Conservation Rally	35
Municipalities	NJ League of Municipalities	In progress
Natural Resources	State, federal and regional commissions or agencies; non-profit environmental groups	28
Planners	American Planning Association NJ Chapter	138
Public Health Officers	NJ Association of City and County Health Officials	22
Social Services	Rutgers School of Social Work contact list containing 800 social service agencies, hospitals, state programs, schools, and government agencies	74
Water Resources	American Water Works Association NJ Chapter; Association of Environmental Authorities; NJ Water Environment Association	85

These surveys complement workshops and listening sessions held with key representatives from each sector. Additionally, 875 New Jersey residents were surveyed in a random digit dial telephone survey (land-line and mobile phones) conducted in February-March of 2013 as part of a Rutgers University study to gauge the general public's opinions on climate change in New Jersey.

It is important to note that because these online surveys were distributed via e-mail to existing mailing lists, the results cannot be interpreted to represent the entire interest group or stakeholder community. Rather, these surveys were intended as a general measure to obtain structured input from convenient samples to gauge opinions and priorities amongst different groups of practitioners in New Jersey.

## Survey Format

Each survey followed a similar format, beginning with several questions that asked about survey respondents’ professional background and area of practice.

Next, respondents were asked whether they “Strongly Agree”, “Agree”, “Disagree”, “Strongly Disagree”, or “Don’t Know” with a series of eight statements regarding the respondent’s personal perceptions and beliefs about climate change. These questions were identical across all of the stakeholder-specific surveys as well as the statewide telephone poll. The following chart summarizes the responses:

**Percent Agreeing or Strongly Agreeing (except for Statement A as noted)**

	Stakeholder Group (Number of Respondents)									
	Public Poll (875)	Agriculture (55)	Coastal (119)	Emergency Managers (51)	Land Conservation (25)	Natural Resources (28)	Planners (138)	Public Health (22)	Social Services (74)	Water Resources (85)
<b>A. Global climate change is not occurring.</b> <i>(Showing % disagreeing with this statement)</i>	70%	78%	84%	73%	89%	96%	89%	68%	83%	75%
<b>B. Global climate change is mostly caused by human activity.</b>	64%	64%	67%	60%	89%	78%	79%	50%	81%	52%
<b>C. Global climate change is a risk to New Jersey.</b>	70%	82%	96%	91%	94%	100%	95%	91%	94%	87%
<b>D. Global climate change is a risk to me, my family, and my friends.</b>	64%	67%	83%	82%	91%	92%	86%	77%	90%	69%
<b>E. The international scientific community understands the science behind global climate change.</b>	64%	55%	64%	58%	80%	78%	77%	64%	64%	50%
<b>F. I trust the scientific community to truthfully report their findings related to climate change.</b>	54%	56%	68%	64%	86%	85%	76%	68%	66%	56%
<b>G. Our state and local officials understand the implications of global climate change for my region.</b>	41%	7%	15%	38%	11%	4%	23%	10%	23%	11%
<b>H. The media I rely on communicate honestly with us about global climate change.</b>	33%	22%	31%	29%	46%	44%	42%	29%	33%	27%

Respondents were then presented with a list of climate change impacts that related to their sector and were asked to rate how concerned they were about each impact on their area of practice on a scale of “Great Concern”, “Some Concern”, “Little Concern”, “No Concern”, or “Not Applicable”. Options presented included impacts resulting from sea level rise, storm events, warmer temperatures, drought, and increased precipitation.

The next series of questions asked respondents whether they were affected by Hurricanes Irene (2011) and Sandy (2012), and if so, what impacts they experienced. Choices included flooding, power outages, major and minor property damage, and other sector-specific impacts.

Next, the survey presented a list of climate-adaptive activities and asked respondents to select whether the activities were “In Place”, “Planned”, or “Needed” in their community or jurisdiction. These activities varied widely by sector but example activities include “critical infrastructure assessments”, “green infrastructure such as riparian buffers, wetland restoration and living shorelines”, “hazard mitigation plans”, “local utility communication plans for use during outages” and “surveillance for mental health conditions”.

The subsequent question asked respondents to identify the most important programs or actions needed at the regional, state, or federal level to help prepare and respond to climate change impacts in their sector. The survey presented a list of options and respondents were asked to rank them as “High Need”, “Some Need”, “Little or No Need”, “Don’t Know”, or “Not Applicable”. Examples of programs and actions presented as options include “water supply planning and conservation programs”, “improved weather modeling capacity for local scale assessments”, “incentive programs to protect natural areas”, and “censuses of vulnerable subpopulations”.

Respondents were then given two free response questions. The first asked “What does your jurisdiction/service area most need to prepare for and be ready to respond to climate change impacts in the coming decades?” The second asked “What are the biggest challenges to achieving preparedness for climate change in New Jersey?”

Finally, respondents were presented with a list of five or six sector-specific challenges, one of which was ‘climate change impacts’, and asked to rank them in order of importance. The answers to this question reveal the relative importance of climate change versus other non-climate issues and stresses facing that sector.

## Survey Results

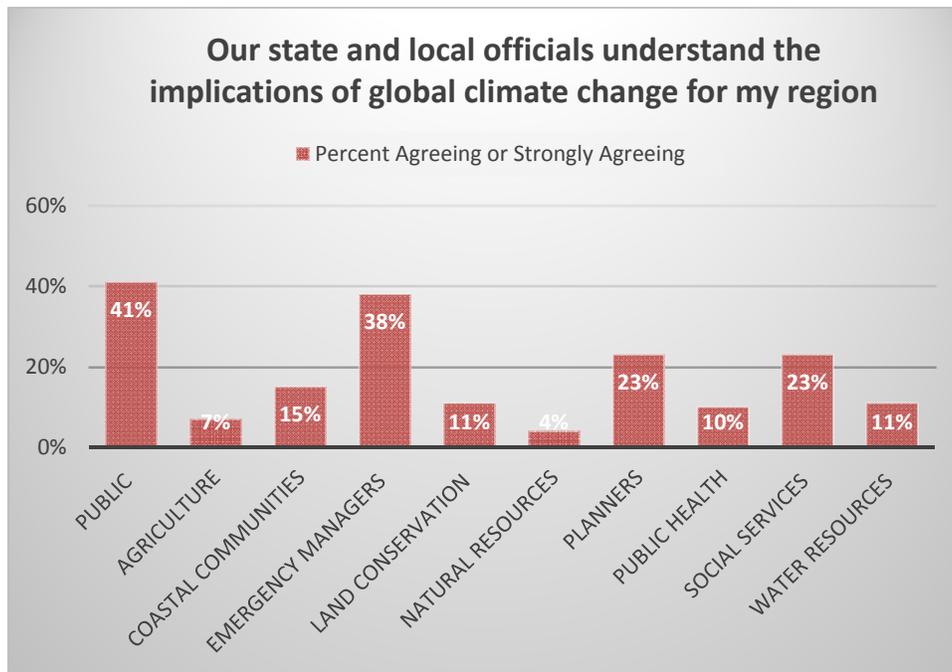
The results from each online survey are summarized individually in the following pages. Due to variations in sample size, and because most of the questions differed from survey to survey, any overall summary or comparison of the results between groups would be very limited. However, a few patterns emerged across all the surveys, and some strong preferences or perceptions from certain stakeholder groups can be highlighted:

### *Patterns across stakeholder groups:*

- Large majorities of respondents in every stakeholder group were impacted by Hurricane Irene (2011), Hurricane Sandy (2012), or both.
- In general, respondents were more concerned about impacts from flooding and extreme weather events than they were about impacts from heat, drought, or warmer temperatures, likely as a result of the state’s recent experiences with Hurricanes Irene and Sandy.
- Across all stakeholder groups, ‘improved coordination’, both between different agencies and levels of government, and across different sectors (e.g. transportation, emergency management, public health), ranked as an extremely high priority need at the regional, state, or federal level.
- Lack of funding, lack of political leadership, and the difficulty of motivating citizens to plan for long-term impacts that aren’t immediately apparent were consistently cited as the biggest challenges to achieving preparedness for climate change.
- Respondents across all sectors indicated that assessing and addressing the resiliency of critical infrastructure such as electric, emergency communications, and transportation infrastructure is a high priority need.
- Stakeholders across all sectors expressed a high degree of support for green infrastructure such as wetland restoration, riparian buffers, dunes, and native landscaping as well as for water supply planning and conservation programs.

*Highlights from particular stakeholder groups:*

- Natural resource managers and land conservationists prioritized better science and data about climate change impacts and support for habitat conservation and restoration.
- Emergency managers and representatives from coastal communities highlighted a lack of public awareness and acceptance of climate change impacts as a major barrier to planning for climate change impacts.
- Public health and social services respondents emphasized the need for better planning, especially as relates to shelters, and an enhanced state of emergency preparedness.
- Planners focused on the need to assess and update critical infrastructure and to revise regulations to steer development away from high risk areas.
- The agriculture community indicated a need for more authoritative and reliable data on climate trends and their impacts on agriculture.



## Agriculture Survey

Administered to representatives of the agricultural community in New Jersey, including the New Jersey Farm Bureau, New Jersey Department of Agriculture, Northeast Organic Farming Association NJ chapter, Rutgers NJ Agricultural Experiment Station, and USDA Natural Resources Conservation Service-NJ  
Survey conducted online September 13 – October 4, 2013.

### *Overview of Participants*

55 respondents completed this online survey. Of the respondents, 15 (27%) work for county cooperative extensions, 15 (27%) work for the government in other roles, 13 (24%) are in academia, 6 (11%) are farmers, and 5 (9%) are researchers/scientists for non-governmental organizations. The commodities grown by respondents include grain (4), vegetables (4), nursery (4), forage (3), livestock (3), pasture/grazing (2), fruit (1), and greenhouse (1). Despite only 6 respondents identifying as farmers, there were 10 responses to the question “how many acres do you farm in total”, of which 5 reported that they farm a total of 201-1,000 acres, with the rest farming smaller plots of land. There were also 10 responses to the question “what is the annual market value of the commodities you sell”; 3 reported selling >\$500,000 annually, 1 sells \$100,000-\$500,000, 4 sell \$50,000-\$100,000, and 2 sell <\$50,000 worth of commodities annually. Only 4 respondents indicated that farming was their primary source of income.

### *Views on Climate Change*

Respondents were asked whether they agree, strongly agree, disagree, or strongly disagree with the statement “Global climate change is not occurring.” Forty-three (78%) of the respondents believe climate change is occurring, with 27 of the respondents strongly disagreeing and 16 disagreeing with this statement, while 9 respondents agreed or strongly agreed with the statement and 3 responded ‘don’t know’.

The majority of respondents (35, or 64%) believe that climate change is mostly caused by human activity. Forty-five respondents (82%) agreed or strongly agreed with the statement “Climate change is a risk to New Jersey”, and 67% think climate change is a personal risk to family and friends. About half the respondents (30/55%) agree that the international scientific community understands the science behind climate change, while 29% (16 respondents) disagree or strongly disagree and 9 responded ‘don’t know’. 56% (31 respondents) trust the scientific community to truthfully report their findings related to climate change. Confidence in public officials is low, with only 4 respondents agreeing that “state and local officials understand the implications of global climate change for my region”, 38 (69%) disagreeing or strongly disagreeing, and 13 responding “don’t know”. Trust in the media is also low, with 12 (22%) agreeing the media communicate honestly about global climate change, 28 (51%) disagreeing or strongly disagreeing, and 15 (27%) responding ‘don’t know’.

### *Climate Change Impacts*

The survey presented a range of climate change impacts and respondents were asked to rank whether each impact was of great concern, some concern, little concern, or no concern. For every impact presented, a majority of respondents selected either ‘some’ or ‘great’ concern.

Of impacts related to water, respondents had the greatest concern about increased occurrence and severity of flooding (37 respondents, or 71% selected ‘great concern’), followed by reduced water availability (62%), more and longer droughts (58%), and salt water intrusion (41%). Of impacts related to land, soil erosion/loss (47%) and tidal wetland erosion/loss (46%) were selected as great concerns by the most respondents. Of impacts related to farming, crop damage/loss was the primary concern (58% selected as a great concern). Other farming-related impacts of concern include increased water demand for crops (46%) and reduced crop yield (43%). Of impacts

related to flora and fauna, the impacts of greatest concern were increased occurrence/spread of pathogens, pests, and vector-borne diseases (58%) and increased spread of invasive species (55%).

#### *Impacts from Irene and Sandy*

32 of 35 respondents (91%) reported that their farming operation or agricultural area of responsibility was impacted by Hurricane Irene in 2011, and 32 of 38 (84%) reported that they were impacted by Hurricane Sandy in 2012. Due to a glitch in the questionnaire, survey data on impacts of these events is inaccurate, but respondents reported impacts such as downed trees, wind damage to crops, power outages, gasoline shortages, property damage, nursery stock that was killed as a result of being saturated too long, mudslides, salt-water inundation, flooding, and market loss due to hurricane impacts on NYC and the need to clean up downed trees after the storm.

#### *Climate Change Adaptation and Preparedness Activities*

Respondents were presented with a list of climate change adaptations and asked whether they are 'In Place', 'Planned', or 'Not Planned but Needed', or 'Not Needed' for their program or properties. Several of the climate change adaptation actions listed in the survey are already in place or planned in many respondents' programs or properties. Of the options presented, emergency preparedness plans are the most common (44% in place, 31% planned), followed by water conservation measures such as drip irrigation, water efficiency, or a change to less water intensive crops (43% in place, 35% planned), and crop diversification (42% in place, 30% planned).

Major needs identified, as measured by the percentage of respondents reporting that the activity is not planned but needed, include property and resource vulnerability assessments (17, or 63%), surveillance for diseases (14/48%), drilling new wells or seeking alternative water sources (12/43%), protection of connective corridors between ecosystems (11/43%), and green infrastructure such as riparian buffers, living shorelines, wetland restoration, etc. (13/39%).

#### *Policy Priorities*

Respondents were asked "what are the most important actions or programs needed at the regional, state, or federal level to support efforts of the agricultural community in preparing for and responding to climate change impacts?" and asked to rank each in a list of options as 'high need', 'some need', or 'little or no need'. The highest priority action, as measured by the percentage of respondents choosing it as a high need, is enhanced vector and disease surveillance programs (52%/26). Research on the vulnerability of economically important agricultural species and development of adaptive plant/agricultural species and varieties including species adapted to reduced water quality (increased salinity) was also identified as a high need by 24 (47%) respondents.

Other priority actions at the regional, state, or federal level include water supply planning and conservation programs to account for a changing climate (23, or 45% selected as a high need), development of improved and low-cost weed/vector control approaches (21/42%), research on innovative and cost effective strategies for improved water systems management and design (21/41%), enhanced Best Management Practices to reduce stormwater runoff (20/39%), and incentive programs to preserve, increase, or improve climate-resilient agricultural land (20/39%). Other needs identified by respondents via text-entry include agricultural pest management and invasive species management, coordination of grant programs, and scientific evaluation of strategies for agriculture to reduce carbon emissions.

### *Critical Needs*

When asked “what does your agriculture program most need to prepare and be ready to respond to climate change impacts over the coming decades”, several responses focused on the need for better science regarding climate change trends and their impacts on agriculture. Responses included “more research on the impacts on pest species”, “better assessment of risk”, “enhanced monitoring to establish baselines and monitor changes to crop yield/health”, more flexibility from the NJDEP to irrigate during droughts and install and maintain erosion control and drainage systems without getting a permit first, “willingness to diversify ag products”, “flooding and power outage support”, “valid information on anticipated change in ten year increments”, “adapting forage and feed needs for livestock”, and “better understanding of long term trends”.

### *Challenges*

Primary challenges identified to achieving preparedness for climate change in New Jersey are uncertainty about actual effects of climate change on agriculture, difficulty discerning what information and data is accurate, and lack of funding to implement certain practices. Responses included “it is somewhat of an unknown what weather change will bring. Wait and see what happens and then adjust. The change may not be all bad.”, “credible science and forecasts of impacts”, “uncertainty of actual effects; lack of capital for business alterations”, and “too many unknowns”. One respondent pointed out that farmers plant season to season and very few plan or plant with a 10 or 20 year eye to the future.

### *Issue Prioritization*

When presented with a list of five stressors to agriculture and asked to rank them in order of importance, with 1 being most important and 5 being least important, the average rank order selected was 1) Increased Costs of Operations; 2) Encroaching Land Development; 3) Climate Change Impacts; 4) Introduced or Invasive Species; and 5) Increases in Contaminants.

## Coastal Communities Survey

Administered to over 2,000 stakeholders representing and serving New Jersey's coastal communities, including elected and appointed municipal officials, municipal staff, and state, county, and federal government staff.

Survey conducted online July 30 – August 13, 2013.

### *Overview of Participants*

116 respondents completed this online survey. Of the respondents, 35% work for municipal government, 15% for county government, 20% for state government, 8% for federal government, 13% for non-governmental organizations, 12% are consultants, and 6% work in private industry. Respondents hold a variety of positions within their communities; 31% are environmental specialists, 17% are emergency managers, and 15% are planners, while others are planning board members, environmental commission members, natural resource managers, council members, public works staff, zoning officers, municipal engineers, and construction officials, among other positions. Respondents work primarily in three coastal counties: Ocean County (34%), Monmouth County (23%) and Atlantic County (14%). Sixty-six percent (66%) of respondents live in the coastal community which they serve. Of the 49 respondents not living where they serve, 37% live in a different coastal community while 63% live inland.

### *Views on Climate Change*

84% of respondents believe climate change is occurring, with 62 of the respondents strongly disagreeing and 35 disagreeing with the statement “global climate change is not occurring”. 13% do not think that climate change is occurring. The majority of respondents (67%) believe that climate change is mostly caused by human activity, with 23% strongly agreeing on this point, 44% agreeing, 17% disagreeing or strongly disagreeing and 16% responding “don't know”. Nearly all respondents (96%) feel climate change is a risk to New Jersey, and 83% think climate change is a personal risk to family and friends. 64% agree that the international scientific community understands the science behind climate change, while 21% disagree and 16% don't know. 68% trust the scientific community to truthfully report their findings related to climate change while 24% do not. Trust in the media is fairly low, with 31% agreeing that the media communicate honestly about global climate change, 57% disagreeing, and 12% responding “don't know”. Most respondents expressed little faith in state and local officials' comprehension of climate issues, with 73% disagreeing or strongly disagreeing with the statement “our state and local officials understand the implications of global climate change for my region”, interesting given that the majority of respondents are themselves state or local officials.

### *Climate Change Impacts on Coastal Communities*

The majority of respondents expressed ‘great concern’ or ‘some concern’ about all of the climate change impacts presented in the survey, with the greatest concern related to increased occurrence and severity of flooding (94% concerned overall, 74% great concern/20% some concern). Damage to critical utility infrastructure was also a major concern, with 94% expressing concern about damage to wastewater infrastructure (62% great/32% some), 92% about damage to water supply infrastructure (63% great/29% some), 90% about damage to energy infrastructure (55% great/35% some), 84% about damage to transportation infrastructure, and 83% about damage to communications infrastructure.

Of impacts related to the environment and natural resources, respondents were most concerned about tidal wetland erosion and loss (91% - 71% great/20% some), sea level rise (90% - 63% great/27% some), and beach/dune loss (91% - 58%/33%). Other natural impacts of concern included a decline in marine and freshwater quality (87% and 83% respectively), saltwater intrusion (84%), higher water temperatures (84%), and more intense rainfall events (83%).

Major concerns related to emergency management included deaths and injuries from storm events (84% - 57% great/28% some), disruption of drinking water supply (86% - 51% great/35% some), power outages (85% - 43%/42%), and stress and strain on responders (86% - 40%/46%). Primary economic concerns included loss of jobs (91%), damage to the commercial fishing and shellfish industries (86%), damage to local businesses (87%), damage to the recreational fishing industry (83%) and private property damage (83%).

Amongst vulnerable populations, respondents expressed the greatest concern for the elderly (91%), followed by the physically disabled (88%), mentally disabled (86%), the poor (87%), low income homeowners (83%), middle income homeowners (80%), racial minorities (78%) and non-English speakers (78%).

#### *Impacts from Irene and Sandy*

The coastal communities of 90% of survey respondents were impacted by Tropical Storm Irene in 2011, with common impacts including minor flooding (74%), short-term stress (73%), minor property damage (73%), power outages (69%), and road closures (69%).

Fully 99% of respondents' communities (all but 1 respondent) were affected by Hurricane Sandy in 2012. Common impacts included power outages (96%), road closures (92%), major property damage (89%), severe flooding (86%), resident evacuation (85%), and longer-term stress (84%). Deaths were reported by 26 respondents (23%) and injuries were reported by 55 respondents (48%).

#### *Policy Priorities*

Utilization of green infrastructure such as dunes, riparian buffers, and living shorelines was identified as the most important action or program needed to support New Jersey's coastal communities in preparing for and responding to climate change impacts, with 81% of respondents selecting this as very important and 16% selected it as important (97% overall). Fully 100% of respondents agreed that infrastructure vulnerability assessments are important, with 64% citing this as a very important need. Other high priorities included coordination between municipalities and state resources (98% overall/66% very important), development of resilient emergency communications infrastructure (98%/65%), incentive programs to protect natural areas (96%/65%), rapid response systems for extreme events (94%/61%), and coordination between municipalities/mutual aid programs (97%/56%).

Other programs or activities that respondents identified as very important included planning for water supply protection and conservation programs, property vulnerability assessments, utilization of rolling easements to enable natural landward migration of the shore, elevation of structures, censuses of vulnerable subpopulations, planning for regional transportation for ease of evacuation, property buyout programs, development of local and state climate adaptation plans, financial support programs for municipalities to make infrastructure more climate-resilient, and expansion of flood warning systems.

#### *Challenges*

The biggest challenges identified to achieving preparedness for climate change in New Jersey were lack of public awareness and acceptance of climate change impacts. Other major barriers identified include lack of political will, limited funding, and the difficulty of convincing the public and local officials to plan for long-term climate change impacts when there is no apparent urgency.

### *Issue Prioritization*

When presented with a list of six challenges to coastal communities in New Jersey and asked to rank them in order of importance, with 1 being most important and 6 being least important, the average rank order was 1) Land Development Pressures; 2) Climate Change; 3) Economic Conditions; 4) Environmental Degradation; 5) Changing Demographics; and 6) Crime/Public Safety.

### *Technical Needs*

Most respondents (51%) feel there is an adequate availability of resources to help them understand climate impacts on their community, though 25% said this was an unmet need. 32% feel there is an unmet need for resources related to how their community can adapt to climate change. Half (50%) of the respondents felt there was an unmet need for financial and technical assistance and/or incentives for climate adaptation planning and to implement adaptive actions. Many were unsure of the availability of financial resources for climate adaptation planning and for implementation of climate adaptation activities, with 18% and 21% respectively responding that they were not sure whether there were resources available for these items.

## Emergency Managers Survey

Administered to members of the New Jersey Emergency Management Association (NJEMA)

Survey conducted online August 15 – September 5, 2013.

### *Overview of Participants*

46 respondents completed this online survey. Of the respondents, 67% (31 respondents) work for municipal offices of emergency management (OEM), 13% (6 respondents) work for County OEM, and 15% (7 respondents) work for State OEM or other state agencies. 30% (14 respondents) work in Monmouth County, with the remainder of respondents' jurisdictions scattered throughout the state. Respondents' service jurisdictions range in size from small towns (1,100 people was the smallest) to the entire state (8.8 million people). 78% (36 respondents) serve suburban communities, with 7 respondents serving urban areas and 3 serving rural areas. Respondents' reported experience in their present emergency management capacity ranges from 1 to 37 years.

### *Views on Climate Change*

73% of respondents believe climate change is occurring, with 24 of the respondents strongly disagreeing and 9 disagreeing with the statement "global climate change is not occurring". Eleven respondents (24%) do not think that climate change is occurring. The majority of respondents (60%) believe that climate change is mostly caused by human activity, with 13% strongly agreeing on this point, 47% agreeing, 18% disagreeing or strongly disagreeing and 22% responding "don't know". Nearly all respondents (91%) feel climate change is a risk to New Jersey, and 82% think climate change is a personal risk to family and friends. Slightly over half of respondents (26 respondents/58%) agree that the international scientific community understands the science behind climate change, while 20% disagree and 22% don't know. 64% trust the scientific community to truthfully report their findings related to climate change while 23% do not. Trust in the media is low, with only 29% agreeing that the media communicate honestly about global climate change, 53% disagreeing, and 18% responding "don't know". In response to the statement "our state and local officials understand the implications of global climate change for my region", 37% agreed, 42% disagreed, and 20% responded "don't know".

### *Climate Change Impacts*

Respondents overall were much more concerned about impacts from extreme weather events than they were about impacts from heat, drought, infectious disease, or other exposures, with the majority of emergency responders expressing concern about all of the extreme weather impacts presented in the survey. The greatest concerns arising from extreme weather events were injuries from storm events (95% concerned – 70% great concern/25% some concern), damage to energy infrastructure (96% – 71% great/24% some), and interrupted care for vulnerable populations, e.g. during evacuations (98% - 60%/38%). Other extreme weather impacts of major concern included damage to communications infrastructure (93% - 64%/29%), strain and stress on responders (93% - 60%/33%), deaths from storm events (93% - 58%/36%), and increased need for sheltering (98% - 52%/45%). Additional issues of concern include damage to water supply infrastructure, long term economic impacts, extreme cold from power outages, ensuring food safety during power outages, damage to wastewater infrastructure, disruption of food supplies, and toxics from flooding of hazardous or contaminated sites.

Other (non-storm-related) climate impacts of concern include drinking water contamination, increases in food-, water-, and vector-borne diseases, and increased mold and mildew. Issues such as decreased water supply, more heat stress/stroke, and increases in wildfires, were relatively less important to emergency managers.

Amongst vulnerable populations, respondents expressed by far the greatest concern for the elderly (96% - 69% great/27% some), followed by the physically disabled (96% - 49%/47%), mentally disabled (91%), the poor and economically disadvantaged (89%), car-less households (91%), low income homeowners (84%), middle income homeowners (84%), racial minorities (80%) and non-English speakers (75%).

#### *Impacts from Irene and Sandy*

The service areas of all 46 respondents (100%) were impacted by Tropical Storm Irene in 2011, with common impacts including power outages (93%), road closures (89%), minor property damage (80%), short-term stress (78%), and resident evacuation (63%). Injuries and deaths were reported by 8 and 3 respondents, respectively.

The service areas of 44 out of 46 respondents (96%) were affected by Hurricane Sandy in 2012. Common impacts included power outages (98%), road closures (95%), short-term stress (80%), major property damage (77%), longer term stress (77%), and resident evacuation (75%). Injuries and deaths were reported by 20 and 8 respondents, respectively.

#### *Climate Change Adaptation and Preparedness Activities*

Several of the climate change adaptation actions listed in the survey are already in place or planned in many emergency managers' jurisdictions. Of the options presented, cooling centers are the most common (60% in place, 18% planned), followed by short-term sheltering plans (56% in place, 29% planned), warming centers (56%/19%), local utility communication plan for outages (50%/30%), inclusion of vulnerable populations in emergency preparedness plans (50%/28%), risk communication (45%/33%) and risk maps (40%/38%).

Major needs identified, as measured by the percentage of respondents reporting that the activity is not planned but needed, include public awareness programs on climate change impacts (64%), emergency preparedness plans that incorporate climate change and local capacities (51%), local climate adaptation plans (68%), and vulnerability assessments/censuses of vulnerable subpopulations (44%).

#### *Policy Priorities*

When asked "what are the most important actions or programs needed at the regional, state, or federal level to support local emergency managers in preparing for and responding to climate change impacts?" and presented with a list of options, there were several actions or programs that 100% of respondents indicated a need for (i.e. 100% of respondents selected either "high need" or "some need"). The highest priority item was resilient emergency communications infrastructure, selected as a "high need" by 82% of respondents. Improved coordination was also identified as a high priority, both between different levels of government (80% high need) and among emergency management and other sectors such as transportation and health (76%).

Other priority actions at the regional, state, or federal level that respondents nearly unanimously agreed are needed include additional training and exercises for emergency management (67% high need), critical infrastructure assessments (66%), rapid response system for extreme weather events (64%), and improved climate and weather modeling capacity for local scale assessments (60%). Other perceived needs include provision of regional shelters (59%), better regional transportation options (59%), enhanced weather forecasting (56%), enhanced weather monitoring (58%), assistance with stockpiling of supplies, and updated or new regulations on floodplains, infrastructure upgrades, and emergency planning and sheltering.

### *Critical Needs*

When asked “what does your jurisdiction/agency most need to prepare and be ready to respond to climate change impacts over the coming decades”, there was a wide variety of responses. Several respondents identified a need for additional financial and staffing resources, while others pointed to a need for more and better equipped shelters, warming/cooling centers, and stockpiles of supplies. Other needs identified included better communication equipment and systems, updating of plans and a more regional approach to planning, flood control, and better climate and weather modeling.

### *Challenges*

The biggest challenges identified by emergency managers to achieving preparedness for climate change in New Jersey were lack of adequate and consistent funding and staffing. Other challenges include a lack of public education on personal preparedness, limited buy-in from the public and elected officials on climate change issues, and inadequate infrastructure.

### *Issue Prioritization*

When presented with a list of five emergency management concerns and asked to rank them in order of importance, with 1 being most important and 5 being least important, there was no clear consensus on which issue was the most important. The average rank order was 1) Communications Interoperability; 2) Alert and Warning Systems; 3) Facilities and Equipment; 4) Training, Education, and Outreach; and 5) Climate Change Impacts; with the top four choices clustered fairly close together but with climate change impacts clearly the lowest priority.

## Land Conservation Rally Survey

Administered to attendees of the New Jersey Land Conservation Rally on March 9, 2013

Survey conducted online May 1 – June 12, 2013.

### *Overview of Participants*

35 respondents completed this online survey. Of the respondents, 17% are government land managers, 20% are land managers for nonprofit organizations, 17% are citizens with a general interest in land conservation, and 11% are local volunteers, with the remainder responding “other”.

### *Views on Climate Change*

89% of respondents believe climate change is occurring, with 30 of the respondents strongly disagreeing and 1 disagreeing with the statement “global climate change is not occurring”. 11% do not think that climate change is occurring. The overwhelming majority of respondents (89%) believe that climate change is mostly caused by human activity, with 51% strongly agreeing on this point, 37% agreeing, 6% disagreeing and 6% responding “don’t know”. Nearly all respondents (94%) feel climate change is a risk to New Jersey, and 91% think climate change is a personal risk to family and friends. 80% agree that the international scientific community understands the science behind climate change and 86% trust the scientific community to truthfully report their findings related to climate change. Opinion on the media is divided, with 46% agreeing that the media communicate honestly about global climate change, 31% disagreeing, and 23% responding “don’t know”. Most respondents expressed little faith in state and local officials’ comprehension of climate issues, with 80% disagreeing or strongly disagreeing with the statement “our state and local officials understand the implications of global climate change for my region.”

### *Climate Change Impacts to Open Space and Farmland*

Respondents expressed ‘great concern’ or ‘some concern’ about nearly all of the water-related impacts presented in the survey. More and longer droughts was the issue of the greatest concern, with 97% expressing concern (89% great/8% some). The next most concerning water-related issue was the opposite climate extreme, increased occurrence and severity of flooding (97% overall - 74% great/23% some). Other water issues of major concern include increased algal blooms (97% - 71%/26%) and reduced water availability (94% - 69%/26%).

Tidal wetland erosion and loss was a major concern, with 97% of respondents expressing great (80%) or some (17%) concern about this issue, as was beach and dune loss (91% - 66% great/25% some). 94% of respondents identified critical species habitat loss as a concern, with 69% of respondents expressing great concern and 26% expressing some concern. Species lifecycle changes such as bloom time and reproductive timing was also a major concern (97% - 60%/37%), as was the risk of changes in plant and animal species composition and distribution (94% - 66%/29%) and an increased spread of invasive species (91% - 63%/29%). Other impacts of concern include reduced water filtration, reduced air purification, reduced carbon storage, and soil erosion and loss.

Of impacts related specifically to farmland, respondents were most concerned about increased water demand for crops (91% - 74% great/18% some), reduced crop yield (91% - 68% great/24% some) and crop damage/loss (94% - 62%/32%).

### *Impacts from Irene and Sandy*

The open lands/farmlands of 81% of respondents were impacted by Tropical Storm Irene in 2011, with common impacts including severe flooding (33%) and short-term land/property damage (33%).

81% of the respondents' open spaces and farmlands were affected by Hurricane Sandy in 2012, with 32% reporting short term land/property damage and 28% reporting long term or permanent land/property damage. Only 12% of respondents reported severe flooding from Hurricane Sandy, compared with 33% from Irene.

#### *Climate Change Adaptation and Preparedness Activities*

Very few of the climate change adaptation options listed in the survey were identified as already in place or planned. Of the options presented, emergency preparedness plans are the most common (24% in place, 35% planned), followed by surveillance of diseases (23% in place, 15% planned) and green infrastructure (14% in place, 23% planned, 59% not planned but needed).

Major needs identified, as measured by percentage of respondents reporting that the activity is not planned but needed, include property and resource vulnerability assessments (89%), collaborative regional approaches to manage ecosystems (79%), protection of representative ecosystems of sufficient size (72%), water conservation (71%), farming for biodiversity (69%), and protection of connective corridors between ecosystems (68%).

#### *Regional, State, and Federal Actions*

Incentive programs to preserve climate resilient open space and farmland were identified as one of the highest priority needs at the local, state, or federal level, with 75% of respondents selecting this as a 'high need'. Improved coordination and training between the conservation community and regional, state, and federal resource agencies was a close second, identified as a high need by 74% of respondents, followed by water supply planning and conservation programs to account for a changing climate, selected by 73% of respondents.

Other state, regional, or federal actions and programs identified as 'high need' include support for habitat restoration projects (72%), development of land conservation targets based on likely climate change scenarios (71%), enhanced best management practices to reduce stormwater runoff (67%), and research on innovative and cost effective strategies for improved water systems management and design (66%).

Other programs or activities that respondents identified there was 'some' or 'great' need for include enhanced monitoring to establish baselines and monitor changes in species health and crop yield, improved climate modeling capacity for local scale assessments, research on the vulnerability of economically important agricultural species and development of adaptive species and varieties, and implementation of appropriate fire management strategies in forested areas.

#### *Critical Needs*

When asked "what does your open space or farmland preservation program most need to prepare and be ready to respond to climate change impacts over the coming decade", many of the responses focused on the need for more preserved open space and for sustainable funding mechanisms to enable more land preservation. Other needs identified include deer control, ability to model and predict climate change scenarios at the local and regional level, more public awareness, better understanding of the effects of climate change on specific crops and land types, and prohibition of development in flood plains.

#### *Challenges*

The biggest challenges identified to achieving preparedness for climate change in New Jersey were lack of political will and lack of public awareness of climate change issues. Other barriers identified include development pressures, local regulations that allow for development in environmentally sensitive areas, the fragmented nature of local zoning rules, and the inherent complexity and long-term timescale of climate issues.

*Issue Prioritization*

When presented with a list of six challenges to land and farmland preservation and asked to rank them in order of importance, with 1 being most important and 5 being least important, the overall rank order was: 1) Encroaching Land Development, which was clearly identified as the primary challenge, followed by 2) Climate Change Impacts; 3) Alterations to Hydrology; 4) Increases in Contaminants; 5) Introduced or Invasive Species; and 6) Overuse of Trails/Multi-use conflicts.

## Natural Resources Survey

Administered to representatives of the natural resource management community, defined as those involved in the management or protection of ecosystems and/or species, or the commercial or recreational harvest of species across New Jersey.

Survey conducted online August 15 – September 5, 2013.

### *Overview of Participants*

27 respondents completed this online survey. Of the respondents, 6 respondents (23%) work in government, 13 respondents (50%) work for non-governmental organizations, and 6 respondents (23%) are resource users. Respondents' roles include habitat, land, and species managers (14 respondents), recreational fisherman (4 respondents), as well as a funder, regulator, attorney, scientist, and commercial fisherman. Twenty-five of the respondents work in New Jersey and 24 live in New Jersey.

### *Views on Climate Change*

Respondents were asked whether they agree, strongly agree, disagree, or strongly disagree with the statement "Global climate change is not occurring." Twenty-six (96%) of the respondents believe climate change is occurring, with 23 of the respondents strongly disagreeing and 3 disagreeing with this statement, while 1 respondent strongly agreed with the statement.

The majority of respondents (21, or 78%) believe that climate change is mostly caused by human activity. All 27 respondents (100%) agreed or strongly agreed with the statement "Climate change is a risk to New Jersey", and 92% think climate change is a personal risk to family and friends. Most respondents (21/78%) agree that the international scientific community understands the science behind climate change, while 19% (5 respondents) disagree or strongly disagree and 1 responded 'don't know'. 85% (23 respondents) trust the scientific community to truthfully report their findings related to climate change. Confidence in public officials is low, with only 1 respondent agreeing that "state and local officials understand the implications of global climate change for my region", 24 (89%) disagreeing or strongly disagreeing, and 2 responding "don't know". Trust in the media is mixed, with 12 (45%) agreeing the media communicate honestly about global climate change and 14 (52%) disagreeing.

### *Climate Change Impacts*

The survey presented a range of climate change impacts and respondents were asked to rank whether each impact was of great concern, some concern, little concern, or no concern. For every impact presented, a majority of respondents selected either 'some' or 'great' concern.

Respondents overall had the greatest concern about increased occurrence and severity of flooding (25 respondents, or 93%, selected 'great concern'), and loss of critical species habitat (85% 'great concern'). Other major concerns included loss and erosion of tidal wetlands (80%), loss of beaches and dunes (79%), higher water temperatures (70%), increased spread of invasive species (70%), increased occurrence/spread of pathogens, pests, and vector-borne diseases (67%), increased algal blooms/eutrophication (58%), and changes in plant and animal species compositions and distribution (56%).

### *Impacts from Irene and Sandy*

The natural resource areas of 20 respondents (80%) were impacted by Tropical Storm Irene in 2011, with common impacts including short-term land and property damage (70%) and severe flooding (65%).

The natural resource areas of 24 respondents (89%) were affected by Hurricane Sandy in 2012. Common impacts included severe flooding (71%), short-term and long-term land and property damage (71% and 54% respectively), and short and long-term species impacts (46% and 42%).

#### *Climate Change Adaptation and Preparedness Activities*

Several of the climate change adaptation actions listed in the survey are already in place or planned in several natural resource managers' jurisdictions. Of the options presented, emergency preparedness plans are the most common (8 in place, 5 planned), followed by green infrastructure (6 in place, 9 planned), habitat conservation and restoration plans (5 in place, 9 planned) and risk maps (3 in place, 10 planned).

Major needs identified, as measured by the number of respondents reporting that the activity is not planned but needed, include collaborative regional approaches to manage ecosystems and species to respond to climate change (15), protection of representative ecosystems of sufficient size (14), natural resource vulnerability assessments (13), property vulnerability assessments (12), protection of connective corridors between ecosystems (12), and water conservation plans (11).

Survey respondents were also asked what actions they have already taken to address climate change in their programs and activities. Responses included education and awareness building programs, acquisition of coastal land, development of coastal planning tools, and conducting an infrastructure assessment and baseline data collection.

#### *Policy Priorities*

Respondents were asked "what are the most important actions or programs needed at the regional, state, or federal level to support local emergency managers in preparing for and responding to climate change impacts?" and asked to rank each in a list of options as 'high need', 'some need', or 'little or no need'. There were several actions or programs presented that 100% of respondents indicated a need for (i.e. 100% of respondents selected either "high need" or "some need"). The highest priority action, as measured by the number of respondents choosing it as a high need, is support for habitat restoration projects to enhance resiliency and survival of endangered and threatened species and critical habitat, which was selected as a "high need" by 25 (93%) respondents. Development of conservation/restoration plans for at-risk coastal ecosystems was also identified as a high priority, with 21 (84%) respondents selecting it as a high need.

Other priority actions at the regional, state, or federal level that respondents nearly unanimously agreed are needed include enhanced conservation practices to reduce stormwater runoff (21 respondents view as a high need), water supply planning and conservation programs that account for a changing climate (20), improved coordination and training between the conservation community and regional, state, and federal resource agencies (19), incentive programs to preserve open space and farmland (18), enhanced monitoring to establish baselines and monitor changes to species health and distribution (18), development of land conservation targets based on likely climate change scenarios (17), research on the impacts to commercially important fisheries species and development of adaptive management plans (17), and improved climate modelling capacity for local scale assessments (16).

#### *Critical Needs*

When asked "what does your natural resource management program most need to prepare and be ready to respond to climate change impacts over the coming decades", responses focused on the need for better baseline data and improved modelling to project climate change impacts. Responses included "good local predictive models", "support for baseline monitoring and local scale modeling", and "better baseline data and improved modelling". Other

responses included “increased personnel and streamlining of regulatory and management processes” and “coordination with state government in coastal adaptation projects”.

### *Challenges*

Challenges identified by natural resource managers to achieving preparedness for climate change in New Jersey include lack of funding, difficulty in modelling, especially at the local scale, and better understanding of the causes and impacts of climate change.

### *Issue Prioritization*

When presented with a list of five natural resource management concerns and asked to rank them in order of importance, with 1 being most important and 5 being least important, the average rank order selected was 1) Encroaching Land Development; 2) Climate Change Impacts; 3) Alterations to Hydrology; 4) Regulations to Restrict Harvest; and 5) Overuse of Trails/Multi-Use Conflicts, with land development and climate change clearly the priority issues.

## Planners Survey

Administered to members of the New Jersey chapter of the American Planning Association  
Survey conducted online June 24 – July 12, 2013.

### *Overview of Participants*

137 respondents completed this online survey. Of the respondents, 17% work for municipal government, 12% for county government, 12% for state government, 4% for federal government, 2% for regional planning organizations, 28% work in the private sector or are consultants, 7% work in the non-profit sector, and 8% in the academic sector, with the remainder responding “other”. Respondents work in a variety of fields, with 58% reporting they do land use planning, 39% environmental planning, and 35% transportation planning (respondents could select multiple options). Other areas of practice include community development, housing, economic development, land preservation, and urban design. 39% of respondents have served in their position for more than 10 years, 20% for 5-10 years, and 41% have been in their position for 1-5 years.

### *Views on Climate Change*

89% of respondents believe climate change is occurring, with 101 of the respondents strongly disagreeing and 21 disagreeing with the statement “global climate change is not occurring”. 9% do not think that climate change is occurring. The majority of respondents (79%) believe that climate change is mostly caused by human activity, with 43% strongly agreeing on this point, 36% agreeing, 14% disagreeing or strongly disagreeing and 7% responding “don’t know”. Nearly all respondents (95%) feel climate change is a risk to New Jersey, and 86% think climate change is a personal risk to family and friends. 77% agree that the international scientific community understands the science behind climate change and 76% trust the scientific community to truthfully report their findings related to climate change. Opinion on the media is divided, with 42% agreeing that the media communicate honestly about global climate change, 44% disagreeing, and 15% responding “don’t know”. Most respondents expressed little faith in state and local officials’ comprehension of climate issues, with 67% disagreeing or strongly disagreeing with the statement “our state and local officials understand the implications of global climate change for my region.”

### *Climate Change Impacts Related to Planning*

The majority of respondents expressed ‘great concern’ or ‘some concern’ about all of the flooding and extreme weather-related impacts presented in the survey. Damage to critical utility infrastructure was the issue of the greatest concern, with 97% expressing concern (77% great/20% some), followed by damage to property (96% overall – 59% great/37% some) and disruption to transportation systems (93% - 64%/30%). Other flood-related issues of concern include increased stormwater runoff (93% - 55%/39%), sewage overflows (91% - 56%/36%), housing insecurity and displacement (89% - 44%/45%), degradation of natural systems and habitat (88% - 53%/35%), exposure to contaminants and toxic material as a result of flooding (86% - 47%/39%), and loss of jobs, tourism, and tax revenue (83% - 40%/43%).

Of impacts related to sea level rise, respondents were most concerned about inundation of low-lying infrastructure such as roads and substations, with 67% expressing great concern and 27% expressing some concern (94% overall). Other sea level rise impacts of major concern to planners included a decrease in the function of water and sewer systems (94% overall, 61% great/33% some), increased severity of storm surges (90% - 64%/26%), coastal erosion (83% - 56%/27%), inundation of natural systems and habitat such as wetlands and dunes (86% - 44%/42%), and a decline in water quality due to saltwater intrusion (84% - 46%/38%). Respondents also expressed concern about loss of cultural and historical landmarks due to inundation (83%), loss of tax revenue due to declining property value or lost properties (83%), and loss of recreational land from inundation (76%).

Planners were somewhat less concerned about impacts resulting from heat and drought, though the majority of respondents still expressed “some” or “great” concern for all of the impacts presented in the survey. Heat and drought impacts of concern include the health of vulnerable populations during heat events (85%), additional maintenance requirements for rail and road networks (85%), a decline in air quality from increased levels of ozone and particulate matter (84%), decreased agricultural sustainability (82%), decrease in water supply (81%), urban heat island effect (78%), and a decline in water quality (75%).

#### *Impacts from Irene and Sandy*

The service areas of 90% of survey respondents were impacted by Tropical Storm Irene in 2011, with common impacts including power outages (83%), road closures (74%), infrastructure damage (54%), severe flooding (53%), minor property damage (52%), minor flooding (51%), resident evacuation (41%) and major property damage (40%).

96% of the respondents’ service areas were affected by Hurricane Sandy in 2012. Common impacts included power outages (93%), road closures (84%), infrastructure damage (71%), major property damage (59%), severe flooding (51%), minor property damage (50%), minor flooding (44%), and resident evacuation (43%). Other impacts noted included transit closures and substantial tree damage.

#### *Climate Change Adaptation and Preparedness Activities*

Several of the climate change adaptation actions listed in the survey are already in place or planned in many planners’ jurisdictions. Of the options presented, emergency preparedness and response plans are the most common (61% in place, 22% planned), followed by hazard mitigation plans (44% in place, 26% planned), risk maps (42% in place, 22% planned), prohibition of new development in flood prone areas (34%/13%), cluster zoning and/or lot averaging (29%/11%), and resource vulnerability assessments (23%/21%). 28% of planners report that green infrastructure projects (such as riparian buffers, native landscaping, and wetland restoration) are planned for their service jurisdictions.

Major needs identified, as measured by the percentage of respondents reporting that the activity is not planned but needed, include capital improvement and maintenance plans that incorporate climate change projections (73%), censuses of vulnerable subpopulations (65%), comprehensive plans that incorporate climate change projections (64%), public outreach programs on climate change (64%), rolling easements (62%), bans on hazardous materials in flood prone and sensitive areas (59%), green infrastructure projects (55%), and resource vulnerability assessments (51%).

#### *Regional, State, and Federal Actions*

Critical infrastructure assessments were identified as the highest priority need at the local, state, or federal level, with 80% of respondents selecting this as a ‘high need’. Improved coordination between planning and other sectors was identified as a high need by 72% of respondents, followed by improved coordination between local planning departments and regional, state, and federal resources, selected by 71% of respondents.

Other state, regional, or federal actions and programs identified as ‘high need’ include incentive programs to relocate development away from vulnerable areas and to preserve open space (64%), updated regulations or guidelines addressing design and construction standards (61%), updated regulations or guidelines addressing floodplains (58%), and research on innovative funding strategies to implement adaptation measures (58%).

Other programs or activities that respondents identified there was ‘some’ or ‘great’ need for include support for green infrastructure projects, strengthened training for local planning and zoning boards and town councils, a

mandate to incorporate climate change into comprehensive plans, shoreline change data and projections, and socioeconomic vulnerability assessments.

### *Critical Needs*

When asked “what does your planning jurisdiction most need to prepare and be ready to respond to climate change impacts over the coming decades”, many of the responses focused on the need for better infrastructure and hardened utilities, particularly the electrical grid, as well as more comprehensive planning and funding to implement plans and projects. Other needs identified include more coordination amongst different agencies and levels of government, better data, hazard mitigation plans, enhanced floodplain and stormwater management, public education and outreach programs, stronger political leadership, and adaptation tools that are appropriate for urban settings.

### *Challenges*

The biggest challenges identified to achieving preparedness for climate change in New Jersey were lack of political will, lack of public awareness of climate change impacts, and the difficulty of convincing the public and local officials to plan for the long-term when there is no apparent urgency. Other major barriers identified include home rule/the fragmented nature of planning and governmental jurisdiction in New Jersey, funding constraints, and data shortcomings.

### *Issue Prioritization*

When presented with a list of six planning challenges in New Jersey and asked to rank them in order of importance, with 1 being most important and 6 being least important, Aging Infrastructure was clearly identified as the primary challenge, with the rest of the responses clustered together with no strong ordering pattern. The average rank order was 1) Aging Infrastructure; 2) Climate Change; 3) Natural Resource Protection; 4) Affordable Housing; 5) Neighborhood Revitalization; and 6) Sprawl.

## Public Health Officers Survey

Administered to members of the New Jersey Association of City and County Health Officials

Conducted online April 8 – April 22, 2013

### *Overview of Participants*

22 respondents completed this online survey. Of the respondents, 36% work at municipal health departments serving single municipalities, 36% work at a health department serving multiple municipalities, 14% work at county health departments, and 14% work at regional health departments. Fifty percent serve populations of 25,000-50,000, 41% serve populations of more than 50,000 and 9% serve populations of 15,000-25,000. 73% work in suburban communities, 23% in urban communities, and 1 respondent works in a rural community. 87% of respondents are the lead public health officer in their health department. 62% of respondents have served in their position for more than 10 years. All but one respondent reported that a member of their health department is routinely present at emergency planning and response meetings in the community.

### *Views on Climate Change*

68% of respondents believe climate change is occurring, with 7 disagreeing and 8 strongly disagreeing with the statement “global climate change is not occurring”. 23% do not agree that climate change is occurring, and 10% responded “don’t know”. There is a wide range of opinion regarding whether climate change is mostly caused by human activity, with 50% agreeing that it is, 32% disagreeing, and 18% responding “don’t know”. The overwhelming majority (91%) feel climate change is a risk to New Jersey, and 77% think climate change is a personal risk to family and friends. 64% agree that the international scientific community understands the science behind climate change and 68% trust the scientific community to truthfully report their findings related to climate change. There is little trust in the media, with only 27% agreeing that the media communicate honestly about global climate change. Most public health officers have limited faith in state and local officials’ comprehension of climate issues, with 64% disagreeing or strongly disagreeing with the statement “our state and local officials understand the implications of global climate change for my region.”

### *Climate Change Impacts to Public Health*

Of the heat and drought impacts presented in the survey, 82% of the respondents expressed great or some concern about increases in heat stress and stroke, 73% expressed concern about decreased water supply, and 59% expressed concern about food scarcity. Of the air quality impacts, 95% expressed concern about increased cases and severity of respiratory diseases (48% answered ‘great concern’), and 95% were also concerned about increases in cases and severity of allergies (33% answered ‘great concern’). Of the infectious disease impacts, 86% expressed great or some concern about increases in vector borne diseases. 86% also expressed concern about increases in food or water-borne disease, and 90% expressed concern about newly emerging diseases. Of other exposures, mold and mildew were a concern of 90% of respondents, with 62% reporting great concern and 29% reporting some concern. 67% expressed concern about drinking water contamination (33% great/33% some).

Extreme weather impacts were a nearly universal concern, with no respondents reporting that they had ‘no concern’ about any of the extreme weather impacts to public health that were presented in the survey. Ensuring food safety during power outages was a primary concern, with 100% of respondents expressing concern about this issue (71% great concern/29% some concern). 95% expressed concern about interrupted care for vulnerable populations (57% great/ 38% some) and 90% expressed concern about an increased need for sheltering (67% great/24% some). Public health officers were also very concerned about the impacts of extreme weather events on their own staff, with 86% reporting some or great concern about strain and stress on responders. Other major concerns included

extreme cold from power outages (90% overall - 48% great/43% some), toxic contamination from flooding of hazardous or contaminated sites (86% - 48%/38%), longer term economic impacts (86% - 57%/29%), and deaths from storm events (86% - 43%/43%).

There were a number of extreme weather impacts about which the majority of respondents expressed some but not great concern, including rescues/strandings (19% great, 67% some), injuries from storm events (43% great, 52% some), acute emotional distress (24% great, 62% some), and disease spread from sheltering (24% great, 62% some).

#### *Impacts from Irene and Sandy*

The service areas of 86% of the public health officers surveyed were impacted by Tropical Storm Irene in 2011, with common impacts including road closures (88%), short-term stress (88%), minor property damage (69%), severe and minor flooding (56% each), and resident evacuation (56%). Other impacts experienced in their service areas included major property damage (44%), injuries (38%), longer-term stress (38%), power outages, nursing home evacuations, and deaths (2 respondents).

95% of the respondents' service areas were affected by Hurricane Sandy in 2012, with large majorities reporting that residents in their service areas experienced short-term stress (89%), road closures (89%), and minor/major property damage (78%/56%). 67% reported general resident evacuation and 11% (2 respondents) reported nursing home/assisted living facility evacuation. Six respondents reported injuries in their service area and one reported a death.

#### *Climate Change Adaptation and Preparedness Activities*

The most commonly reported preparedness activities that are already in place include surveillance for diseases (89% in place, 11% planned), mosquito control (84% in place, 11% planned), cooling centers (68% in place, 11% planned), warming centers (63% in place, 11% planned), crisis and emergency response communications (56% in place, another 22% planned), short term sheltering plans (50% in place, 22% planned), and local utility communication plans for use during power outages (39% in place, 33% planned).

Major needs identified, as measured by percentage of respondents reporting that the activity is not planned but needed, include health impact assessments related to climate change impacts (81%), emergency preparedness plans that incorporate climate change (76%), home energy assistance programs (71%), public awareness programs on climate change impacts (69%), risk maps (69%), local climate adaptation plans (67%), vulnerability assessments/censuses of vulnerable populations (67%), and heat warning systems (47%). 59% identified a need for extra capacity/resources for local health departments in emergencies, while 29% reported that additional capacity is already planned.

#### *Regional, State, and Federal Actions*

Better regional transportation options for ease of evacuation was identified as the highest priority need from the local, state, or federal level, with 89% of respondents noting a high level of need in this area. Improved coordination, both between health departments and state resources (67%) and between health and other sectors (68%) were also identified as major needs.

Other state, regional, or federal actions and programs identified as 'high need' include more resilient emergency communications infrastructure (68%), provision of regional shelters (63%), strengthened training and retention for local health departments (61%), rapid response systems for extreme weather events (61%), enhanced vector and

disease surveillance programs and data (58%), critical infrastructure assessments (58%), updated regulations addressing infrastructure upgrades (58%), provision of regional charging centers for electronic equipment (53%), and updated or new regulations/guidelines addressing emergency planning (53%).

Programs that respondents identified that there was 'some need' for include enhanced air monitoring data, enhanced weather forecasting, improved climate and weather modeling capacity for local scale assessments, provision of regional cooling and warming centers, and updated mold and floodplain management regulations.

#### *Critical Needs*

When asked "what does your department most need to prepare and be ready to respond to climate change impacts over the coming decade", nearly all responses focused on the need for more staff and more financial resources. Other suggestions included better leadership at the state level, reliable emergency power sources, more precise weather forecasting, and regional shelter planning and stockpiling of supplies.

#### *Challenges*

Not surprisingly, the biggest challenges identified by local health departments to achieving preparedness for climate change were lack of funding and lack of staff resources. Other barriers identified included a lack of regional coordination and statewide leadership, and the tendency to prioritize short-term needs over long-term planning.

#### *Issue Prioritization*

When presented with a list of five public health challenges and asked to rank them in order of importance, with 1 being most important and 5 being least important, the overall rank order was: 1) Communicable Diseases; 2) Senior Services for Aging Populations; 3) Climate Change Impacts; 4) Infant and Child Health; and 5) Domestic and Community Violence.

## Social Services Survey

Administered via the Rutgers School of Social Work contact list containing 800 social service agencies, hospitals, state programs, schools, and government agencies in New Jersey

Survey conducted online August 30 – September 16, 2013.

### *Overview of Participants*

71 respondents completed this online survey. Respondents provide social services for a wide range of populations, including children, the elderly, the physically and mentally disabled, victims of domestic violence, the homeless, veterans, low income families, people with substance abuse issues, the unemployed, college students, and patients who have been hospitalized. 42% of respondents' service areas are counties, 24% have regional service areas, 20% of service areas are statewide, 4% are municipalities/cities, with other respondents reporting that they serve individual hospitals and school districts. 52% of respondents reported that their agencies are primarily funded by the county or state government, or a combination of both, while 46% are non-profits and 6% are for-profit.

### *Views on Climate Change*

Respondents were asked whether they strongly agree, agree, disagree, or strongly disagree with the statement "Global climate change is not occurring." 44 respondents strongly disagreed and 14 disagreed with this statement indicating that 83% of the respondents believe climate change is occurring, while 12 respondents agreed or strongly agreed with the statement, indicating they do not believe climate change is occurring.

Most respondents (81%) believe that climate change is mostly caused by human activity. 94% of respondents agreed or strongly agreed with the statement "Climate change is a risk to New Jersey", and 90% think climate change is a personal risk to family and friends. The majority of respondents (64%) agree that the international scientific community understands the science behind climate change, while 16% disagree and 20% (14 respondents) responded 'don't know'. Forty-six respondents (66%) trust the scientific community to truthfully report their findings related to climate change while 24% do not. Confidence in public officials is low, with 23% of respondents agreeing or strongly agreeing that "state and local officials understand the implications of global climate change for my region", 59% disagreeing or strongly disagreeing, and 19% (13 respondents) responding "don't know". Trust in the media is also limited, with 33% agreeing the media communicate honestly about global climate change, 56% disagreeing and 11% responding 'don't know'.

### *Climate Change Impacts*

The survey presented a range of climate change impacts related to heat and drought, air quality, extreme weather events, infectious diseases, and other exposures. Respondents were asked to rank whether each impact was of great concern, some concern, little concern, or no concern.

Respondents overall had the greatest concern about extreme weather-related impacts. Major concerns for social services providers, as measured by the percentage of respondents rating the impact as a 'great concern', include interrupted care for vulnerable populations (68%), long-term economic impacts resulting from extreme weather events (66%), increased need for sheltering (61%), increased molds and mildew (57%), ensuring food safety during power outages (54%), injuries from storm events (54%), increase in cases and severity of allergies from a longer and more potent pollen season (53%), extreme cold during power outages (51%), and stress/strain on responders (51%).

*Impacts from Irene and Sandy*

The service areas of 83% of respondents were impacted by Tropical Storm Irene in 2011, with common impacts including short-term stress (78%), road closures (78%), power outages (78%), and minor property damage (72%). 27 respondents reported resident evacuations, 15 reported injuries, and 4 reported deaths in their service areas.

The service areas of 92% of respondents were affected by Hurricane Sandy in 2012. Common impacts included power outages (92%), road closures (88%), short and longer-term stress (85% and 74% respectively), minor and major property damage (74% and 71%). 45 respondents (69%) reported resident evacuations, 29 reported injuries, and 11 reported deaths in their service areas.

Other impacts that residents reported included gas shortages, school and facility closings, and homeless people experiencing difficulty qualifying for assistance since they were not legal residents of a building.

*Climate Change Adaptation and Preparedness Activities*

Several of the climate change adaptation actions listed in the survey are already in place or planned in several respondents' service areas. Of the options presented, home energy assistance programs for heating and cooling are the most common (41 respondents say they are in place, 9 planned), followed by coordinated short-term sheltering plans (26 in place, 12 planned), cooling centers (25 in place, 5 planned), crisis and emergency response risk communication (25 in place, 14 planned), heat warning systems (24 in place, 4 planned), warming centers (23 in place, 6 planned), local utility communication plans for use during outages (19 in place, 13 planned), and inclusion of vulnerable populations in emergency preparedness plans (18 in place, 9 planned).

Major needs identified, as measured by the number of respondents reporting that the activity is not planned but needed, include surveillance for mental health conditions (17), surge capacity/resources for local social service agencies in emergencies (13), local climate adaptation plans (13), stockpiling of supplies such as food, fuel, water, and medicine (12), and public awareness programs on climate change impacts (12).

*Policy Priorities*

Respondents were asked "what are the most important actions or programs needed at the regional, state, or federal level to help social service agencies prepare for and respond to climate change impacts?" and asked to rank a list of options as 'high need', 'some need', or 'little or no need'. The highest priority action, as measured by the percentage of respondents choosing it as a high need, is improved coordination, both between social service agencies and state resources (79% selected as high need) and between social service agencies and other sectors such as planning, health, transportation, and emergency management (77%), along with better regional transportation options (79%).

Other priority actions at the regional, state, or federal level include rapid response systems for extreme weather events (76%), resilient emergency communications infrastructure (72%), provision of regional shelters (68%), strengthened training and retention for social service agencies (67%), critical infrastructure assessments (67%), provision of regional charging centers (62%), provision of regional cooling and warming centers (61%), and assistance with stockpiling of supplies (57%). The only action which a majority of respondents did not consider a high need was enhanced weather forecasting, which 34% selected as a high need.

### *Critical Needs*

When asked “what does your agency most need to prepare and be ready to respond to climate change impacts over the coming decades”, respondents cited a wide variety of needs, including more information about what to prepare for, better coordination with other agencies, communication plans in case of emergencies, and a stockpile of generators and other supplies.

One respondent noted that they had not thought about it until they completed this survey, but believe that more information about their local government’s disaster plan and preparations for climate change would be helpful. Other responses included “coordinated regional plans”, “stockpile of food, clothing, and first/aid medical supplies”, “understanding what the emergency plan is and where to send people who are being evacuated”, “communication plan to reach member families and individuals with mental illness in case of emergencies”, “generators”, and “staff and board time to focus on the issue”.

### *Challenges*

When asked “what are the biggest challenges to achieving preparedness for climate change for your agency”, of the 55 respondents who provided answers, 23 cited limited financial resources as the biggest challenge. Other challenges identified include “not knowing what the plan is, if any”, “understanding of the issue”, “having enough staff to carry through the plan”, “lack of communication from the state”, and the fact that climate change exacerbates challenges for an “already overburdened, underserved client population” for whom climate change is “not the priority considering their other pressing needs”.

### *Issue Prioritization*

When presented with a list of six social service challenges and asked to rank them in order of importance, with 1 being most important and 6 being least important, the average rank order was 1) Decrease in Government Resources for Social Service Needs; 2) Senior Services for Aging Populations; 3) Decreases in Personal Economic Security; 4) Domestic and Community Violence; 5) Climate Change Impacts; and 6) Insurance Coverage), with Decrease in Government Resources clearly identified as the most important challenge.

## Water Utilities Survey

Sent to members of the American Water Works Association-NJ Chapter (AWWA-NJ), Association of Environmental Authorities (AEA), and New Jersey Water Environment Association (NJWEA)

Survey conducted online September 30 – November 1, 2013.

A link to the online Water Utilities survey was provided to members of the American Water Works Association-NJ Chapter (AWWA-NJ), Association of Environmental Authorities (AEA), and New Jersey Water Environment Association (NJWEA) by email. Executive management of utilities were encouraged to respond to a longer survey of 33 questions, while all others were encouraged to respond to a shorter survey of 15 questions. All questions on the short-form survey are also contained in the long-form survey. There were 63 responses to the short-form survey and 54 responses to the long-form survey. The results from the two surveys have been combined (117 total responses) for the questions that were in both the short and long versions. However, only approximately 85 total respondents made it past the introductory questions and answered questions related to climate change impacts.

### *Overview of Participants*

54 respondents completed the long form survey and 63 completed the short form survey, for a total of 117 responses, though only 85 total respondents made it past the introductory questions. 46 (34%) work primarily for publicly owned wastewater utilities, 22 (16%) work for publicly owned community water supply systems, 21 (16%) are consultants, 12 (9%) work for municipal government, 10 (7%) work for investor-owned community water supply systems, and 6 (4%) work for investor-owned community wastewater utilities. The remainder of respondents work in county, state, or federal government, or in other private sector roles. Utility executive directors/CEOs/COOs comprise 22% of overall respondents and 43% of long-form survey respondents (22 total). Utility managers (21 responses) comprise 21% of overall respondents and 31% of long form respondents. Consultants or attorneys (23 responses) comprise 23% of overall respondents and 12% of long form respondents. Job functions of respondents include operations management, treatment operations, executive management, engineering, planning, and emergency preparedness.

### *Views on Climate Change*

A total of 85 respondents (across both surveys) answered the set of questions related to climate change perceptions and climate impacts of concern. Respondents were asked whether they strongly agree, agree, disagree, or strongly disagree with the statement “Global climate change is not occurring”. 32 disagreed and 32 strongly disagreed, indicating that 75% of respondents believe climate change is occurring (86% of those who took the short survey and 64% of those who took the long survey).

52% of respondents agree that climate change is caused by human activity, with 28% disagreeing and 31% responding ‘don’t know’. 50% agreed with the statement that climate change is primarily a natural phenomenon that occurs cyclically. There were again differences between the two surveys, with a 40%/62% agreement on human activity/natural phenomenon in the long survey and an almost opposite response, 63%/38%, on the short survey, indicating that executives of utilities are more inclined to ascribe climate change to natural causes. 87% of respondents feel that climate change is a risk to New Jersey. 50% agree that the scientific community understands the science behind climate change. Only 13% agree that state and local officials understand the implications of global climate change for their industry sector (7% long, 19% short). Overall, only 27% trust the media to communicate honestly about global climate change. There is optimism about the potential for policymakers to

develop adaptations to minimize adverse effects (75%) and for the potential of water and wastewater utilities to develop adaptations (80%); these numbers were similar across both surveys.

### *Climate Change Impacts*

Both surveys presented a list of 26 climate change impacts related to the ability of water utilities to provide service. Respondents were asked to rank whether each impact was of 'great concern', 'some concern', 'little concern', or 'no concern'. The impact of greatest concern, as measured by the percentage of respondents choosing it as a 'great concern', was increased severity of storms (selected as a great concern by 49% of respondents), followed by the increased frequency of severe storms (46%). Other impacts of concern include increased inundation of low-lying infrastructure such as roads, pumping stations, and electrical utility substations (45%), more severe droughts (44%), physical damage to critical utility infrastructure (44%), increased severity of coastal storm surges (42%), increased occurrence/severity of coastal floods (40%), and reduced recharge of aquifers (38%).

### *Impacts from Irene and Sandy*

The long form survey asked respondents about impacts from Hurricanes Irene and Sandy. The service areas of 33 out of 42 respondents' utilities (79%) were impacted by Hurricane Irene in 2011, with common impacts including road closures (25 respondents), short term power loss of <48 hours (22 respondents), severe and minor flooding (19 each), and minor property damage, both to customers (19) and respondents' organization (16). The service areas of 38 respondents (91%) were impacted by Hurricane Sandy in 2012, with common impacts including longer term power loss of >48 hours (32 respondents), road closures (31), business closures (23), major and minor property damage in the community (22 and 20), and severe flooding.

### *Climate Change Adaptation and Preparedness Activities*

The long form survey presented a list of climate adaptations and were asked whether they were 'In Place', 'Planned', 'Not Planned but Needed', or 'Not Needed'. The most common adaptation activities, as measured by the percentage reporting it as 'In Place' or 'Planned', are Crisis and Emergency Response Risk Communication systems (63% in place, 26% planned), local water utility communication plan for outages (62% in place, 21% planned), stockpiling of supplies (44% in place, 38% planned), alternate service distribution routes (54% in place, 18% planned), and risk maps (53% in place, 15% planned). While only 4 respondents reported that raising, relocating, or flood-proofing capital facilities prone to flooding or storm surges has been done, 22 (58%) report that it is planned at their water utility. While only 4 respondent's utilities have capital improvement and maintenance plans which incorporate climate change, 19 (53%) say this is planned. Twelve (38%) plan to develop hazard mitigation plans, in addition to the 9 that already have hazard mitigation plans in place.

Major needs identified, as measured by the number of respondents reporting that the activity is 'Not Planned but Needed', include local climate adaptation plans (18), local electric utility communication plan for outages affecting water utilities (15), public and employee awareness campaign on emergency preparedness (14), public awareness program on climate change impacts (14), green infrastructure such as wetland restoration and living shorelines (13), buyout of properties in high hazard floodplains (12), vulnerability assessments/census of vulnerable sub-populations and inclusion of vulnerable populations in emergency preparedness plans (10 each), and hazard mitigation plans (10). Interestingly, while approximately 35 respondents completed this portion of the survey, options that referred explicitly to climate change or other controversial subjects such as buyouts got only around 26-

28 responses each, indicating that even in an anonymous survey there is some reluctance to address certain issues.

### *Policy Priorities*

Respondents were asked “what are the most important actions or programs needed at the regional, state, or federal level to support water utility efforts prepare for and respond to climate change impacts?” and asked to rank a list of options as ‘very important’, ‘important’, or ‘somewhat important’. The highest priority actions, as measured by the percentage of respondents choosing ‘very important’, are: clearly established emergency response lines of communication (70%), resilient emergency communications infrastructure (68%), critical infrastructure assessments (55%), regulatory programs to encourage the accelerated replacement of aging infrastructure (53%), development of innovative funding strategies to implement adaptation measures (50%), clear policy direction with supporting incentives to expedite hardening and resiliency measures (47%), and improved planning, coordination, and communication across affected entities (46%).

### *Critical Needs*

When asked “what does your agency most need to prepare and be ready to respond to climate change impacts over the coming decades”, most of the responses focused on funding and back-up power supply. Responses included “emergency generators and extra fuel supply”, “emergency standby power”, “alternate power supplies”, “innovative project financing”, “funding sources for increased infrastructure resiliency”, and “funding for infrastructure upgrades”. Other respondents noted that clear policy direction for facilities in regard to severe weather events, a regulatory climate that accepts the need to set rates at levels that permit more investment in infrastructure, and updated flood zone mapping are important needs.

### *Challenges*

When asked “what are the biggest challenges to achieving preparedness for climate change for your agency”, lack of funds was clearly the biggest issue, with 18 of 36 responses focusing on a lack of adequate funding. Other challenges include a lack of reliable, accurate risk assessment and the difficulty in making projections for the future, regulatory issues, and a lack of public awareness and support for investment.

When presented with a list of six water utility challenges and asked to rank them in order of importance, with 1 being most important and 6 being least important, the average rank order was 1) Regulatory Compliance; 2) Achieving Revenue/Budget Targets; 3) Asset Management; 4) Meeting Customer Price/Rate Expectations; 5) Employee Capabilities and Retention; and 6) Climate Change Impacts, with Climate Change Impacts clearly the lowest concern.

### *Emergency Preparedness*

Respondents were asked to rate the preparedness of their organization for a major storm event as ‘Not at all Prepared’, ‘Somewhat Prepared’, ‘Adequately Prepared’, or ‘Extremely Well-Prepared’ both prior to Hurricane Irene and after Hurricane Sandy. Prior to Hurricane Irene, 36% of respondents said their organization was somewhat prepared, 49% felt they were adequately prepared, and 14% felt they were extremely well prepared. Post-Sandy, respondents felt levels of preparedness within their organizations had increased, with 55% adequately prepared and 29% extremely well prepared.

### *Asset Management*

Respondents were asked a series of questions about asset management for water utilities. Approximately equal percentages of respondents feel that asset management is likely to be implemented voluntarily by most water utilities (29%), likely to be implemented ad hoc rather than system-wide (26%), and likely to be mandated through state funding requirements or regulations (32%). When asked whether public assistance to water utilities should be dependent on a demonstration that the water utility has effective system management such as asset management, 45% answered that asset management is necessary for all systems and distributes funding efficiently, while 25% believe it is necessary but stringency should vary with size of utility, and 25% believe it is not necessary and will not guarantee an efficient use of funding. Similarly, 50% believe that NJPDES permits should be dependent upon a demonstration that the utility has an effective asset management system in place, while 25% think stringency should vary with size of utility and 20% think this is not necessary. Responses were similar for whether water allocation permits should be dependent on asset management plan adequacy, at 42.5% yes, 22.5% yes but with varying levels of stringency, and 22.5% no.

36 of 81 (44%) reported that their water utility has a partial level of asset management implementation (have implemented some specific asset management tools for managing risk and are developing an asset management plan). 27% report they have a significant level of asset management implementation (have developed an asset management plan and initiated substantial implementation) while 12% report that their utility has a minimal level of implementation. 58% use databases or spreadsheets to track assets, 58% use GIS, 53% use CMMS, 23% use FMS, and 20% use custom-designed asset management programs.

Respondents reported that asset management programs are most dramatically beneficial to assist with decision making approaches for capital improvements (43/79 respondents), to assist with knowledge retention and information transfer within the utility (40), to improve internal coordination, communications and operation of the utility (39) and to prolong asset life and value (35). Respondents view asset management as less useful for lowering utility insurance premiums, improving the utility's bond rating and lowering interest rates, improving rankings for funding for grants and low-interest loans, and assisting with public confidence and developing justifiable rates, but still see it as somewhat beneficial for these purposes.

### *Energy*

Respondents, on average, rated the importance of electrical supply on capital project decisions as 3.2 on a scale of 1 to 5. In terms of electricity demand management strategies, on the long form survey 33 reported that their utility has replaced capital equipment with more energy-efficient equipment, 30 have installed or expanded auxiliary generators, 25 conduct energy audits for treatment works, 21 conduct energy audits for buildings, and 20 have undertaken building upgrades for emergency conservation. To reduce contributions to greenhouse gas emissions, 25 have employed energy conservation measures, 17 employ water leak measurement and prevention, 17 have undertaken building modifications for energy efficiency, 13 have switched fuels (e.g. oil or propane to natural gas), 11 have installed solar or wind energy systems, 11 employ water conservation measures, and 10 offer customer-oriented conservation measures.

*Financial Impacts of Climate Change*

33 of the 36 (92%) who responded to the question disagreed or strongly disagreed with the statement “My organization quantifies and separately identifies expenses related to climate change impacts and/or adaptations”. Seventeen respondents (55%) feel that their organization should quantify these expenses in the future.

Eighteen respondents (49%) reported that their utility has spent less than \$1 million to restore service in response to extreme weather events in the last three years; 12 (32%) spent \$1-10 million, and 6 (16%) spent \$10-25 million.