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Municipal Lessons Learned From Superstorm Sandy in New Jersey

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Preface

This is the twentieth paper in NJLM Foundation's "Friends of Local Government" Policy Paper series. This paper, is entitled, "***"Municipal Lessons Learned From Superstorm Sandy"*** and builds on the Rutgers report, *The Impact of Superstorm Sandy on New Jersey Towns and Households*, October 2013.

That report is available on the NJDataBank's "Special: Superstorm Sandy" page, http://njdatabank.newark.rutgers.edu/special-superstorm-sandy

On behalf of the Board of the NJLM Educational Foundation, we thank the School of Public Affairs and Administration, Rutgers-Newark, Dr. Stephanie Hoopes Halpin, Ph.D and believe you will find this paper informative.

We would also like to note the support of the Foundation's Board for this project, as well as staff from the New Jersey State League of Municipalities.

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Her research focuses on low-income households, the impact of Superstorm Sandy, and current issues in political economy. Most recently she authored the report, The Impact of Superstorm Sandy on New Jersey Towns and Households. She is also the author *ALICE (Asset-Limited, Income-Constrained, Employed): A Study of Financial Hardship in New Jersey* with the United Way of Northern New Jersey. Currently she is heading a project to expand ALICE across the US. Her research has been reported in national and NJ media.

She currently serves on the board of the McGraw-Hill Federal Credit Union, and was a Commissioner of New Jersey's Public Broadcast Authority and Treasurer from 2006-2010.

INTRODUCTION

Only a few towns were spared the devastating blow of Superstorm Sandy. High winds and precipitation, as well as overflowing rivers and bays, caused direct damage to homes, businesses and town facilities, including fallen trees, blown off roofs, and flooded critical infrastructure. Tidal surges caused flooding and excessive damage to coastal protective barriers including dunes, bulk heads, and jetties. Widespread power outages reduced the ability of towns and households to respond to the crisis. Finally, gasoline shortages further slowed response and recovery, limiting the effectiveness of generators and adding time and cost to transportation.

Superstorm Sandy was the most disruptive natural disaster to hit New Jersey in recent history. Sandy was ranked by Moody's Analytics as the second most costly disaster in the United States with $50 billion in economic loss (loss from Katrina was $157 billion) and $48 billion in economic aid (aid for Katrina was $167 billion); and seventh most destructive, in terms of property damage as a percent of GDP at 0.16 percent, Katrina was the most at 0.85 percent (Zandi, 2012).

The extent of damage in New Jersey was wider than initial media reports suggested. According to the Community Hardship Index which standardizes the wide range of damage that impacted New Jersey's 21 counties and 565 New Jersey towns, Monmouth and Ocean counties suffered the most overall, but hardship occurred across the state. Monmouth and Ocean counties faced power outages, residential damage, residents in shelters, and gasoline shortages. Counties in central and northeast New Jersey were significantly impacted, especially by extended power outages and gas shortages. Somerset, Middlesex, Union, Hunterdon, and Morris counties suffered significant residential damage, and Hudson, Union, Essex, Middlesex, Bergen, and Passaic counties suffered significant commercial damage. Cape May and Atlantic counties suffered municipal damage, but they did not lose power for long and extensive residential or commercial damage was not as wide spread. The Community Hardship Index at the municipal level reveals pockets of hardship in almost every county.

Municipalities are the front line response to a disaster. Their staff includes first responders, police and fire, and second responders, such as Department of Public Works, and school and health officials. Superstorm Sandy tested their preparation, response and resilience. This paper outlines the major "Lessons Learned." The report identifies what worked and what did not, focusing on three areas: providing basic services, meeting the needs of special populations, and allocating resources. It also identifies what needs attention and ways to build resilience before the next inevitable disaster.

This Report builds on the "Rutgers Sandy Report" released on the first anniversary of Superstorm Sandy, *The Impact of Superstorm Sandy on New Jersey Towns and Households*, and the "Sandy Municipal Survey," a survey conducted in partnership between the School of Public Affairs at Rutgers-Newark and the New Jersey League of Municipalities during the spring of 2013 of mayors and business administrators. Additional information comes from state statistics, news reports, and the New Jersey Department of Community Affairs Action Plan, and supplemented by dozens of interviews with senior administrators and community leaders.

The Lessons Learned from Sandy are divided into sections. **Section One** highlights the lessons learned by towns in the provision of the basic services, particularly their role in power restoration, debris collection and removal, emergency shelter, communication, health issues and water and sewer remediation.

Section Two focuses on special populations, including the elderly and infirm, low income residents, and those with second homes. This section identifies the lessons learned in providing the additional and different forms of assistance these groups require. **Section Three** reviews the resources available to municipalities, services as well as finances, and highlights the lessons learned in using resources efficiently and effectively. The report concludes with a outline of the major themes that emerged from the Lessons Learned.

A. Basic Services

A.1. Power

The most common challenge municipalities faced was lack of power. The Department of Energy estimates that 2.6 million New Jersey customers were without power, the most of all the states in the region (Mansfield and Linzey, 2013). According to the Rutgers Sandy Report, some towns were without power for as long as 22 days, and 17 percent of towns were without power for more than 10 days. Power was out the longest in towns in Monmouth County, an average of 10 days, followed by 9 days in Somerset and Union counties, and 8 days in Ocean County. Power was out for 2 or fewer days in Warren, Cumberland, Salem, Gloucester, and Camden counties. Power outages were caused by damaged substations and power plants as well as downed utility poles. 68 percent of towns reported utility poles down immediately after the storm with an average of 38 down per town.

A.1.1 Lesson Learned: Need to Better Protect Power Infrastructure

Because so much recovery activity depended on having power, and so many expenses were associated with the outages, this report echoes calls for better protection of the state's electrical infrastructure. For towns, rapid power restoration would have expedited recovery and reduced costs. For low-income households, their work and income would not have been interrupted, and expenses would have been minimal.

A.1.2 Lesson Learned: Need Better Power Damage Information

Even over a year after the storm, there is no accurate record of which customers were without power and for how long. Outage numbers reported by the power companies varied between their websites, e-mails, the Board of Public Utilities compilations, and official statements. This reflects the fact that the power companies did not have a reliable system to determine if a customer was without power. Ralph LaRossa, the president of PSE&G, acknowledged, "We look antiquated" (Friedman, 2012).

Improving the accuracy of information to and from the utility companies would speed restoration. Power companies could benefit from a system that incorporated information from local Department of Public Works (DPW) personnel, the people witnessing downed power lines and broken utility poles first hand. In addition, local officials could have provided useful local

information to out-of-state power workers sent to their area. In the other direction, if towns were better informed about the extent of damage and restoration, they could help stage repairs by clearing access roads or moving residents out of the way.

A.1.3 Lesson Learned: Need Better Power Restoration Communication

Overall, communication from power companies to municipalities and residents alike was poor. Inaccurate and infrequent information made it difficult to plan and meet the challenges of clearing roads, setting up shelters, getting residents to shelters, and keeping residents informed. Better information would facilitate remediation and planning, such as how long shelters would need to be open, and enable families to plan for alternative accommodation and travel.

According to the Sandy Municipal Survey, towns were disappointed with the quality of communication from their power company. Similarly, the New Jersey's Board of Public Utilities recorded the largest number of customer complaints in recent history after Superstorm Sandy (Hennelly, 2012).

A.1.4 Lesson Learned: Need Alternative Power Options

Power outages in municipal buildings were widespread. According to the Sandy Municipal Survey, 62 percent of towns reported no power at their police station, 65 percent at their fire station, 76 percent at the municipal building, and 52 percent lost power for their water/sewer facility. Most towns were prepared, 95 percent had generators to help power their municipal facilities, but fueling them became an issue. While 52 percent reported that they almost ran out of gasoline to power their generators, only 9 percent actually ran out. Finding gasoline supplies, however, took considerable time and energy of municipal personnel (Schneider, 2012; Tovo, 2013, Amoruso, 2013).

Thus, additional gas reserves would have helped. But towns could also consider alternative forms of power such as battery powered equipment or even solar, wind or water powered options. For any of these to be effective, they need to be tested regularly. There were many cases were back-up generators were not connected properly or malfunctioned.

A.1.5 Lesson Learned: Need Faster Power Restoration Capabilities

Many out-of-state utility workers did not know the local area and had to travel over an hour each way to their hotel. Utility companies could better accommodate out-of-state workers closer to the areas of distress. Since it is against policy for them to stay in shelters with residents, many municipalities could establish a plan for separate shelters to accommodate those providing this critical assistance.

The pressure to restore power pushed several towns to take risks and bypass safety rules. State regulations prohibit working in areas of downed power lines until the utility company verifies they are not live. Yet the utility companies were overwhelmed and were not able to provide this service in a timely manner. Many towns resorted to hiring their own electrician to test the power lines (Amoruso, 2013; Reiman, 2013). A protocol could be developed that would increase local restoration capabilities and ensure safety as well.

A.2. Debris

One of the biggest issues municipalities had to address in the aftermath of Sandy was clearing 8.5 million cubic yards of debris from towns, roads and waterways and removing it to landfills. While this is an enormous amount, it is significantly less than the amount generated by other storms of this magnitude. For example, there were 38 million CY of debris removed from New Orleans alone after Hurricane Katrina (Times-Picayune, 2011). Overall, debris collection and removal systems worked

A.2.1. Lesson Learned: The Role of FEMA Was Key for Debris Collection and Removal

FEMA debris experts were on the ground in New Jersey within 3 days of landfall by Superstorm Sandy. Visiting each municipality, they estimated the amount of debris to be collected as the basis for future reimbursement. Based upon these timely estimates, towns were assured of significant funding to cover additional resources needed for debris collection and removal, including overtime for DPW staff, and contracting for additional personnel and equipment.

A.2.2. Lesson Learned: DPW Had Capabilities to Ensure Timely Debris Collection and Removal

Town personnel were the major force behind debris collection and removal. According to the Sandy Municipal Survey, 74 percent reported using their own personnel to collect the debris, and 57 percent reported using their own personnel for debris removal, see Figure 1.

Figure 1. Methods for Collecting and Removing Debris after Sandy

	Debris Collected	Debris Removed
Town Personnel	74%	57%
Existing Contractor	45%	46%
New contractor	8%	13%
Cooperative Purchasing Program	3%	3%

Source: Sandy Municipal Survey, 2013.

A.2.3. Lesson Learned: Prearranged Contracts Were Effective for Debris Collection and Removal

In terms of outside assistance with debris collection and removal, the most common type, 45 percent, was a contractor with whom they had an existing contract. Only 8 percent used a new contractor for debris collection and 13 percent for debris removal. An even smaller number, 3 percent used a contractor selected from a state or federal Cooperative Purchasing Program, see Figure 1.

While there were problems with some contracts, the one that received the most attention was AshBritt, hired by the Christie administration in the days before the storm hit. In total, 51

municipalities hired AshBritt to clear vegetation, construction and demolition debris, as well as destroyed vehicles and appliances after Sandy.

Contracts require a clear and precise scope of work, co-operative relationships, and monitoring of performance. Existing contracts are more likely to have co-operative relationships, hence the scope of work and monitoring become even more important in new contracts. And in fact, the state hired a separate contractor, Arcadis US, to monitor each load of waste to make sure the government was not being overcharged (Lipton and Semple, 2012; Schoonejongen and Laarsen, 2013),

A.2.3. Lesson Learned: Waterway Clearing Efforts Worked

Huge amounts of debris washed into New Jersey's waterways, especially bays, marshes and coastal lakes. As of October 30, 2013, more than 6,000 locations were targeted and 101,000 cubic yards of debris removed, which included 194 cars and boats, four "mostly intact" homes, as well as docks, bulkheads, pieces of boardwalks, barbecue grills, patio furniture (AP, 2013).

The clean-up was managed by the NJ Department of Environmental Protection and managed by Dewberry. There was a different contractor and monitor for the three regions of the state, northern, central and southern. Debris removal focused on debris that was a threat to life, public health or safety, followed by a threat to economic recovery of the community and impediments to navigation (Kozinski, 2013; NJEP, 2013). Most debris was removed from coastal areas in time for the summer tourist season and all efforts were complete by the first anniversary of the storm, October 2013. There remain complaints about pollutants and debris in coastal lakes, however (Bates, 2013).

A.3. Shelter

Shelter was a major concern for many residents. In fact, requests for information about evacuation shelters were the most common call received by the NJ 2-1-1 helpline in the two weeks following Superstorm Sandy (NJ 2-1-1, 2013). And most towns, 86 percent, provided a shelter according to the Sandy Municipal Survey. The shelters were open from 1 to 20 days with an average of 3 days.

A.3.1. Lesson Learned: Shelters Are Needed for a Range of Services

Shelters primarily provided heat, food, and beds. In addition, charging stations were provided by 46 percent of shelters, and FEMA application information was offered by 24 percent of shelters. For the whole state, the Red Cross National Shelter System carefully records the number of people using a shelter daily at noon and midnight. Their total for New Jersey recorded that 31,000 residents used shelters (Red Cross NSS, 2013). However, the results of the Sandy Municipal Survey suggest that more than double that number used shelters. The difference may be due to definitions of shelter. Many towns opened municipal buildings and libraries for heat and charging, but were not official shelters that offered food and overnight accommodation. Thus, towns met the needs of their residents in ways that are not recorded in official statistics.

A.3.2. Lesson Learned: Shelters Can be Run in a Variety of Ways

Shelters were most commonly, 47 percent, run by town personnel. County governments ran 24 percent of the shelters, and the rest were distributed between the Red Cross, faith based groups,

and other non-profits. The shelters were staffed from multiple sources: 39 percent were staffed by town personnel, 33 percent were staffed by local volunteer groups, and 12 percent were staffed by out-of-town volunteers. Additional shelters were provided by county level staff for special populations such as Mennan Arena for homeless and mentally ill patients and Middlesex County College for those needing sub-acute medical care (D'Amico, 2012; Pinto, 2013). Thus, there is a wide variety of means and methods, towns proved adept at using available resources to meet immediate needs.

A.3.3. Lesson Learned: Shelters Need to Be Able to Accommodate Pets

Public officials noted that residents with pets were reluctant to leave if they could not take their pets. Thus, the safety of the resident depended on accommodation for their pet. According to the Sandy Municipal Survey, 17 percent of towns reported that households with pets required assistance. Some towns were prepared for this situation with 19 percent of shelters providing accommodation for pets.

A.3.4. Lesson Learned: More Resources are Needed for Relocation Housing

Most municipalities had the resources to manage and fund temporary shelters, but most did not have the resources to provide longer term temporary housing for the 27,000 families who were displaced. Due to the high cost of housing in NJ and the lack of availability of housing that is affordable, longer term temporary needs were difficult to meet.

Almost 3,000 families lived in hotel and motel rooms using FEMA vouchers, approximately 100 rental units at Fort Monmouth, and about 70 families moved into FEMA trailers (Gouin, 2013). Efforts were made to harness the private market, the NJ Housing Resource Center created an easy-to-use private rental market search engine and website, and there was an Hurricane Sandy Temporary Housing Exchange on Facebook. But the number of complaints suggest that housing was too expensive, too far from work or impossible to find. More resources are needed for housing that is affordable in general in New Jersey, and in particular after a disaster.

A.4. Communication

Because of the extent of damage and power loss, residents were eager for information. The less power and the more damage, the more residents needed information, but the harder it was for towns to provide it. With power out and cell phone towers down, many means of communication were spotty and unreliable.

A.4.1. Lesson Learned: Towns Need Multiple Communication Channels

Towns were prepared with different methods of communication, in fact, 96 percent used 3 or more forms of communication. Due to power outages and inoperable cell phone towers, this redundancy proved useful.

More than 80 percent of towns had a website in place before Superstorm Sandy and 80 percent used it in the two weeks after the storm. The percent of all New Jersey towns will be lower because the Sandy Municipal Survey is slightly skewed towards larger towns, those more likely to have a website.

Cell phones, land line mass notification systems, and e-mails were also highly used. More than 60 percent of towns had these communication tools in place before the storm and each was used by more than 60 percent of towns in the two weeks after Superstorm Sandy. Radio communication was in place in 19 percent of towns and community bulletin boards were in place in 34 percent of towns and used accordingly, see Figure 2.

Communication challenges in the wake of Superstorm Sandy galvanized many towns to add new media capacities. For Facebook, 43 percent of towns had an account established before the storm and yet 48 percent reported using it in the two weeks after the storm to communicate with residents. For Twitter, 26 percent of towns had an account established before the storm and yet 29 percent reported using it in the two weeks after the storm. For cable access channel, 26 percent of towns had an account established before the storm and 28 percent reported using it in the two weeks after the storm.

Many towns improvised using other, less technology dependent forms of communication, including a utility bill stuffer, town meetings, local newspapers, flyers or hand delivered letters, and door-to-door communication. The most commonly mentioned "other" form of communication however was Nixle Emergency Alert. Nixle is a notification system for verified government agencies to send messages to local residents via phone, email, and web. Information is delivered almost instantly to geographically targeted consumers. In the Sandy Municipal Survey comments, many towns noted that they would use this service in the future.

Figure 2. Types of media towns have to communicate with residents

	In place before Sandy	Used during Sandy
Website	84%	80%
Cell phone	70%	66%
Land line mass notification system	69%	62%
E-mail	66%	62%
Facebook	43%	48%
Community bulletin board	34%	30%
Twitter	26%	29%
Cable access channel	26%	28%
Other	18%	24%
Radio	19%	19%

Source: Sandy Municipal Survey, 2013.

In terms of frequency, 77 percent of towns communicated with their residents at least once a day in the two weeks following Superstorm Sandy. With various forms of media, these towns responded that they communicated “about once a day” or “several times a day.” Most used their website daily, followed by cell phone and e-mail, but there was great variation across towns.

The success of the towns' communication efforts is revealed in the Monmouth University tracking poll of New Jersey residents who were displaced by Sandy. Half, 50 percent, of the survey respondents say that it has been easy to get information about recovery and rebuilding from their local municipal government, much higher than county government (19 percent), utility provider (29 percent) and charitable or community organization (27 percent) (Murray, 2013b).

To prepare for the future, several improvements were noted in the Sandy Municipal Survey comments as well as interviews. For a disaster, when residents need to be updated continually, towns need off-site communication capabilities and multiple methods of communication.

A.4.2. Lesson learned: Make FEMA and SBA Loan info Widely Available

There was significant geographic disparity in information regarding FEMA Individual Assistance (IA) and Small Business Association loans, as well as disparity in how to complete the process especially among the low-income population. FEMA IA is for individuals and families whose property has been damaged or destroyed as a result of a federally-declared disaster, and whose losses are not covered by insurance. It is meant to help with critical expenses that cannot be covered in other ways. This assistance is not intended to restore damaged property to its condition before the disaster.

Despite the fact that FEMA application information was available through disaster recovery centers, town halls, and all levels of government websites, some residents were not aware of the program or who was eligible. And information may not have been where the most needy residents could find it. A clear indication is that only 24 percent of towns responding to the Sandy Municipal Survey disseminated FEMA information in their shelters. For those most in need, many were disoriented from damage to their home or lack of power. For others, this would be the first time they ever needed social services (Kalet, 2012). Even in Sayreville, one of the hardest hit towns, 44 percent of residents surveyed felt that they were not receiving sufficient public information on recovery resources, and the percent increased to 53 percent in for residents living in direct impact neighborhoods (Burgo, 2013).

In other locations, residents were able to register but did not successfully complete the application. One of the most confusing parts of the FEMA IA application process was the requirement to complete a SBA disaster loan form (O’Brien, 2013; Burgo, 2013). While insiders shared this knowledge at emergency shelters and FEMA disaster recovery centers, it was only posted on a few websites, such as United Methodist Committee on Relief and a local Monmouth blog.

A.4.3. Lesson Learned: Different Communication Needed For Different Types of Residents

Towns need to be prepared to provide many different types of information to meet the various needs of their residents. Those with special needs require particular kinds of information, such as health care or social services. In addition, those with second homes or those who were displaced

are keen to see photos and learn details of damage to their property. Facebook proved to be popular, but was not always reliable.

An After-Sandy conference hosted by the NJ State Library highlighted the role a towns librarians might play. As 'second responders' they could manage a social media site with up-to-date photos from the town as well as recovery and special needs information (NJ State Library, 2013).

A.4.4. Lesson Learned: Need Better Means to Collect Information from Residents

Most of the communication in the aftermath of Superstorm Sandy was one-way. Towns could improve the services they deliver if they had better information from residents. With interactive technologies now widely available, such a dialogue is more feasible. For example, with open source maps they could communicate where roads are closed and power out.

In addition, if towns knew how many residents were displaced and how to contact them, they could share information about housing damage, FEMA inspection dates and other local information. A registry for residents to report their location or temporary contact information could be helpful.

A.5. Health issues

Towns faced many health issues in the aftermath of Superstorm Sandy including injury and stress to residents and responders, contaminated flood water, and mold, as well as the challenge of getting treatment for ongoing health issues when power is out and doctors offices are closed. According to the CDC, of the people relocated to New Jersey shelters after the storm, more than 5,100 reported a health care visit — 52 percent for an acute illness; 32 percent for follow-up care, such as blood-glucose checks or medication refills; 13 percent for a worsening chronic illness; and 3 percent for injuries (Rettner, 2013). In addition, recovery efforts also posed additional risks from working in dangerous situations, using heavy equipment and by-passing safety regulations to get the job done.

A.5.1. Lesson Learned: Municipal Health Officials Need to Prioritize Health Issues

Municipal health officials faced a wide range of issues and many were overwhelmed. Officials were responsible for managing the evacuation of health care facilities, setting up and staffing medical shelters, co-coordinating with emergency responders, as well as protecting food safety, providing animal care and educating the public about storm related health issues and government programs such as the emergency prescription drug program. They also reached out to elderly and homebound residents via phone and site visits (Barron, 2013).

While most officials juggled emergency tasks with their day-to-day responsibilities, such as inspections and complaint responses, a protocol to prioritize emergency functions would streamline operations across all towns. In some cases, additional personnel were needed but limited communication with state and federal agencies and lack of funding minimized their ability to provide support.

A.5.2. Lessons Learned: Mental Health Need to be Addressed

Sandy took a toll on mental health, exposing millions of people to short-term distress. In the immediate aftermath of the storm, approximately 700 residents and first responders a day required help addressing basic mental health issues. Even more people were affected by depression; a Gallup-Healthways poll of adults living in the most affected ZIP codes in New York, New Jersey and Connecticut, found that there was a 25 percent increase in diagnoses of depression in the six weeks following the storm. In addition, a smaller group of people, perhaps numbering in the hundreds of thousands, were exposed to more severe conditions that could increase their risk of long-term psychological trauma (FEMA timeline, 2013; Rettner, 2013; USHHS, 2012).

According to the Mental Health Association of NJ, emotional recovery from Sandy will take a year-and-a half to two years, however, state and federal programs provided fund for crisis counseling through February and not funding for long-term treatment (Kitchenman, 2012). Mental health needs attention for the long term, or those residents will be more vulnerable to trauma in the future.

A.5.1. Lessons Learned: Ongoing Health Consequences of Water Damage Need Immediate Remediation

Across New Jersey, residents faced damp mattresses and flooded floors, the breeding ground for mold. Additional health hazards manifest after a disaster as well, such as exposed asbestos and other toxins. The result can be an allergic reaction, poisoning or infection known as "Sandy Lung" (Jarrett, 2012; Spoto, 2013).

The health community has made significant efforts to address these risks through education and respiratory screenings. Education on the issues surrounding mold have been extensive. More than 900 homeowners and local officials participated in mold training sessions at the Rutgers School of Public Health, 12,000 mold brochures were distributed in both English and Spanish to the Red Cross, county and local health officials, libraries and other community groups (NJDH, 2013). In addition, local hospitals screenings for respiratory conditions that may be linked to mold in Sandy-affected areas were conducted through December 2013 (Kitchenman, December 2013).

A.6. Water/Sewer

One of the more lasting — and even less appealing — problems from Sandy was sewage, sediment and other pollutants churned up and swept into waterways by the storm. There were failures at 40 drinking water facilities and 12 wastewater treatment plants in New York and New Jersey, allowing millions of gallons of raw sewage carrying high levels of bacteria and viruses into New Jersey's rivers, streams and estuaries (Gammon, 2012). The fecal coli form levels from samples taken by the EPA from Newark Bay, New York Harbor, Washington Canal, Raritan River, Upper Raritan Bay, and the coastal waters of New Jersey from Sandy Hook to Seaside Heights were all above New Jersey’s established limit (Stormwater, 2013).

A.6.1. Lesson Learned: Sewer Infrastructure Needs Better Flood Protection and Remediation

In New Jersey, 9 wastewater treatment plants were inoperable for a month. Many systems were sand-filled or corroded from salt water or damaged and not functioning as designed. The two biggest facility failures were at the Passaic Valley Sewerage Commission which receives sewage and industrial waste from 48 municipalities in and around Newark and is the nation's fifth-largest wastewater treatment plant, and the Middlesex County Utility Authority in Sayreville which serves 36 towns in Central Jersey. Both are located on the banks of waterways and were damaged by salt water flooding (Gammon, 2013).

Because the consequences of failure are high, both in health and cost terms, better protection is warranted. In addition, stop gap measures for failures need to be more effective. The cost for the Passaic Valley Sewerage Commission to ship sludge to landfills and fix damaged electrical circuits was $15 million (Dinges, 2013).

Thus, efforts such as those at the Middlesex County Utilities Authority which is installing a $2.6 million facility to protect the damaged Sayreville sewerage pumping station from storm surges, are essential for protection from future storms (Dinges, 2013). More measures need to be taken to prevent sand from entering the sewer system as well as elevating facilities well above flood levels.

A.6.2. Lesson Learned: National Networks Need Better Systems to be Effective

An important resource for emergency assistance could be available through the Water and Wastewater Agency Response Network (WARN), an intrastate network of "utilities helping utilities." Their usefulness in New Jersey was muted, however. In their After-Action Report, they identify two areas where their assistance can be improved, improved communication and co-ordination between federal agencies.

The major source of assistance provided by the network after Sandy was the supply of generators for NJ sewer facilities without power. However there were significant delays due to the lack of situational awareness stemming from the total volume of requests, lack of prioritization criteria, and inconsistent postings. Additional assistance was curtailed by confusion over the roles of federal agencies. Several local municipalities indicated that they were confused about the roles assigned to US Environmental Protection Agency and the US Army Corps of Engineers at their facilities. Closer coordination and a single FEMA tasking under the National Response Framework would likely be an improvement (AWWA, 2013; WARN, 2013).

A.6.3. Lesson Learned: Shellfish Eaters Were Protected

In response to Sandy, the DEP along with its partners, placed a commercial and recreational harvest ban on New Jersey shellfish due to the degradation of water quality in the state's ocean waters and estuaries. Bivalves such as clams, oysters and mussels are filter feeders that can accumulate harmful bacteria carried into waterways by stormwater.

The protocol for assessing and regulating the harvesting of shellfish was clear, transparent and worked to protect those who eat shellfish. There is a minimum standard for water quality. When that was not met, a ban was put in place. Once the water mets the federal standard, a minimum of

seven days must pass before the shellfish tissue is tested to ensure no bacteria are present in the shellfish. This process ensured that bacteria have had a chance to be flushed from the shellfish (Marine Water Monitoring, 2013).

However, the DEP only has the power to advise residents and visitors to avoid consuming clams, oysters and mussels taken from state waters, and the Department of Health and Senior Services (DHSS) can only urge commercial and recreational harvesters, certified shellfish dealers, and the public to observe all harvesting restrictions because ingesting shellfish from closed beds could potentially cause illness. The state should consider stronger authority to prevent consumption and harvesting.

B. Special Populations

Most towns have special populations that need more or different services than the overall population. These include nursing homes, senior housing, homes for those with a disability, hospitals and prisons. In fact, 97 percent of towns responding to the Sandy Municipal Survey reported having at least one special population, but most had three or more. The most common special population was those in senior housing, located in 74 percent of towns, followed closely by a home for those with a disability and a nursing home. In addition, 30 percent of towns had a hospital and 14 percent had a prison, see Figure 3. While most reported that these populations did not need assistance, for those that did, the most common type of assistance was communication.

Figure 3. Special Assistance Required by Category

Special Populations	Percent of towns
Nursing Home or assisted living	67%
Senior housing	74%
Home for those with a disability	73%
Prison	14%
Hospital	30%
Pets	82%

Source: Sandy Municipal Survey, 2013.

B.1. Elderly and Infirm

The elderly are those who live in a nursing homes or senior housing, and infirm are those living in a home for those with a disability or a hospital. They typically need assistance for basic needs, and thus are especially vulnerable in a disaster.

B.1.1. Lessons Learned: Special Populations Need Additional Communication

With the unique needs of special populations, it is not surprising that the most common requirement, according to the Sandy Municipal Survey, was for particular and additional communication for their town. Additional communication was required for hospitals in 38 percent of towns, for senior housing in 31 percent of towns, for nursing homes in 24 percent of towns, and for homes for those with a disability in 19 percent of towns. For prisons, 8 percent of towns reported that the only form of assistance they needed was additional communication.

To facilitate the quality and delivery of information, towns need to understand the kinds of information the special population will require and have channels of communication established.

B.1.2. Lessons Learned: Towns Need Capabilities for Emergency Services for Special Populations

Special populations required town assistance with evacuation, medical assistance, and shelter. Special assistance with evacuation for nursing was needed in 12 percent of towns, for senior housing in 8 percent, for homes for those with a disability in 5 percent, and for hospitals in 4 percent. Evacuation for these populations often requires vehicles with handicapped access or ambulances as well as medical personnel.

Medical assistance for those with a disability was required in 13 percent of towns, for those in a nursing home in 8 percent, for hospitals in 8 percent, and for senior housing in 5 percent. Again, such assistance requires trained personnel. Finally, special assistance with shelter was needed for those in senior housing in 20 percent of towns, for those with a disability in 11 percent, and for those in a nursing home in 7 percent. Such shelters require handicapped access, medical personnel and possibly special dietary accommodation.

B.2. Low Income Residents

Another type of special population are those with a low-income, defined here as ALICE, namely working families that do not earn enough to afford a basic household survival budget as documented in the 2012 report, *ALICE (Asset-Limited, Income-Constrained, Employed): A Study of Financial Hardship in New Jersey.* Notwithstanding a natural disaster, one-third of New Jersey households do not earn enough to afford a basic household survival budget. The ALICE Threshold is above the Federal Poverty Level but below financial stability. These households live in all towns in New Jersey. Typically family members work in service jobs essential to the state's economy, have minimal or no savings, are more likely to buy or rent in disaster prone areas, and are unable to invest in preventative measures, or save for a 'rainy day.'

A measure of the extent of hardship incurred by households with income below the ALICE Threshold is the Household Hardship Index presented in Rutgers Sandy Report. These low-income households faced the greatest hardship in Hudson County, followed closely by Bergen

County then Monmouth, Middlesex, Ocean, and Essex counties. Overall, the cost of residential damage and lost income for households with income below the ALICE Threshold was $4.1 billion of the $7.84 billion for the total residential sector.

B.2.1. Lesson Learned: Hourly Wage Workers Need to Get to Work

Members of many ALICE families work at hourly wage jobs where they only get paid for the time they work. With the damage and power outages, the economic impact of lost wages was significant. In fact, the cost of lost wages for households with income below the ALICE Threshold was $832 million, an average of $760 per household. Essex County had the largest loss with $294 million, followed by Bergen County with $252 million and Essex County with $101 million. As means of example, if two parents were unable to work at their $14.62/hour job for 6 days, a family lost $1,404 in income in the month following Sandy. While this amount would be difficult for nearly any family to cover, for a family with little or no savings, this loss plus estimated damage expenses accounted for more than a 50 percent of their normal monthly income, and 5 percent of their total annual income.

As a result, hourly workers took great effort, and at times risk, to get to work during the weeks after Superstorm Sandy. Thus, officials need to be cognizant of the impact of actions that impede hourly wage workers from getting to their job, including regulations or delays in debris collection or damage repair or the declaration of a state of emergency

B.2.2. Lesson Learned: Renters Need Assistance Too

Because renters are more likely to have a lower income, they are often more vulnerable to emergencies and less able to find help. Renters were more likely to apply for FEMA AI. The NJ Department of Community Affairs estimates that 28 percent of residences that sustained major or severe storm-related damage were rental properties, yet they accounted for 43 percent of total FEMA AI registrations. Additionally, 63 percent of registrations from households with income below the ALICE Threshold were renters. Of these, approximately 20 percent received FEMA IA. There was virtually no difference in award rate; rental applicants who were low-income renters were just as likely to receive assistance as those with income above the ALICE Threshold.

According to the NJ Department of Community Affairs, less than seven months after housing recovery funds finally started flowing in New Jersey, 43 percent of the money was either earmarked for spending, or had already been awarded to people in need. Nearly three-quarters of those funds were distributed to low- or middle-income people (Sherman, 2013).

However, an October 2013 survey by Enterprise Community Partners found that renters were more likely to be struggling one year after Superstorm Sandy. A smaller proportion of renters have seen a full recovery, 50 percent reported that full repairs have been made compared to 65 percent of homeowners. Renters also face additional obstacles, 32 percent of renters in damaged buildings wanted to move out following the storm, but were forced to remain because of their lease agreement, and 43 percent of renters in damaged buildings reported that their landlord had not adequately prepared for Hurricane Sandy (Enterprise, 2013). Similarly, the Monmouth University tracking poll of residents displaced by Sandy found that one year later, those who remain displaced are three times more likely to be renters (Murray, 2013a).

Towns can assist these households by ensuring information about government programs such as FEMA AI is available, bringing government officials to the town including HUD and DCA, ensuring landlords maintain their properties, and working with nonprofits to facilitate repair programs.

B.2.3. Lesson Learned: ALICE Needs Help with Preliminary Work

One reason ALICE owners were less likely to receive FEMA AI funding than renters is because there were unable to complete preliminary work required. For example, one homeowner was required to remove asbestos before FEMA would provide payment for demolition, another needed to comple repairs before FEMA would provide payment to raise the house above approved flood levels. ALICE households may not have the savings or the cash flow to complete this work, or at least not quickly (O'Brien, 2013; Spoto, 2013).

Towns can assist these households in several ways. First, they can work with nonprofit programs that offer volunteer repairs. Second, they can provide information about DIY, including the hazards. And third, in the interest of the value of all properties in the neighborhood, the town can seek additional funding for repairs or in extreme cases buyout programs.

B.2.4. Lesson Learned: Insurance Needs to be More Affordable for ALICE

Lack of insurance was one of the major reasons low-income households need to apply for FEMA IA. Households with income below the ALICE Threshold were twice as likely not to have insurance: 69 percent did not have homeowners insurance and 90 percent did not have flood insurance.

This issue is being addressed in part with the Community Rating System (CRS), a program administered by FEMA that provides lower insurance premiums under the National Flood Insurance Program. Communities can apply to participate in the CRS, and residents of participating communities pay lower rates based on the implementation of floodplain management policies.

To participate, communities must complete activities in four categories: Public Information, Mapping and Regulations, Flood Damage Reduction and Flood Preparedness. In exchange, flood insurance premium rates are discounted in 5 percent increments with a maximum 45 percent premium reduction. The 61 communities in the program have saved a total of $17 million. (FEMA, December 2013).

B.2.5. Lesson Learned: ALICE Needs More Public Assistance

Households earning below the ALICE Threshold were disproportionately impacted by Superstorm Sandy. The cost of residential damage and lost income for households with income below the ALICE Threshold was $4.1 billion of the $7.84 billion total for the residential sector. In terms of meeting their need, private insurance, non-profits, and public assistance provided $1.7 billion. Thus, there is a gap of $2.4 billion, for which there are roughly $195 million in SBA disaster home loans. The remaining gap is $2.2 billion for households with income below the ALICE Threshold, compared to a gap of $887 million for the total residential sector. For families with the least resources, this gap is one they are unlikely to be able to fill, thereby threatening the recovery of the entire state.

While few towns provide direct assistance, officials are often better placed to advocate for their residents and be more aware of available government resources. Towns can certainly ensure information is available to residents so they can register and complete the application process for FEMA assistance. Qualifying and receiving assistance would enable low-income families to better plan their recovery. Assistance is also needed for those households who face necessary immediate hazard mitigation, such as elevating housing above the new flood plain guidelines.

In the absence of additional public assistance, low rate loans could be made available to households without access to reasonable credit to help cover extraordinary costs and lost income associated with a disaster.

B.2.6. Lesson Learned: Volunteers Need to be Better Matched with Need

With so many eager volunteers who look to assist in times of crisis, towns could provide an important connecting role between those with housing damage and skilled, trained volunteers. This could minimize the need for public assistance and the prevalence of victims living in unrepaired structures and poor condition for months, or trying to make the repairs themselves, or worse, leaving their homes altogether and foregoing any equity (Kov, 2013; Nurin, 2013; HCDNJ, 2013).

B.2.7. Lesson learned - ALICE Faces On-going Vulnerability

According to the Monmouth University tracking poll of residents displaced by Sandy, one year after the storm, those who remain displaced are twice as likely to earn less than $50,000 (Murray, 2013a). Thus, for households earning below the ALICE Threshold (near $50,000 in most counties), the consequences of Sandy are longer lasting than for more wealthy households.

A strong predictor of on-going need to ALICE households is the Household Hardship Index. Towns can use this tool to identify not only where there is immediate need, but where there is likely to be ongoing need. Officials can then help direct repairs, infrastructure investment and aid appropriately. Similar indices could be developed for other vulnerable groups, such as small businesses (Hoopes Halpin, November 2013).

B.3. Second Homes

Second homes were a hot media topic in the aftermath of Superstorm Sandy and many of the dramatic destruction photos were of luxury beach houses. There was less sympathy for these second home owners and most public assistance was not available to them. However, second homes are often an important part of a town - their economy, tourist industry, and tax revenue. Second homes are not all million dollar show houses, many are modest investments or businesses, essential to the livelihood of many middle class families. Second homes also pose a special set of issues for towns. Because the owners are less likely to be in residence, the property may be more susceptible to damage because there is no one there to secure it before the storm.

B.3.1. Lesson Learned: Second Homes Require Different Recovery Procedures

During a disaster, priorities are different when the owners have another home. There is not the immediate concern for evacuation or shelter. But other services are needed, such as protecting the empty houses from looting and establishing long-distance communication with the owner.

Since many second homers do not have enough savings and are not eligible for public funding, they are unable to repair their homes. One year later, many of these houses remain in disrepair (Paik, 2013). Thus, these homes not only remain more vulnerable to future disasters, they negatively impact the value of the neighborhood. Towns need to develop strategies that would enable owners to repair or sell damaged second homes.

B.3.2. Lesson Learned: FEMA Needs Better Protocol for Second Homes

FEMA clearly states: "Damages to a secondary or vacation home are not eligible under FEMA's disaster assistance program," and the FEMA application clearly asks, “Is this your primary residence?" However, 13 percent of applicants answered "No," indicating the damaged property was not their primary residence at the time of the disaster. Perhaps the applicant was confused, but in any event, of the 32,647 registrations for second homes, 78 percent received assistance. This award rate is much higher than the overall rate of 24 percent.

All towns need to clarify these rules with FEMA so they can properly advise their residents and ensure their residents are not left out of possible funding. Geographically, almost half of the second home registrations, 48 percent, were in Ocean County, 11 percent were in Monmouth County, and 9 percent in Atlantic County. The percent of second homes receiving assistance was also highest in these counties, 88 percent in Ocean County, 82 percent in Monmouth County, and 75 percent in Atlantic County. FEMA officials have not provided an explanation for this apparent conflict with stated policy.

C. Resources

A wide variety of resources were available to towns in the aftermath of Superstorm Sandy. Some resources came from outside assistance, such as information or manpower. The most desired however were financial resources. Both are reviewed in this section.

C.1. Outside Assistance

After a one-in-a-hundred year storm, a key question was whether towns had the capacity to maintain safety and basic services.

Over time, towns did use outside resources. In fact, 79 percent of towns responding to the Sandy Municipal Survey used outside assistance, primarily from the government but also their local community. Towns reported 12 different sources for assistance, see Figure 4. County Offices of Emergency Management provided the most assistance with 16 percent of the total, followed by FEMA with 11 percent. The utility companies provided 9 percent, the New Jersey Office of Emergency Management 8 percent, and the Red Cross and Salvation Army provided 6 percent. New Jersey departments, such as HUD or NJDCA, and social media each provided 5 percent, neighboring towns provided 4 percent and outside groups provided only 2 percent. Interestingly, much of the assistance was home-grown, coming from local residents, businesses, and groups.

Figure 4. Sources of Assistance to NJ Towns

% of total assistance	
County OEM	16%
Town residents	11%
FEMA	11%
Local businesses	11%
Local group	10%
Utility	9%
NJ OEM	8%
Red Cross or Salvation Army	6%
NJ Department	5%
Social media	5%
Neighbor town	4%
Outside group	2%

Source: Sandy Municipal Survey, 2013.

The kind of assistance is also revealing. Most commonly, 53 percent of towns responded that they received information from outside sources, see Figure 5. In addition, 25 percent received supplies, 19 percent used manpower from outside groups, and only 4 percent received financial assistance.

Most assistance was in the form of information from county and state Offices of Emergency Management, followed by supplies from county Offices of Emergency Management and local businesses, and manpower from local community groups and town residents, and in only a few cases financial assistance from FEMA, town residents and local businesses, see Figure 5. Even when information was not included as a category of assistance, 70 percent of towns reported receiving outside assistance.

Figure 5. Types of Assistance to NJ Towns

Information	53%
Supplies	25%
Manpower	19%
Finance	4%

Source: Sandy Municipal Survey, 2013.

C.1.1. Lesson Learned: Local Businesses Are an Important Partner

For the needs New Jersey was facing, several towns highlighted the effective role local businesses played. As outlined in the Rutgers Sandy Report, the most pressing need in the immediate aftermath of the storm for most towns was debris collection and removal, and almost half of the towns used private contractors debris services. In addition, businesses provided vital goods and services, notably, electricians tested power lines, gas stations provided gasoline during rationing, and other businesses made available emergency and building supplies. In addition, Home Depot and Lowe's stores throughout New Jersey positioned FEMA building specialists in stores for weeks after the storm to offer advice on repairing and/or rebuilding homes (Hoopes Halpin, October 2013). The useful role of businesses in disaster response was so clear, that the head of Morris County OEM noted that for the next disaster they would include a seat at the Emergency Operations Center for the local chamber of commerce (Paul, 2012).

C.1.2. Lesson Learned: Local Resources Are Important in the Immediate Aftermath

While outside assistance increased over time, it was not available in the immediate aftermath of the storm. Because the storm path was so wide, all towns and counties were struggling, few had capacity to spare, especially in the days and weeks after the storm, leaving them primarily on their own. Town officials recounted the way their municipal staff rose to the challenge, adapting quickly to changing circumstances, and displaying extreme dedication. They emphasized their ingenuity in the face of repeated challenges (Amoruso, 2013; Keen, 2013; Paul, 2013; Schneider, 2012). Towns seemed to be proud of their self-sufficiency following the storm. While they reported using resources that were available, the common perception was that they did not need them to maintain basic services. When asked directly in the Sandy Municipal Survey if they required assistance beyond their municipal staff to maintain municipal services (i.e. from the state or federal government or nonprofit groups), 96 percent said that they did not.

This sentiment is captured in some of the comments provided from the Sandy Municipal Survey respondents, for example, "We have to be more self-reliant as assistance did not come quickly enough."

Significant amounts of aid from FEMA and relief agencies did not come until weeks or months later. This is particularly true for FEMA Municipal Public Assistance; only 4 percent of towns reported that they had received FEMA financial assistance at the time of the Sandy Municipal Survey in March. This number rose significantly as time elapsed. According to the New Jersey Comptroller, 81 percent of all New Jersey towns had received FEMA assistance by July 2013.

To further build local capacity, municipalities could formalize their partnerships with businesses and residents so that everyone knows what to do in a crisis. For example, FEMA's Community Emergency Response Team (CERT) program provides training for local residents in basic disaster response skills so they can assist others in their neighborhood or workplace (FEMA.gov, CERT, 2013).

C.1.3. Lesson Learned: Need to Liaise with Disaster Relief organizations

There are several ways towns could assist nonprofits reach those in need which would help town residents and make nonprofits more effective. Currently, nonprofits wait for those in need to seek

them out and then work directly with the family. By working with towns, nonprofits could reach many households at once.

Residents could also better find resources by using NJ 2-1-1, a 24/7 statewide service that links residents to local resources during times of distress. NJ 2-1-1 connects callers to everything from basic needs like food, housing, and health care to legal services, drug treatment, jobs assistance, child care, mental health services, transportation, and financial assistance. Many residents affected by Sandy did not know about the NJ 2-1-1 service, especially in southern and western New Jersey, despite its existence since 2005. If awareness of this service improved, it could make a difference in disseminating information to those in need after a future disaster.

C.2. Financial Resources

Overall, the total cost of damages from Superstorm Sandy exceeded $37 billion as reported in the Rutgers Sandy Report. Insurance paid $6.5 billion, public assistance provided $1.3 billion, and relief agencies raised $146 million. In addition, the Small Business Administration provided $816 million in disaster loans. The remaining unmet need in New Jersey is $28.4 billion, see Figure 6, and a further breakdown below.

Impact on residents: the damage from Sandy incurred by residents, as measured by insurance assessed damage and lost income, totals $7.8 billion. There were over 325,000 housing units damaged totaling $5.9 billion. In addition, there were $1.4 billion in lost wages and $532 million in expenses from personal auto damage. Were these needs met? Private insurance paid losses totaled $2 billion and flood insurance paid $3.3 billion, while public assistance totaled $816 million. In addition, relief organizations raised $146 million for families impacted by Superstorm Sandy. Thus, the remaining gap is $1.5 billion which $630 million in home disaster loans partially covers. The unmet need is $887 million.

Impact on the commercial sector: the damage incurred by the commercial sector, as measured by insurance assessed damage to business structures and loss of sales or revenue, totals $3.56 billion. Businesses incurred direct damage as well as lost income from temporary closures, unavailability of critical inputs, and/or displaced customer bases. In total, 10 percent of commercial units applied for private insurance for property and commercial autos damage, business interruption, and flood insurance totaling $1.1 billion (DOBI, 2013), leaving a gap of $2.4 billion. The Small Business Administration has issued $186 million in disaster business loans. The unmet need is $2.2 billion.

Impact on municipalities: the damage incurred by municipalities, as measured by damage to public and community buildings and infrastructure as well as emergency expenses and loss of tax revenue, totals $2.2 billion. In addition, 33 towns lost more than 5 percent of their tax base or non-tax revenue. FEMA has provided a Community Disaster Loan program to meet these needs but the totals have not been confirmed. As of July 2013, FEMA had allocated a total of $262 million to 81 percent of New Jersey municipalities. Additional $254 million in FEMA assistance has been paid to state transportation agencies to repair damage. Thus, a gap of $1.7 billion in direct damage and $23.5 billion for hazard mitigation still remains.

Figure 6. Financial Impact of Sandy on Communities and Households

$ millions				
	Communities			
	Residents	Businesses	Municipalities	Vulnerable Households
Expenses				
Cost of damage	$ 5,929	$ 1,684	$ 1,970	$ 2,787
Lost income	$ 1,383	$ 1,873	$ 77	$ 1,089
Extra expenses	$ 532		$ 171	$ 250
Total expenses	$ 7,844	$ 3,557	$ 2,218	$ 4,125
Income				
Insurance payments	$ 5,365	$ 1,161		$ 966
Private assistance (nonprofit or biz)	$ 146			$ 146
Public Assistance	$ 816		$ 516	$ 590
Total income	$ 6,327	$ 1,161	$ 516	$ 1,702
Gap	$ 1,517	$ 2,396	$ 1,702	$ 2,424
Loans	$ 630	$ 186	$ -	$ 195
Remaining gap	$ 887	$ 2,210	$ 1,702*	$ 2,229
*** plus $23.5 billion for hazard mitigation**				

Source: FEMA, 2013, DOBI, 2013; SBA, 2013; Star-Ledger, 2013; also see Figure 29.

C.2.1. Lesson Learned: Community Disaster Loan program enabled Municipalities to Function

The impact of Superstorm Sandy was also severe in terms of lost revenue. According to the Sandy Municipal Survey, 19 percent of towns reported losing a part of their ratable base, ranging from .03 to 8 percent with 3 percent of towns reporting a loss 5 percent or more. Similarly, 18

percent of towns reported losing from 1 to 10 percent of total non-property tax revenue, such as fees and fines; 4 percent of towns reported losing 5 or more percent.

The total drop in property values is estimated to be between $4.3 billion and $5 billion, costing local government more than $77 million in revenue. Ocean County lost $3.6 billion from its total ratable base due solely to storm damage and Monmouth County lost $511 million, followed by Atlantic County with $72 million, and Cape May County with $26 million. Outside these counties, no municipality lost more than 1 percent of its tax base, except Downe on the Delaware Bay in Cumberland County (Procida, 2013; Star-Ledger, 2013). The hardest hit town, Seaside Heights had its bond rating lowered and 5 other municipalities were issued warnings, making it harder to borrow (Star-Ledger, December 2012). At the same time, these towns faced significantly greater expenses.

To fill the budget gap from lost revenue, FEMA offered a Community Disaster Loan program for any town with projected revenue shortfall of at least 5 percent (lost tax ratables, as well as parking meters, hotel taxes and beach badges). As of August 2013, 33 towns had applied to the Community Disaster Loan program (Star-Ledger, 2013). The full impact will depend on how quickly homeowners repair their homes and how successfully businesses reemerge. These are good incentives for towns to facilitate recovery for residents and businesses.

C.2.2. Lesson Learned: Municipal Budgets Robust Enough to Cover Extraordinary Expenses

All towns incurred numerous expenses that were not included in their current budget, according to the Sandy Municipal Survey, The most common expense was overtime for town employees. In fact, 96 percent of towns paid Department of Public Works personnel overtime, 87 percent paid public safety personnel overtime, and 57 percent paid overtime for other town personnel. Towns also incurred expenses for non-personnel costs; 72 percent had costs for debris collection and removal; 60 percent had costs for supplies, 40 percent had expenses for infrastructure repairs, and 27 percent incurred expenses for office supplies. Other expenses were incurred by 11 percent of towns, including costs for temporary help, food, gasoline for generators, outside crane equipment, and library repairs, see Figure 7.

Figure 7. Expenses incurred beyond current budget by category

Overtime for Department of Public Works personnel	96%
Overtime for public safety personnel	87%
Non personnel cost for debris collection and removal	72%
Office of Emergency Management supplies	60%
Overtime for other town personnel	57%
Non personnel cost for Infrastructure repairs	40%
Supplies	27%
Other	11%

Source: Sandy Municipal Survey, 2013.

Towns used a multitude of means to cover expenses after Sandy, see Figure 8. In addition to their current budget, towns were forced to use additional means to recoup excessive expenses: 38 percent made an emergency appropriation, 33 percent borrowed funds until they received reimbursement from FEMA, 14 percent used funds from their snow removal trust fund, and 5 percent used long-term borrowing. At the time of the Sandy Municipal Survey, 15 percent of towns planned a tax increase, which later proved unnecessary. Other funding methods were used by 13 percent of towns, including utilizing insurance and budget surpluses.

Figure 8. Methods to pay for additional costs

Current budget	81%
Emergency appropriation	38%
Borrow until reimbursed by FEMA	33%
Tax increase	15%
Snow removal trust fund	14%
Borrow - long term	5%
Other	13%

Source: Sandy Municipal Survey, 2013.

C.3.3. Lesson Learned: FEMA Assistance Key to Timely Debris Removal

FEMA announced in January 2013 that it would provide Public Assistance funds to New Jersey towns to bear the added financial burden of Sandy recovery expenses. As of July 2013, FEMA had allocated $262 million to 457 towns (81 percent of towns) across the state (NJComptroller, 2013). FEMA Public Assistance can be used for immediate expenses such as debris removal, emergency protective measures, as well as reparations to infrastructure damage, such as road systems and bridges, water control facilities, public buildings and contents, public utilities, and parks and recreation (Public Assistance, FEMA.gov, 2013; FEMA, April 2013; NJ Office of the Governor, June 2013).

FEMA Public Assistance funds have prevented the need for towns to raise taxes and ensured that most could maintain a balanced budget. In addition, because FEMA was a reliable source to reimburse emergency costs, towns could plan, borrow, and complete essential work (Amoruso, 2013; Keen, 2013; Razzoli, 2013; Schneider, 2012).

C.2.4. Lesson Learned: Need to Provide Timely Damage Information

Because federal assistance is based on initial damage estimates, more care needs to be taken to assess all costs of a major storm, especially residential damage and lost wages. There also need to be estimates for immediate and long term hazard mitigation costs for households as well as for public infrastructure. After Sandy, the NJ DCA estimated these costs. Their numbers could have been better if towns were consulted and provided on the ground information.

C.2.5. Lesson learned: More Funding Essential for Hazard Mitigation

Most towns had the means to handle their immediate problems – safety, debris collection and removal, and maintain basic services. However, the much bigger challenge for municipalities is finding ways to invest in aging infrastructure in order to prevent compounded damage from future disasters.

Assessments for damaged infrastructure reveal staggering costs. In terms of direct damage, the greatest damage was to transportation with an estimate of $882 million, followed by schools with $401 million, then public and community buildings with $386 million, utilities with $277 million, and public health facilities with $21 million, totaling $1.97 billion (Star Ledger, 2013). In terms of providing resilient infrastructure, the state estimates that there is an additional cost of $23.5 billion to fully address necessary hazard mitigation work (NJDCA, 2013).

The cost of hazard mitigation is not surprising given the fact that 66 percent of roads are graded poor or mediocre quality in New Jersey, 26 percent of bridges are functionally obsolete, and 10 percent of bridges are structurally deficient, according to the 2013 Report Card for America's Infrastructure. Even before Superstorm Sandy, severe infrastructure funding needs were identified: $32.5 billion in waste water infrastructure, $8 billion for drinking water infrastructure, $7 billion for bridges, $4.9 for New Jersey Transit, $1 billion for highways, $1 billion for New Jersey schools, $360 million for rail freight infrastructure, $340 for airports, and $323 million for the parks system (Transportation for America, 2013; Blue Ribbon Commission, 2003).

FEMA Public Assistance has not even covered the cost of all of the immediate damage and extraordinary expenses; there is no extra money for essential hazard mitigation. More infrastructure spending is vital to ensure the future resilience of New Jersey's aging roads, bridges, schools, public transportation, rail, air, parks and water infrastructure. Without such improvements, New Jersey towns will continue to be vulnerable.

CONCLUSION

The Lessons Learned provide a window into what worked and what did not after Superstorm Sandy. Several themes emerge from the overall list: local capacity, innovation, two-way communication, investment, and local-state-national co-ordination. These highlight what still needs to be done to build resiliency and prepare New Jersey towns for the next inevitable disaster.

Greater local capacity: With municipalities on the front line and often on their own in the worst disasters, greater capacity would improve response and recovery. Most towns had the ability to conduct or manage debris collection and removal, primarily because such work could be prioritized over routine activities and resources could be reallocated. Similar prioritization needs to occur in the health area, though harder to do because the expertise required makes it harder to shift personnel. Additional capacity could be gained by implementing emergency protocols that would fast track normal procedures but still ensure essential safety features, such as those that were done for environmental regulations regarding debris removal. Another protocol would be to certify local electricians to test power lines enabling DPW staff to work around those that are not live. Towns could further build local capacity by formalizing partnerships with businesses and residents and training them so that everyone knows what to do in a crisis, including existing programs such as FEMA's Community Emergency Response Team (CERT).

Improvise: The ability of towns to improvise made a difference in many instances, including developing a range of communication methods, and hiring local electricians to test power lines. While working exhausting, long hours, most municipal employees relished the job they did after Superstorm Sandy. Often administrative work is routine, on-going and seemingly without purpose; during a disaster officials can make decisions fast and see the immediate impact of their efforts. Innovation does not need to be relegated to disasters, towns would benefit from an administrative culture that empowered employees to make decisions and take responsibility for outcomes.

Two-way communication. Most Sandy responders were focused on sending information, not receiving it. With 2.0 communication widely available, towns would benefit from incorporating feedback. Sandy provides two specific examples. Two-way between towns and power companies would have speeded power recovery. Also, two-way communication between residents and towns could have increased accuracy and timeliness of blocked roads and power outages.

Investment in infrastructure. The Lessons Learned outlined in this report make it clear that investment in New Jersey's infrastructure is vital, and yet has been avoided for years. Much of the damage caused by Superstorm Sandy would have been avoided or been less severe if previously identified problems with aging infrastructure had been repaired, expecially for power and wastewater. With tight budgets, lack of bipartisanship and short term political horizons, long-term hazard mitigation projects are not popular, but they are essential to the resilience of New Jersey's towns.

Other kinds of infrastructure also need investment, such as in mental health and ALICE households. For mental health, emotional recovery can take two years, funding and treatment for that long will make those residents stronger and less vulnerable to trauma in the future. For ALICE families, investing in housing and secure jobs with sustainable salaries would make these families more resilient. For example, with increased and reliable income, an ALICE family would be able to save for an emergency, buffering the detrimental consequences from sudden wage loss in the face of a disaster. And relocating to a safer location or making structural upgrades to current homes could prevent future storm damage and associated expenses.

Coordination between levels of government: Finally, coordination between local-state-national levels of government were a barrier to faster and stronger disaster recovery. While huge improvement have been made since Hurricane Katrina, problems remain. The cases of FEMA and the American Water Works Association provide examples of unmet potential for disaster recovery. In both cases, the lack of understanding of the local level, poor communication between officials, and delays in delivering resources caused major delays and increased recovery times.

The strategy articulated in the 1993 report by the National Commission on the State and Local Public Service are just as valid today. The path to high-performance government is clear: "Give leaders the authority to act. Put them in charge of lean, responsive agencies. Hire and nurture knowledgeable, motivated employees, and give them the freedom to innovate in accomplishing the agencies' mission."

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