Municipal Vulnerability Preparedness Program Action Grant Case Study

Municipality: City of Somerville, on behalf of Boston, Chelsea, Everett, Winthrop, and Revere
Project Title: Critical Regional Infrastructure and Social Vulnerability in the Lower Mystic Watershed
Award Year (FY): FY2020
Grant Award: $ $389,995
Match: $ $180,941
Match Source: Barr Foundation, City of Somerville
One or Two Year Project: Two years
Municipal Department Leading Project: Office of Sustainability and Environment
Project Website URL: https://resilient.mysticriver.org/lower-mystic

Community Overview:

- What is the population size of your community and where is it located?
- Do you have any Environmental Justice or other Climate Vulnerable communities? (Think about both those who live and work in your town.)
- Other unique traits of your municipality like who the top employers are, geography, history, etc.

The Lower Mystic River Watershed is defined as its saltwater portion below the Amelia Earhart Dam. Approximately 300,000 people live in the municipalities of Somerville, Everett, Chelsea, Boston (Charlestown and East Boston), Winthrop, and Revere. This region is home to both the most concentrated assembly of critical infrastructure in New England and some of the most diverse environmental justice communities in Massachusetts.

Residents of the Lower Mystic are heavily burdened by active industrial sites and legacy brownfields. Bulk fuels--including jet fuel for Logan airport, home heating oil and other petrochemicals—are stored adjacent to dense residential neighborhoods, putting them at risk of significant toxic releases during and after extreme weather events. Four of these communities--Charlestown/East Boston, Chelsea, Somerville, and Everett—are among the most intensively overburdened communities in Massachusetts, according to Dr. Daniel Faber's *Unequal Exposure to Ecological Hazards: Environmental Injustices in the Commonwealth of Massachusetts* (2005). Residents in these communities are disproportionately low-income people of color, English language learners, and/or living with fragile health. Each of these factors increases their risk of economic and physical harm during and after extreme weather events.

Project Description and Goals:

- Where was the project located?
- What climate change impacts did the project address?
- What were the specific goals and tasks of the project as stated in your application?
- Did your project meet the goals set forth in your application in terms of:
    - Employing nature-based solutions

- Improving equitable outcomes for and fostering strong partnerships with EJ and other Climate Vulnerable Populations
- Providing regional benefits
- Implementing the public involvement and community engagement plan set forth in your application
- Finishing the project on time

This project involved 13 of the 16 critical infrastructure facilities between the Amelia Earhart Dam in Everett/Somerville and the Deer Island wastewater treatment plant in Winthrop. The project laid the groundwork for multi-year efforts to minimize coastal storm damage to critical regional infrastructure and the people who depend on it.

The project involved two streams of integrated work: a critical infrastructure vulnerability assessment and a related social vulnerability assessment. The critical infrastructure vulnerability assessment ("infrastructure assessment") involved working with infrastructure managers and emergency preparedness agencies to identify infrastructure interdependencies and potential cascading failures resulting from current and projected coastal storms as defined by the Massachusetts Coast Flood Risk Model, the consensus best available science for this region.

Using the results of the infrastructure assessment, the social vulnerability assessment surveyed statistically significant numbers of vulnerable residents and workers ("priority populations) in each of the six Lower Mystic municipalities to understand how their lives are disrupted when specific infrastructure failures occur. This product will help identify and prioritize those assets most critical to maintaining economic and physical health among vulnerable residents. It will also help municipalities prioritize and plan for alternative services in case infrastructure assets are damaged or destroyed.

The outcome of both assessments was a joint series of key findings and recommendations based on those actions and investments critical to protecting priority populations during and after a major coastal storm safe (we used a sample 2050 1% slow moving winter Nor'easter in the infrastructure exercise). Following this dual assessment, Lower Mystic municipalities now have a more comprehensive analysis of the regional infrastructure that we host but do not control and a better understanding of how to support our residents and workers when this infrastructure fails.

Meeting goals set in our application:

- Central to this project was improving equitable outcomes for and fostering strong partnerships with environmental justice populations. We believe that this work provided a strong example of how to do an equity-centered climate vulnerability assessment.
- Regional benefits: This project lays the groundwork for storm-hardening some of Greater Boston's most critical regional infrastructure by identifying and prioritizing key vulnerabilities.
- The community engagement plan involved two sets of key stakeholders: infrastructure managers and priority populations. We worked with each group for approximately a year to

understand first how infrastructure facilities would fare during an extreme coastal storm, and then how priority populations would fare if infrastructure failed.

- COVID-related public safety concerns prevented us from engaging priority populations in our social vulnerability assessment during the winter 2020/2021. Because we needed to wait for both the vaccine and warmer weather when we could work with people outside, we received a three-month extension from June 30 to September 30.

Results and Deliverables:

- Describe, and quantify (where possible) project results (e.g. square footage of habitat restored or created, increase in tree canopy coverage, etc.). Report out on the metrics outlined in your application.
- Provide a brief summary of project deliverables with web links, if available.

Below are the Key Findings and Recommendations from the dual vulnerability assessment

Key Findings

Both assessments identified transportation, energy and communications as key resilience priorities. Each assessment uncovered different reasons for prioritizing these sectors, as described below. Other findings - such as the importance of childcare and fuel delivery for backup generators - only showed up in one or the other assessment.

Key Finding 1: The cities hosting the highest concentration of critical infrastructure (East Boston, Chelsea, Everett and Revere) were also found to have the highest percentage of socially vulnerable residents.

Key Finding 2: Both community members and critical infrastructure managers expressed concern over the ability to maintain communications in a disaster.

Key Finding 3: There is widespread reliance on emergency generators to protect infrastructure facilities; refueling was a concern.

Key Finding 4: An extreme coastal storm of the size depicted in the functional exercise would flood the harbor tunnels and MBTA subway tunnels, taking weeks to months to recover.

Key Finding 5: Maintaining power and communications infrastructure is critical for both infrastructure facilities and priority populations.

Key Finding 6: Community health centers are both critical for priority populations and disproportionately vulnerable to the impacts of coastal flooding.

Recommendations

We embarked on this dual regional climate vulnerability assessment knowing that we were laying the groundwork for potentially hundreds of millions of dollars in capital investments directed by six municipalities and over a dozen public and private infrastructure agencies. The next steps will involve identifying regional projects for further analysis, community-engaged design, and implementation.

What this assessment accomplished:

This effort was a cost-effective means of identifying the highest priority actions to storm-harden critical regional infrastructure in the Lower Mystic and prevent harm to priority residents and workers who rely on that infrastructure.

What we didn't accomplish:

We did not invite information technology or communications managers to participate in the functional exercise because these sectors are so fragmented by company and location that it would have added too much complexity to our exercise. We then learned from the social vulnerability assessment that these are two of the most critical sectors for our priority populations. We also know from other documented assessments that childcare and strong social connections are extremely important factors affecting the resilience of our priority populations, but the data we gathered did not provide as much insight as we might have expected.

Recommendation 1: Incorporate social resilience into vulnerability assessments and benefit-cost analyses. At the outset of this project, our hypothesis was that conducting a vulnerability assessment with both critical infrastructure and priority populations at the center would result in different and better outcomes than a traditional climate vulnerability assessment. We found this to be true.

Recommendation 2: Prioritize transportation corridors for essential workers during and immediately after extreme weather events. It is critical for low-income residents to be able to get to work safely before, during, and after an extreme weather event. Priority populations use all modes of transportation to get to work, with walking and public transit use being particularly high. Loss of income cascades quickly to other negative impacts, such as hunger, loss of childcare, and reducing or shutting off utilities, including heat, phone, and electricity.

Recommendation 3: Improve regional coordination during emergencies among infrastructure managers and with government agencies. Infrastructure managers and residents in the region expect the government to have a coordinated emergency plan and the capacity to carry it out during a crisis. The state's role in those coordination efforts should include ensuring that critical infrastructure interdependencies are understood by all key parties and adequately incorporated into emergency plans.

Recommendation 4: Develop and implement communications channels and strategies designed specifically to reach socially vulnerable populations in their first languages. Priority populations are relying on local and state governments to tell them what to do to stay safe during a massive winter

storm. The messages must be clear and communicated in people's primary languages. They should be easy to find or receive before, during, and after extreme weather events. Even small communication gaps and errors during a crisis can have significant consequences; effective preparation to minimize those errors is really important.

Recommendation 5: Prioritize making internet and cell phone communications infrastructure storm resilient. Priority populations are highly dependent on internet access and cell phone networks for sending and receiving information. Internet infrastructure for web access on computers is neither widespread nor low-cost in environmental justice neighborhoods. Many rely solely on their cell phones to access outside information.

Conclusions

If we had performed either vulnerability assessment on its own, we would have arrived at different recommendations, and they would have been less effective at reducing harm from extreme coastal storms. We are confident that successful implementation of these recommendations at a regional scale will meaningfully save lives and livelihoods.

Project deliverables: The project results will be available by mid-November 2021 at https://resilient.mysticriver.org/

Lessons Learned:

- What lessons were learned as a result of the project? Focus on both the technical matter of the project and process-oriented lessons learned.
- What is the best way for other communities to learn from your project/process?

We hope this work will be of interest to others who may want to do similar assessments. In that spirit, and for our own learning and reflection, we have compiled the extensive "lessons learned," which are included in Appendix E of the final project report. Below are the five main topics discussed in the lessons learned appendix

1) The lead time for this project was long. Flexibility and creativity, paired with a firm sense of our objectives, were important to maintain as partners and options changed over time.

2) The Covid-19 pandemic made everything more difficult. It impacted relationship building, timing, and participation. It also taught us a lot about social vulnerability that we almost certainly would not have learned otherwise.

3) Relying on community-based organizations to conduct community outreach is a complicated matter that deserves care and an equity and justice-informed approach.

4) Lessons learned on the community intake instruments (survey and focus groups)

5) Compensating participants

Partners and Other Support:

- Include a list of all project partners and describe their role in supporting/assisting in the project.

The overall project was led by the Resilient Mystic Collaborative Lower Mystic communities of Boston, Chelsea, Everett, Revere, Somerville, and Winthrop.

The infrastructure assessment project team was co-chaired by Zoë Davis from the City of Boston Environment Department, and Steve Estes-Smargiassi from Massachusetts Water Resources Authority, with support from staff from Mystic River Watershed Association and consultants from Arup, All Aces, Inc., and BSC Group.

The social infrastructure assessment project team involved staff from Mystic River Watershed Association and consultants from All Aces, Inc., Starluna Consulting, Consensus Building Institute, and CH Consulting.

The following organizations led community engagement as sub-consultants to All Aces: Community Action Agency of Somerville, GreenRoots, Harborkeepers, La Comunidad, Somerville Community Corporation, and TCGT Entertainment.

Special thanks to DHS Cybersecurity and Infrastructure Agency, Massachusetts Emergency Management Agency, NYC Mayor's Office of Recovery and Resiliency, and the US Coast Guard for their guidance and technical support on the functional exercise. Participants in the infrastructure functional exercise are listed below:

Nor'easter Big Papi Functional Exercise Participants
Dam: Mass Department of Conservation and Recreation
Energy Sector: Energy Transfer, Eversource, Global Companies LLC, Gulf Oil Terminal, National Grid
Health Care Sector: Mass General Brigham
Transportation Sector: Mass Bay Transportation Authority, MassDOT, Massport
Water Sector: Boston Water and Sewer Commission, Mass Water Resources Authority

Nor'easter Big Papi Functional Exercise Staffing

Facilitators: Boston Environment Department, Mass Water Resources Authority, Somerville Office of Sustainability and Environment
Exercise Control/Tech Support: Arup, BSC Group, Consensus Building Institute, Mystic River Watershed Association
Table Facilitators: All Aces, Arlington Planning Department, Barr Foundation, Boston Environment Department, Boston Planning and Development Agency, Chelsea Planning Department, Consensus Building Institute, Dutch Consulate of New York, DHS Cybersecurity and Infrastructure Security Agency, Massachusetts Executive Office of Energy and Environmental Affairs, US Environmental Protection Agency
Content Experts: DHS CISA, Everett Department of Public Works, GreenRoots, Massachusetts Emergency Management Agency Medford Department of Public Health, US Coast Guard

Project Photos:

- In your electronic submission of this report, please attach (as .jpg or .png) a few high-resolution (at least 300 pixels per inch) representative photos of the project. Photos should not show persons who can be easily identified, and avoid inclusion of any copyrighted, trademarked, or branded logos in the images. MVP may use these images on its website or other promotional purposes, so please also let us know if there is someone who should receive credit for taking the photo.