Municipal Vulnerability Preparedness Program Action Grant Case Study

Municipality: *Marshfield*
Project Title: *Marshfield Long-term Coastal Resiliency Plan*
Award Year (FY): *FY22*
Grant Award: $ *$78,030*
Match: $ *$26,010*
Match Source: *In-kind services and cash from Town's budget*
One or Two Year Project: *One*
Municipal Department Leading Project: *Planning Department*
Project Website URL: *https://www.marshfield-ma.gov/planning-department/pages/mvp-action-grant-long-term-coastal-resiliency-plan*

Community Overview:

- What is the population size of your community and where is it located? *The Town of Marshfield is located in Southeastern Massachusetts in Plymouth County. A coastal community 30 miles from Boston, Marshfield has a yearly population of about 25,000 people, which grows to about 40,000 in the summer months.*
- Do you have any Environmental Justice or other Climate Vulnerable communities? (Think about both those who live and work in your town.) *Although the Town of Marshfield does not include a mapped Environmental Justice population, it does contain a Climate Vulnerable Population based on the State's Climate Change Vulnerability Map. Specifically, many of the coastal neighborhoods in Marshfield (i.e., the study area for this analysis) have a relatively high percentage (i.e., 25-50%) of elderly residents (i.e., residents over 65 years old). The Climate Change Vulnerability Map also maps the Town of Marshfield in the highest category, >45%, for "Percent of Residential Land in the 100-Year Flood Plain". The actual percent is 50.6%. With more than half of the residential land within the 100-year flood plain, long range planning for how to reduce future flood vulnerability to the residents of Marshfield is much needed.*
- Other unique traits of your municipality like who the top employers are, geography, history, etc. *Marshfield is 31.70 square miles in area, and contains 28.50 square miles of land, 3.25 square miles of water and 5 miles of ocean coastline. The town's rich history of over 350 years dates back to the pre-revolutionary war era and is best known as the home of Daniel Webster from 1832 until his death in 1852. While a resident, he was a very important national political figure and was known as "the Farmer of Marshfield". The town has a traditional New England government structure with a three-member board of selectmen, an administrator and an open town meeting. Marshfield is active throughout the year with events such as the Marshfield Fair and Levitate Music Festival, which attracts visitors from all over the State.*

Project Description and Goals:

- Where was the project located? *The project area consists of approximately 2.5 square miles along the coastal area of Marshfield.*
- What climate change impacts did the project address? *The project addressed coastal flooding and erosion risks from sea level rise, storm surge, and waves.*
- What were the specific goals and tasks of the project as stated in your application?
    - *Task 1 – Risk factors and Asset Inventory: Goal was to provide data on likely scenarios and degrees of potential impact in vulnerable areas that will support the development of recommended strategies to reduce risks to infrastructure, facilities, and natural resources in later tasks. Task involved reviewing existing plans, studies, and data sets to develop a full understanding of the existing risk factors and existing assets within the project area.*
    - *Task 2 – Draft Zoning Recommendations: Goal was to develop zoning and other regulatory recommendations for how and if rebuilding should occur following a catastrophic event to improve the overall coastal and climate change resilience of the Town of Marshfield in the long-term. Task involved dividing the project area into impact zones where policies would apply, drafting recommendations, and reviewing with stakeholders.*
    - *Task 3 – Benefit Cost Analysis: Goal was to conduct a holistic accounting of costs and benefits to inform the community of the relative physical, social, and economic impacts of extreme events under "business as usual" versus alternative zoning and policy scenarios. Task involved estimating damages to the building inventory and associated losses using FEMA's Hazus program (site level analysis) and MC-FRM flood projections, developing and applying costs for a range of non-structural mitigation strategies, and evaluating cost-effectiveness and overall benefits of policy alternatives using a benefit-cost analysis (BCA).*
    - *Task 4 – Public Engagement and Outreach: Goal was to ensure widespread public understanding of the risks facing the community, to gather input on community concerns, priorities and opportunities, to help shape coastal resilience strategies that support community goals and quality of life, and to build support for the adaptation and response strategies proposed. Task involved planning meetings, stakeholder interviews, community survey, public workshop, community meeting, and presentation to the Select Board.*
    - *Task 5 – Draft and Final Plan Development: Goal was to develop a draft and final plan, along with executive summary, to communicate the study's results and recommendations to the community and incorporate public feedback.*
- Did your project meet the goals set forth in your application in terms of:
    - Employing nature-based solutions
        - *Yes, the project helped set the stage for future implementation of nature-based solutions by including natural features in the asset inventory, identifying areas with potential for salt marsh migration, and incorporating the value of improved ecosystem services in the cost-benefit analysis for acquisitions and restrictive zoning policies.*
    - Improving equitable outcomes for and fostering strong partnerships with EJ and other Climate Vulnerable Populations

        - *The project increased climate resiliency for the Climate Vulnerable Population by helping the community adapt to existing and projected impacts of climate change building back smarter after a storm (i.e., elevating a structure, increasing the setback from the coastline, etc.) or relocating to less vulnerable areas.*
    - Providing regional benefits
        - *Although this plan was developed for Marshfield, the plan can serve as a model for other coastal communities.*
    - Implementing the public involvement and community engagement plan set forth in your application
        - *As part of the plan development process, Town departments, elected officials, board/commission/committee members, residents (including Marshfield High School National Honor Society students), and businesses were engaged through interviews, a public workshop, public meetings, and an online survey. Engagement activities focused on educating and raising public awareness about future coastal flooding threats and gathering ideas, feedback, and preferences on different mitigation strategies, policies, and draft recommendations. Members of the public were notified about opportunities to participate in the planning process through the Town's website, printed flyers, and email. Specific outreach to neighborhood organizations, Town board/commission/committee members, high school students, and individuals who participated in prior project engagement activities was conducted. Public presentations, meeting summaries, and a summary of survey results are publicly available on the Town's Planning Department website.*
    - Finishing the project on time
        - *The Long-term Coastal Resiliency Plan was completed on June 30, 2022.*

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.
    - *As a "Project Type 1" (i.e., Planning, Assessments, Capacity Building, and Regulatory Updates), the project set the stage for future success. Short-term success was quantified by how many people are reached through the various public engagement steps. At the first public workshop held on November 10, 2021, 22 adults and 40 high school students attended. At the second public workshop help on May 26, 2022, 20 adults and 14 high school students attended. There were 62 responses to the online survey.*
    - *Over 2,000 buildings were assessed for future vulnerability to coastal flooding damage. $40-100 million in cost-effective opportunities for elevating, dry floodproofing, or acquiring vulnerable buildings were identified. This information will assist the Town with outreach to property owners, renters, and businesses*

about the importance of flood insurance, federal grant opportunities, and stronger regulatory requirements for floodplain development.

- *In the long-term, it is hoped that the Town can measure the success of this project by the number of homes in moderately vulnerable areas that have been elevated above the flood risk; the value of federal and state funding invested in adaptation projects; and an overall increase in flood insurance coverage and reduction in flood insurance claims and repetitive loss properties within the Town of Marshfield.*

- Provide a brief summary of project deliverables with web links, if available.

  https://www.marshfield-ma.gov/planning-department/pages/mvp-action-grant-long-term-coastal-resiliency-plan

  - *November 10, 2021 Workshop PowerPoint Presentation*
  - *November 10, 2021 Workshop Video*
  - *November 10, 2021 On-line Survey*
  - *November 10, 2021 Workshop Photos*
  - *May 26, 2022 Workshop PowerPoint Presentation*
  - *May 26, 2022 Workshop Photos*
  - *June 28, 2022 Select Board PowerPoint Presentation*
  - *Long-term Coastal Resiliency Plan – June 30, 2022*

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.
  - *In order to complete the asset inventory, planning staff collected data about each structure. By visual survey, planning staff recorded the number of steps to the front door of each structure. This process proved to be a simple and cost-effective way to estimate the structure's height above ground, foundation types, and presence of a basement – all critical factors for estimating flood damages.*
  - *The successful in person public meetings increased the understanding of both elected officials and the general public to the enormous scale of the potential impacts from sea level rise and increasing coastal flooding and erosion risks. The public workshop was recorded. The recording is available to watch on Marshfield Community Media. The meetings also increase the understanding of the limited options available to the Town and residents due to the large number of homes (over 2,000) on small lots (5,000 to 8,000 sq. ft.) and the elevation of the homes (not provided by FEMA flood maps).*
  - *The project demonstrated that MC-FRM projections can readily be used in concert with FEMA's standard tools like Hazus to estimate future economic impacts of climate change and coastal flooding at the local level. This proved to be valuable information for not only communicating with the public and elected officials about what is at stake and why resilience actions are needed, but also*

for incorporating the best available scientific, probabilistic, and physics-based projections in identifying mitigation strategies that are cost-effective in the long-run. One challenge was that FEMA's Hazus tool requires a high probability scenario (e.g., 10-year storm), which is not a standard statewide MC-FRM product. This was overcome by using MC-FRM to create such an output for this project area only. If the 10-year storm data becomes available statewide as part of future MC-FRM updates, a similar damage estimation could be conducted statewide and made available through ResilientMA to inform State- and local-level resilience plans.

- *The importance of flood insurance was highlighted through this study. The damage estimates show that the vast majority of losses to individual homes could be fully covered by National Flood Insurance Program policies under current maximum limits. Even if all cost-effective mitigation projects were implemented, there would still be 10s of millions of dollars of future losses in the community from flooding. Insurance is the main tool to cover those residual losses. This points to the need for efforts to increase affordability and promote flood insurance to reduce the coverage gap (about 50% in Marshfield).*
- *The BCA results point to a significant and unexpected challenge to the economic and social rationale for "managed retreat" policies in Marshfield. This may point to a larger challenge across the State. Even when accounting for increasing flooding risk in the future, the economic and social case for large- or even moderate-scale voluntary acquisitions or "no build/rebuild" zoning policies was not favorable.*
    - *Very few cost-effective acquisitions were identified, and amongst those, in most cases, elevation or dry floodproofing alternatives were more cost-effective. It is posited that this is largely due to high property values, but methodological factors could have an effect. While an MC-FRM based 10-year storm scenario was created and used in the damage estimates and BCAs, the study did not account for the economic impact of annual (1-year) storm flooding or sub-annual tidal inundation. Had these highest-frequency impacts been accounted for, it is possible that additional cost-effective acquisitions (and other mitigation projects) would have been identified. If in the future 1-year storm data becomes available statewide as part of future MC-FRM updates, the results could be reevaluated.*
    - *"No build/rebuild zones" were evaluated holistically, accounting for the lost property value to owners, lost property tax revenue for the Town, avoided losses, and environmental benefits from new open space. As with acquisitions, these policies were not cost-effective due to the high property values – especially since with "no rebuild zones" affected property owners are unlikely to be due any payment for lost property value (including the ability to reside on the property). If those private losses were excluded from the BCA equation, these policies were highly cost-effective. However, it went against the principal of the study to consider such policies cost-effective from that limited perspective, since*

the study was about the overall community-level costs and benefits. Ignoring those losses would lead to highly inequitable outcomes.

- *The community survey, to which 62 people responded, identified some challenging behavioral predispositions to overcome. Residents who participated reported significant personal experience with the impacts of coastal flooding and high concern about future sea level rise and coastal flooding. They indicated that financial losses of even moderate scale could influence their decisions on whether to take risk reduction measures like selling their home or moving, elevating their home, or dry floodproofing their business. However, when it came to the influence of flood frequency on such decisions, residents were most certain that they would take risk reduction actions if flooding occurred every day or month. Residents were much less certain of whether they would take action to mitigate flooding impacts that occur once a year or once every few years (though "yes" and "maybe" responses combined were still at about 80-90%). At once every 10 years, that combined "yes/maybe" total dropped to about 65%, and at once in 20 years, it fell to 40%. This points further to the importance of including high-frequency scenarios and projections, statewide, in similar studies and in general communication with the public about risks of inaction.*
- *The study also identified a gap in the technical methods available for estimating damage and loss associated with wave overtopping, which affects many repetitive loss properties in Marshfield that are located just inland of public seawalls. Other communities in Massachusetts face this same type of coastal storm damage. A methodology was developed to approximate these impacts, including how they may increase due to sea level rise and climate change. However, the results are highly uncertain and feel, at a gut level, to be underestimates. The federal government and academic community should work to address this gap so that communities can account for these types of risks and develop cost-effective policies for managing them.*
- *Finally, it has highlighted the need for the State and Federal governments to develop an elevation program that helps the majority of homeowners in Town whom are not repetitive or severe repetitive loss properties.*

- What is the best way for other communities to learn from your project/process?
  - *All project documents are available on the Planning Department website and Planning Staff are available to answer any questions for other communities.*

Partners and Other Support:

- Include a list of all project partners and describe their role in supporting/assisting in the project.
  - *Town of Marshfield, MA*
    - *Greg Guimond, Town Planner*
    - *Karen Horne, Assistant Town Planner*
    - *Michael Maresco, Town Administrator*

        - *Lieutenant Art Shaw, Director, Marshfield Emergency Management Agency*
        - *Chief Simpson, Fire Chief*
        - *Bill Grafton, Conservation Administrator*
        - *Andrew Stewart, Building Commissioner and Flood Plain Administrator*
        - *Joe Rossi, Chair, Community Rating System Committee*
        - *Tim Williams, PPI Committee*
    - *Woods Hole Group, Inc.*
        - *Nasser Brahim, Senior Climate Resiliency Specialist*
        - *Leslie Fields, Senior Coastal Scientist*
        - *Brittany Hoffnagle, Environmental Scientist*
        - *Kali Roberts, Environmental Scientist*
        - *Zach Stromer, Coastal Scientist*
        - *Eric Holmes, Coastal Scientist*
    - *Sobis, Inc. (economic analysis)*
        - *William "Bill" Bohn*

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.
    - *See attached*