



Flood and Sea Level Rise Action Plan Framework

Outline

1. Executive Summary

2. Introduction

- a. Background and context, highlighting the power of a coordinated approach on issues shared by any neighboring towns, the county, or other entities, as appropriate.
- b. Town's vision and goals for its future regarding the impacts of flooding and sea level rise (SLR). Include a brief description of the town's planning horizons (*e.g.*, 2030, 2050, and 2100).
- c. Purpose and objectives of the plan
 - i. Statement of purpose: The plan will identify and characterize nuisance flooding and flooding from larger storm events using the best available science; assess the vulnerability of specific geographic areas in the community; recommend mitigation and adaptation options tailored to each area to address sea level rise impacts including flooding; and prepare implementation strategies.
 - ii. Plan objectives and outputs
- d. Plan development process
 - i. Project approach
 - ii. Project timeline
 - iii. Project roles (include town and technical assistance provider roles)
 - iv. Community outreach and engagement process. Include points throughout the plan development process where community input should be obtained (*e.g.*, identifying flood impacts, ranking assets impacted by flooding, prioritizing projects, programs, and strategies to reduce flood risks, and prioritizing budget and financing scenarios).
- e. Linkages between this plan and other plans, goals, and initiatives
 - i. Town, county, state, federal, and other entities
 1. Outline the process for coordination across these entities regarding shared challenges, solutions, and strategies, to include how the town's plan will link with other jurisdictions' plans, where appropriate.

3. Challenges

- a. Current nuisance flooding (pluvial, fluvial, and coastal) and flooding from larger storm events (*e.g.*, storms like hurricanes, nor'easters, and thunderstorms).

Identify contributing factors shared with other jurisdictions. Include maps and hydrological, meteorological, and any other available data.

- i. Contributing factors to be investigated may include, for example:
 1. Existing stormwater and flood systems (i.e., drains, pumps, grading, bulkheads, jetties, berms, living shoreline, roads, bridges, water storage and absorption capacity)
 2. Low land elevation and land subsidence
 3. High water table
 4. Littoral drift and shoreline erosion
 5. Development prior to current floodplain regulations
 6. Runoff from outside town's boundaries
- b. Current flood impacts on town, including the physical, social, and economic consequences of flooding. Identify current flood impacts shared with other jurisdictions. Include maps, photos, and quantitative and qualitative data, as available. Also, consider including criticality assessments¹ for infrastructure and services.
 - i. Physical consequences of flooding to assess may include impacts to the natural and built environment, like: residential, commercial, cultural, historical, maritime, parks and recreational facilities; natural features that mitigate flooding, like tidal marshes and tree canopy; infrastructure like public or municipal buildings, roads, bridges, stormwater system, wastewater treatment plant and other utilities; and, emergency service facilities, like police and fire.
 - ii. Social consequences of flooding to assess may include effects on certain populations or the community as a whole, like: impacts on the quality of life for residents and visitors; displacements or elimination of recreational amenities and/or access to them; disruption to community wide gatherings, festivals, celebrations, and remembrances; and impacts on other public goods the community has sought to achieve (especially those addressing quality housing for low income residents, accessibility for the disabled, the safety and fullness of opportunity for children to learn about the town's coastal heritage and environment, and the engagement of all residents in the town's civic life and the benefits of living in the community). This of necessity includes how sea level rise might impact the delivery of social support services.
 - iii. Economic consequences of flooding to assess may include: damage to property; loss of tax revenue; reduced tourism and recreation; changes to the coastal/maritime sector; and infrastructure costs due to damage, failure, and/or shortened lifespans.

¹ Criticality assessment, or analysis, is a common practice in infrastructure asset management programs and can also be applied to flood risk assessments. The process involves identifying important assets and ranking them based on the consequences of their failure (their "consequence of failure" or "criticality"). The results of such an assessment can be used to prioritize assets to study in further detail or to prioritize interventions.

- c. Sea level rise projections for three different risk tolerance levels/exceedance probabilities for varying scenarios (*i.e.*, include near-term inundation analysis for 2030 as well as analysis for 2050 and 2100 scenarios, making sure to account for storm surge on top of sea level rise for any projects/assets vulnerable to surge). Include maps and data. Also identify the selected greenhouse gas emissions scenario(s) to be used (*e.g.*, declining, stabilized, or growing).
 - i. 2030
 - 1. SLR
 - 2. SLR plus storm surge
 - ii. 2050
 - 1. SLR
 - 2. SLR plus storm surge
 - iii. 2100
 - 1. SLR
 - 2. SLR plus storm surge
- d. Projected flood impacts on the town, including the physical, social, and economic vulnerability² of the town pursuant to the 2030, 2050, and 2100 planning scenarios. Note interrelationships and cross-cutting impacts (*e.g.*, a building may not flood, but its road access might). Identify projected flood impacts shared with other jurisdictions. Also, consider conducting criticality assessments for infrastructure or services.
 - i. See 3.b. above for descriptions and examples of the categories for which to assess the town’s vulnerability to SLR.

4. Solutions and Strategies

- a. Identify and describe projects, programs, and strategies, as appropriate, to reduce flood risks, including those that may need to be undertaken by private property owners and developers. Work with neighboring jurisdictions, as appropriate, on solutions for shared problem areas, or on solutions that may have a wider impact. Include information on solutions’ or strategies’ expected life spans and performance given SLR scenarios, whether they will address short-, medium-, or long-term issues, if they are “scalable” to accommodate upgrades in future, and if the solution or strategy yields benefits on an individual or parcel scale, or on a neighborhood or wider scale.
 - i. Nature-based and natural (“passive”) project examples
 - 1. Open space protection
 - 2. Living shorelines

² Vulnerability is a more nuanced way to describe the potential consequences of flooding. For the purposes of understanding how sea level rise may impact a town, vulnerability is defined here as “a combination of the exposure, sensitivity, and adaptive capacity of the [town’s] assets, populations, and neighborhoods” (Plastrik, P., Simmons, J., & Cleveland, J. (2017) Essential Capacities for Urban Climate Adaptation: A Framework for Cities. Innovation Network for Communities. <http://lifeaftercarbon.net/wp-content/uploads/2017/05/City-Adaptation-Essential-Capacities-March2017.pdf>).

3. Planning for and enabling marsh migration
 4. Creating wetlands and allowing space for the migration of existing wetlands
 5. Flood spillover and retention areas, floodable parks
 6. Restoration of ecosystems to improve their flood mitigating functions
 7. Creating landforms that can both protect from flooding and provide a recreational amenity.
- ii. Structural/engineering project examples
1. Drain modifications
 2. Pump modifications
 3. Grading modifications
 4. Bulkhead, jetty, berm, and shoreline (hard and soft) modifications
 5. Road and bridge modifications
 6. Water storage and absorption capacity modification
 - a. Green infrastructure (*e.g.*, measures that use plant/soil systems, permeable surfaces, stormwater harvest and reuse and landscaping to store, infiltrate, or evapotranspire stormwater to include standard stormwater best management practices).
 - b. Gray infrastructure (*e.g.*, measures that use conventional stormwater infrastructure like wet wells, underground culverts to move stormwater away from the built environment, stormwater retention ponds and floodwater diversion channels).
 7. Elevate structures and/or floodproof structures
- iii. Management (*e.g.* planning/policy/regulatory/design) strategy examples
1. Assess and recommend modifications to existing, or develop new:
 - a. Zoning laws
 - b. Building codes
 - c. Permits
 - d. Ordinances
 - e. Land use policies (*e.g.*, critical area program) and broad landscape design measures
 - f. Architectural guidance for new buildings (*e.g.*, floodable structures)
 - g. Infrastructure design guidelines (that incorporate projected SLR and precipitation changes)
 - h. Regulations to coordinate the use and development of shorelines structures and piers
- iv. Managed retreat and relocation strategy examples
1. Develop strategies for withdrawal of residential and commercial buildings from highly vulnerable areas and identify approaches to

relocation and acquisition that may be become necessary. Strategies should take into consideration the scale of the strategy/approach (*e.g.* parcel or neighborhood scale) and whether the affected properties or assets are privately or publicly owned/maintained.

- a. Identify thresholds or tipping points for when a structure/road/etc . . . should be relocated or decommissioned.
- b. Retreat (*i.e.*, remove structures and create open space)
- c. Relocate
 - i. Develop ideas for relocating but retaining residents/businesses, community character, revenue, etc . . .
- v. Community capacity-building programs
 1. Education and outreach on measures residents and other target audiences can take to reduce their flood risks.
- b. Recommend project, program, or strategy priority and timing. Consider scalability of the project, program, or strategy and the impact of sea level rise projections.

5. Budget and Funding Scenarios

To the extent that implementation of the plan may require the expenditure of public funds at the municipal, county and state levels:

- a. Identify and describe project, program, and strategy budget scenarios
 - i. Low cost, low impact
 - ii. Medium cost, medium impact
 - iii. High-cost, high-impact
- b. Identify and describe project, program, and potential strategy financing scenarios
 - i. Town and county general funds
 - ii. Grants
 - iii. Utility/authority/dedicated revenue stream
 - iv. Loans and bonds
 - v. Public-private partnership
 - vi. Blended funding
- c. Recommend project, program, or strategy budget and financing scenarios and incorporate into Capital Improvement Plan, as appropriate.
- d. Identify funding role for county, especially where vital public interests are shared.
- e. Identify and/or recommend grant and other funding programs that the state can, or of necessity, is most apt to provide.

6. Conclusion

- a. Findings
- b. Summary of recommendations

- c. Issues requiring further analysis in coordination with other agencies, units of government, citizen and neighborhood groups, or non-profit organizations or that would benefit from further and/or ongoing collaboration with them. Also, identify changes that may be needed in local and state regulations, if any, to facilitate implementation of the measures.
- d. Issues being deferred to a future update or different process.
- e. Plan implementation and maintenance process.
 - i. Formal adoption by town.
 - ii. Establish a timeline for implementing and updating the plan (*i.e.*, link to Maryland’s 5-year SLR projection updates), as well as for integrating strategies into other relevant planning documents.
 - iii. Establish a process to track and evaluate outputs and results and provide updates to all interested parties (e.g., regularly make this information available to the public via the town’s website, annual report, etc.).

Appendices Examples

- Data and methods
- Maps and graphs