RUTGERS
THE STATE UNIVERSITY OF NEW JERSEY

NJ Climate Change Alliance

An Overview of Climate Change Resilience Programs in Four States: *Maryland, Massachusetts, New York and Rhode Island*

Prepared for the New Jersey Climate Change Alliance
Marjorie Kaplan Dr.PH (mbk65@envsci.rutgers.edu)
Jeanne Herb (jherb@ejb.rutgers.edu)

April 1, 2021

This brief report was prepared for the New Jersey Climate Change Alliance to support its efforts to advance science-informed climate change policies and programs in New Jersey. The report summarizes resilience programs in four states: Maryland, Massachusetts, New York and Rhode Island to inform the Alliance's deliberations regarding essential elements of a statewide climate resilience program for New Jersey. This document provides updated information about climate resilience efforts in the four states from a more extensive examination of other states' climate resilience efforts prepared by Rutgers University researchers in 2019 (http://eac.rutgers.edu/rutgers-researchers-study-state-sea-level-rise-policies/).

The authors of this brief report identified six common themes among the climate resilience efforts in the four states:

- ***Authority*** – Each of the four states has specific statutory authority to advance climate resilience programs and policies. The scope of these laws include statewide planning, development of design guidelines, integration of climate resilience provisions into statewide planning and state investments, funding for state and local agency resilience efforts, and elements of climate resilience efforts by local agencies.
- ***Interagency Coordination*** – Each of the four states have a strong focus on intersected state agency governance on climate resilience programs and policies. This includes consistent use of multi-agency climate resilience guidance, cross-sector working groups that facilitate dialogue between state agencies and other stakeholders, establishment of design standards and review processes to direct or guide state agency decision-making, capital investments and/or planning.
- ***Incrementalism*** – The four states each reflect approaches that moderate gradual progression of climate resilience policies and programs. This includes extensive "socialization" of advancing climate resilience programs and policies through cross-sector consultation via committees, working groups and commissions and non-traditional stakeholder engagement. It also includes establishment of specific design standards that may be required for state agency action but that are provided as guidance for other entities. None of the four states have implemented mandatory regulatory standard-based programs outside of provisions for state agencies. The states also provide incentives for municipal application of state climate resilience guidance.
- ***Funding*** – Each of the four states have identified funds to support state and local agencies' implementation of climate resilience programs and policies. Sources of funds among the four states vary, including state appropriations, alternative compliance payments, bonds and use of funds from energy surcharges and climate change cap-and-trade. Additionally, the four states intentionally align federal dollars to support statewide climate resilience priorities.
- ***Focus on state assets and investments*** – The four states have each established guidance and/or standards to direct state capital investments, planning and agency programming. Two states that have laws governing environmental review of state investments (New

York State Environmental Quality Review Act, Massachusetts Environmental Policy Act) have included consideration and review of climate resilience as part of its efforts.

- ***Assistance and support*** – Climate resilience efforts in each of the four states include guidance provided to state and local agencies, training and education programs, and user-friendly data visualization and mapping tools to support state and local climate resilience planning. All of the states emphasize the value of nature-based solutions to climate resilience. Two states have mandatory training requirements: the Massachusetts Municipal Vulnerability Preparedness program provides training to certify local climate resilience planners and Rhode Island requires members of local planning board to attend climate resilience training.

Maryland Resiliency Planning Efforts

A. Background

In 2007 Governor Martin O'Malley established The Maryland Commission onClimate Change (MCCC) through Executive Order. The Commission, which included cabinet-level representatives, was charged with developing an action plan for climate change mitigation of and adaptation which was finalized in 2009. Through a second Executive Order in 2014, O'Malley expanded the scope of the Commission and its membership to include non-state government participants. The Commission was codified into law by the Maryland General Assembly in 2015 to advise the Governor and General Assembly on ways to mitigate the causes of, prepare for, and adapt to the consequences of climate change.[1] The legislation required establishment of certain working groups representing public and private interests; annual reporting by the Commission to the Governor and General Assembly; each State agency to identify and recommend certain changes to certain programs; certain State agencies to report annually to the Governor and General Assembly on program status; University of Maryland Center for Environmental Science to establish and update sea level rise projections and for such projections to include certain publiciy availabie maps.

The Commission consists of 30 members representing State agencies and the legislature, local government, business, environmental non-profit organizations, organized labor, agriculture, philanthropic interests, and the State University system. The Commission meets quarterly, and has posted Annual Reports publicly since 2015. State Agencies by Statuts are require to report annual to the Commission (and the Governor) on their efforts to mitigate ghgs and Improve climate change overall by their policies and programs. The work of the Commission is supported by a Steering Committee and four Working Groups: Adaptation and Resiliency Work Group; Education, Communication and Outreach Work Group; Mitigation Work Group; and Scientific and Technical Workgroup. Each of the work groups have had annual published work plans since 2016.

First thru the Executive Order[2] and then through the aforementioned legislation[3], Maryland state agencies are required to review their planning, regulatory and fiscal programs to identify and recommend actions to integrate Maryland's' emissions reductions goal and impacts of climate change, including consideration of sea-level rise, storm surges and flooding and make specific recommendations to existing programs that do not currently address climate change.

Maryland's Climate Action Plan includes two climate change adaptation strategies that are currently being used to guide state-level adaptation planning efforts. The first strategy (Phase I) addresses the impacts associated with sea level rise and coastal storms. (note this is a 2008 publication). The second strategy (Phase II) (note this is a 2011 document) released as a complement to the Climate Action Plan,

[1] Chapter 429 of 2015. Md. House Bill 514. Maryland Commission on Climate Change. http://mgaleg.maryland.gov/2015RS/bills/hb/hb0514E.pdf

[2] EO 01.01.2007.07 Commission on Climate Change. https://mde.maryland.gov/programs/Air/ClimateChange/MCCC/Publications/EO2007MCCC.pdf

[3] Chapter 429 of 2015. Md. House Bill 514. Maryland Commission on Climate Change. http://mgaleg.maryland.gov/2015RS/bills/hb/hb0514E.pdf

addresses changes in precipitation patterns and increased temperature, and the likely impacts to human health, agriculture, forest and terrestrial ecosystems, bay and aquatic environments, water resources, and population growth and infrastructure. The strategies provide the basis for guiding and prioritizing state-level activities with respect to both climate science and adaptation policy over the near and longer terms. A variety of projects designed to implement components of the strategies is well under way and additional efforts have been identified as high-priorities for early action.[4] Adaptation was also included as a Chapter in the July 2013 Greenhouse Gas Reduction Plan.[5]

A Coast Smart Council was established by statute in 2014 to establish siting and design criteria related to application of sea level rise and coastal flood impacts to the construction or reconstruction of certain State capital projects.[6] Membership in the Council includes cabinet level officers representing Natural Resources, Environment, General Services, Planning, Business and Economic Development, Critical Area Commission, Emergency Management, State University, and members representing local government, environmental and business interests. Legislation in 2018 and 2019 (Chapter 628 and 629 of 2018[7] and Chapter 442 of 2019[8]) amended Maryland's Coast Smart Construction Program, expanding the Council membership, and establishing guidelines and standards for construction of state projects or state-funded projects (including highways and local projects) within the "Coast Smart Climate Ready Action Boundary." The program includes provisions for development of local Nuisance Flood Plans. More information is provided in the appropriate sections below.

Science based standards

The 2008 comprehensive Maryland Climate Change Action Plan included an initial assessment of sea-level rise data for Maryland by the Commission's Scientific and Technical Working Group (STWG).[9]

[4] https://climatechange.maryland.gov/adaptation/

[5] https://climatechange.maryland.gov/wp-content/uploads/sites/16/2014/12/chap8_adaptation_final_lowres1.pdf

[6] Chapter 415 of 2014. Md. House Bill 615. http://mgaleg.maryland.gov/2014RS/Chapters_noln/CH_415_hb0615t.pdf

[7] Chapter 628 of 2018. Md. House Bill 1350. Sea Level Rise Inundation and Coastal Flooding – Construction, Adaptation, and Mitigation. http://mgaleg.maryland.gov/2018RS/bills/hb/hb1350E.pdf

[8] Chapter 442 of 2019. Md. House Bill 1427. Sea Level Rise Inundation and Coastal Flooding – Construction, Adaptation, and Mitigation. http://mgaleg.maryland.gov/2019RS/Chapters_noln/CH_442_hb1427t.pdf

[9] Maryland Commission on Climate Change. 2008. Climate Change Action Plan. Chapter 2. Comprehensive Assessment of Climate Change Impacts in Maryland. http://www.mde.state.md.us/programs/Air/ClimateChange/Documents/FINAL-Chapt%202%20Impacts_web.pdf

Subsequent updates were published in 2013[10] and 2016[11] with a statutory requirement (Chapter 429 of 2015) that the projections be updated every 5 years by the University of Maryland Center for Environmental Sciences (UMCES).[12] An update overseen by UMCES was completed in 2018.[13] The Maryland 2018 projections represent the consensus of an expert group from the Mid-Atlantic region and use the same probabilistic framework incorporating regional factors as that applied in New Jersey under the aegis of the New Jersey Climate Change Alliance's Science and Technical Advisory Panel[14], as well as that applied by for projections in Delaware, California, Oregon, and Washington.[15]

Statewide goals and indicators

With funding from NOAA through DNR, the University of Maryland Center for Environmental Science - Integration and Application Network is developing a suite of Maryland Climate Adaptation Indicators and Coastal Adaptation Report Card to assess where Maryland is on adaptation efforts and track progress in the years to come. The approach involves stakeholder workshops and feedback to identify which indicators are of highest priority for Marylanders. The indicators will provide the Maryland Commission on Climate Change, its working groups, state agencies, and others with an assessment tool for adaptation action in the state moving forward.

---

[10] Boesch, DF, LP Atkinson, WC Boicourt, JD Boon, DR Cahoon, RA Dalrymple, T Ezer, BP Horton, ZP Johnson, RE Kopp, M Li, RH Moss, A Parris, CK Sommerfield. 2013. Updating Maryland's Sea-level Rise Projections. Special Report of the Scientific and Technical Working Group to the Maryland Climate Change Commission, 22 pp. University of Maryland Center for Environmental Science, Cambridge, MD. http://www.umces.edu/sites/default/files/pdfs/SeaLevelRiseProjections.pdf

[11] Maryland Commission on Climate Change, Scientific and Technical Working Group. 2016. Re-examining Projected Climate Changes for Maryland. October 25, 2016. https://mde.maryland.gov/programs/Air/ClimateChange/MCCC/STWG/STWGRe-examinCC01252016.pdf

[12] Chapter 429 of 2015. Md. House Bill 514. Maryland Commission on Climate Change. http://mgaleg.maryland.gov/2015RS/bills/hb/hb0514E.pdf

[13] Boesch, D.F., W.C. Boicourt, R.I. Cullather, T. Ezer, G.E. Galloway, Jr., Z.P. Johnson, K. H. Kilbourne, M.L. Kirwan, R.E. Kopp, S. Land, M. Li, W. Nardin, C.K. Sommerfield, W.V. Sweet. 2018. Sea-Level Rise: Projections for Maryland 2018. 27 pp. University of Maryland Center for Enviornmental Science, Cambridge, MD. https://mde.maryland.gov/programs/Air/ClimateChange/MCCC/Documents/Sea-LevelRiseProjectionsMaryland2018.pdf

[14] Kopp et al. 2014. Probabilistic 21st and 22nd century sea-level projections at a global network of tide-gauge sites. Earth's Future. 2(8), 383-406. https://agupubs.onlinelibrary.wiley.com/doi/full/10.1002/2014EF000239

[15] Boesch, D.F., W.C. Boicourt, R.I. Cullather, T. Ezer, G.E. Galloway, Jr., Z.P. Johnson, K. H. Kilbourne, M.L. Kirwan, R.E. Kopp, S. Land, M. Li, W. Nardin, C.K. Sommerfield, W.V. Sweet. 2018. Sea-Level Rise: Projections for Maryland 2018. 27 pp. University of Maryland Center for Enviornmental Science, Cambridge, MD. https://mde.maryland.gov/programs/Air/ClimateChange/MCCC/Documents/Sea-LevelRiseProjectionsMaryland2018.pdf

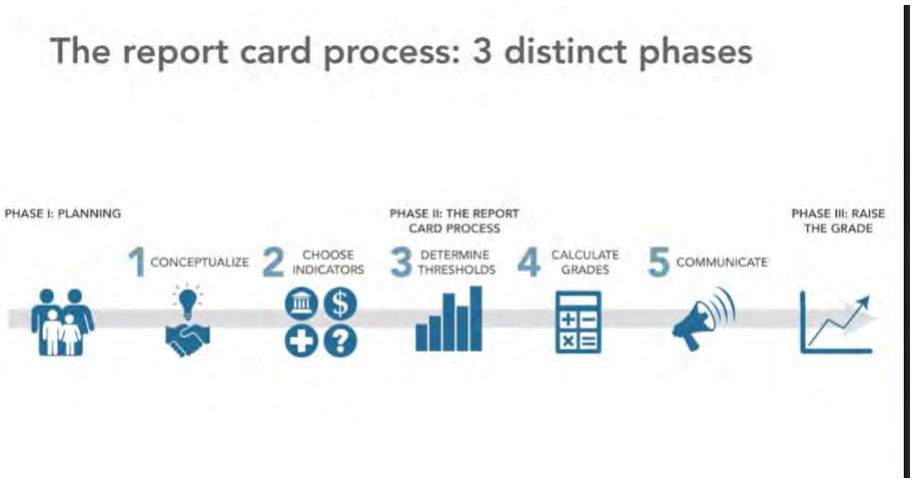


Image from Video on the Maryland Coastal Adaptation Report Card: https://drive.google.com/file/d/1yopJk6ooDyH7OZHE0rVPwnjFfUzvCSHy/view?ts=5f2456a

Maryland;s Mission MFR (Managing for Results) - The MFR strategic plan outlines each agency's mission, vision, goals, objectives and performance metrics. The MFR for MD DNR includes a climate change indicator: Cumulative number of Maryland's state agencies and coastal communities who have incorporated sea level and climate considerations into planning and management strategies. [16]

Data and tools

The MDOT SHA Climate Change Vulnerability Viewer can be used to determine which roadways will be flooded based on a specific likelihood of a storm event and indicates the depth of flooding associated with that event. Two types of data layers are provided: a) flooding depth on a roadway (Roadway Inundation) and b) depth of flooding over the land area (Flood Depth Grids).[17]

Maryland Coastal Atlas/Coastal Resiliency Assessment: Having an easy-to-use and transparent platform to share spatial information early in the planning process allows users to identify potential conflicts so that they can then be avoided or addressed. Spatial data are essential for many planning activities, including siting of renewable energy projects, designing restoration projects, and helping communities identify areas vulnerable to sea level rise, flooding, and erosion. The Atlas includes many data layers useful for planning for cimate change including a Wetland Adaptation Area Data layer and a Sea Level Rise Vulnerablity layer; Sea Level Rise Vulnerable Wetlands ; Priority Shoreline Areas; Marsh Protection Index etc. The newest layer, BUILD (Beneficial Use - Identifying Locations for Dredge), is helping planners match restoration projects with dredging to reduce costs and promote coastal resilience.[18]

---

[16] https://dbm.maryland.gov/budget/Documents/operbudget/2022/agency/Managing-for-Results-Strategic-Plans-FY2022.pdf

[17] https://maryland.maps.arcgis.com/apps/webappviewer/index.html?id=86b5933d2d3e45ee8b9d8a5f03a7030c&extent=-8873057.8749%2C4570795.8131%2C-8407709.2467%2C4826706.9838%2C102100

[18] https://dnr.maryland.gov/ccs/coastalatlas/Pages/default.aspx

Several data layers were developed as part of a Statewide Coastal Resiliency Assessment to inform coastal conservation and restoration decisions. The assessment results include:

- Natural Features Analysis - The assessment ranked how vulnerable different stretches of shoreline are to hazards by examining six factors: geomorphology (shoreline type e.g., sand, mud, or manmade structure), elevation, sea level rise, wave power, storm surge height, erosion rate, and the presence or absence of beneficial natural habitats.
- The Coastal Community Flood Risk Areas rank residential areas from very low to very high risk based on probability of exposure to a flood event, population density, and social demographics (age, income, and language proficiency).
- Marsh Protection Potential Index -The assessment took many natural habitats into account, but marshes are some of the most effective buffers against wave damage, storm surge, and other types of coastal hazards. Some marshes are better equipped or situated, however, to perform these functions. To better document the benefits of existing marshes, the assessment analyzed and ranked individual stretches of marsh according to their size, proximity to hazards, proximity to people, proximity to other protective habitats, and how a marsh is expected to persist over changing conditions in the future.
- The Priority Shoreline Areas identify Tier 1 and Tier 2 priorities for conservation and restoration actions. Tier 1 and Tier 2 shorelines represent areas where habitats have the potential to play a high or moderate role in risk reduction, respectively, for adjacent coastal communities. [19] [20]

Maryland has launched MyCoast Maryland, a citizen science program to document flooding throughout the state.[21] Information collected through this site is used to visualize the impacts of flood events; to enhance awareness among decision-makers and residents of Maryland and to encourage action to reduce flood risks.[22] Through a smart phone app, anyone can submit photographs that document flooding in Maryland (including date/time/location reports pulled from the smart phone) and linked to the nearest tide gage. Maryland is the first state to include not only tidal flooding but also riverine flooding in this tool. The tool includes nuisance tidal flooding; flooding from precipitation and stormwater inland; coastal storm damage; and under development is a restoration tool that will be used to document state supported Resiliency Through Restoration projects in communities.[23] [24]

Recent/Ongoing Studies to Develop Data Highlighted in the ARWG FY20 Workplan

Th**e Installation of Tide Gauges in Somerset and Talbot Counties v**ia a partnership with DNR, Maryland Emergency Management Agency, United States Geological Survey, Somerset and Talbot Counties in Crisfield and Claiborne expanded the network of gauges throughout the Chesapeake Bay measuring water levels. The two new gauges fill a data gap and will allow for more local and accurate reporting of water levels ongoing and during flood events thereby providing critical information to help reduce flood hazards.[25]

[19] https://dnr.maryland.gov/ccs/Documents/CRAssessment-One-Sheet.pdf
[20] https://dnr.maryland.gov/ccs/coastalatlas/Pages/CoastalResiliencyAssessment.aspx
[21] Land, Sasha. 2021. Personal communication.Maryland Department of Natural Resources.
[22] https://mycoast.org/md
[23] https://mycoast.org/md
[24] Land, Sasha. 2021. Personal communication. Maryland Department of Natural Resources.
[25] https://mde.maryland.gov/programs/Air/ClimateChange/MCCC/ARWG/ARWG%202020%20Work%20Plan.pdf

DNR is a participating investigator in a grant, **Evaluating an Adaptation Strategy to Enhance Coastal Marsh Resilience: Thin Layer Sediment Placement.** The grant aims to gather data to inform thin-layer placement as a restoration technique to promote marsh resilience in the face of sea level rise. Through this project, replicated restoration experiments are being conducted at several reserve sites across the nation, with the purpose of examining the effectiveness of thin-layer sediment placement as a marsh adaptation strategy. Novel aspects of the project include the broad distribution of sites, the examination of the effectiveness of thin-layer sediment placement at different marsh elevations, a standardized monitoring protocol and the incorporation of biochar (carbon material produced through the conversion of biomass in an oxygen limited environment) to improve soils and plant health. Monitoring guidance developed as part of this study is now being used to inform a marsh enhancement project with the Army Corps of Engineers on the Deal Island Wildlife Management Area. [26]

Maryland's Ecological Effects of Sea Level Rise Project is monitoring and modeling the wave attenuation and flood reduction benefits of marshes, seagrass and other nature-based features. This three-year project will quantify the protective services of Maryland's natural features and investigate how those services may change as sea levels rise. Wave, water level, and current sensors were deployed in the summer of 2020 and DNR engaged state, federal and local partners through a Management Transition Advisory Group. This study expands on previous monitoring conducted in Somerset County and will assist managers with identifying restoration needs and priorities in areas where natural features can enhance community resiliency to climate change impacts.[27]

Addressing Increased Precipitation at the Local Level: Maryland's average annual precipitation is projected to increase by 10% over the current average by the year 2100. The frequency of extreme precipitation events is also anticipated to increase. Existing gray infrastructure (e.g. stormwater systems) and green infrastructure investments (e.g. water quality BMPs) may not be able to effectively manage these increases. Computer models, such as those used by the Chesapeake Bay Program Partnership, are now being used to predict possible changes to precipitation regimes resulting from climate change. Continuing in 2020, MDE, DNR, and other partners will assess the ability of these models to predict climate change impacts on precipitation, with a focus on design storms. This could help Maryland communities better assess their localized flood risks and plan to become more resilient to precipitation-induced flooding.[28]

Deployment of **Continuous Monitoring and Adaptive Control (CMAC) Retrofits for Flood Control i**n Howard County not only provides cost-efficient water quality management in compliance with MS4 permit requirements but also supports sound water quality management and reduces flood hazards. With funding from DNR, Howard County partnered with OptiRTC to assess and develop a prioritization methodology for determining locations for the technology.[29]

---

[26] https://mde.maryland.gov/programs/Air/ClimateChange/MCCC/ARWG/ARWG%202020%20Work%20Plan.pdf

[27] https://mde.maryland.gov/programs/Air/ClimateChange/MCCC/ARWG/ARWG%202020%20Work%20Plan.pdf

[28] https://mde.maryland.gov/programs/Air/ClimateChange/MCCC/ARWG/ARWG%202020%20Work%20Plan.pdf
[29] https://mde.maryland.gov/programs/Air/ClimateChange/MCCC/ARWG/ARWG%202020%20Work%20Plan.pdf

As part of **MDOT Mayland Port Administration's "Strategy for Resiliency in the Face of Climate Change,"** the Fairfield Marine Terminal Wet Basin Redevelopment Project filled in an obsolete wet basin. A storm water management and sand filtration system was constructed in 2019 to capture and filter 14 acres of stormwater runoff. The construction also elevated the terminal area to protect cargo from future sea level rise and extreme weather flooding events.[30]

Regulatory Standards

Coast Smart siting and design criteria apply to certain State and local capital projects that involve the construction of a structure or highway facilities, have a cost of $500,000 or more and are funded with at least 50% State funds. Additionally, the vulnerable areas within which the Coast Smart siting and design criteria apply have been updated to include areas outside of the Special Flood Hazard Area (as was initially required by the original statute). In determining vulnerable areas, DNR and the Maryland Department of Environment (MDE) developed a mapping layer referred to as the Coast Smart Climate Ready Action Boundary (CS-CRAB). All applicable projects located waterward of this boundary are required to comply with the Coast Smart practices.[31]

All units of State and local government that construct applicable capital projects are subject to the Program. Coast Smart means a construction practice in which preliminary planning, siting, design, construction, operation, maintenance, and repair of a structure or highway facility avoids or minimizes future impacts associated with coastal flooding and sea level rise inundation. Coast Smart includes both siting and design criteria that are applicable throughout the entire lifecycle of a project. Qualifying Agencies are not required to implement siting and design criteria for temporary access points or erosion control measures so long as those practices do not constitute a "structure" or new "highway facility," as those terms are defined in § 3-1001 of the Natural Resources Article.[32]

i. State and Local Capital Projects That Include the Construction or Reconstruction of a Structure If a State or local capital project, for which at least 50% of the project costs are funded with State funds and which costs $500,000 or more, includes the construction of a new structure or reconstruction of a structure with substantial damage, the structure shall be constructed or reconstructed in compliance with the Coast Smart siting and design criteria.

● A "structure" is defined as a walled or roofed building; a manufactured home; or a gas or liquid storage tank that is principally above ground.

● "Substantial damage" means damage caused by any source that is sustained by a structure such that the cost of reconstruction to its before-damaged condition is at least half of the structure's replacement cost before the damage occurred. ii. State and Local Capital Projects That Include the Construction of a Highway Facility Beginning on July 1, 2020, if a State or local capital project includes the construction of a highway facility, where at least 50% of the project costs are funded with State funds and which costs $500,000 or more, the highway facility shall be constructed in compliance with the Coast Smart siting and design criteria.

[30] https://mde.maryland.gov/programs/Air/ClimateChange/MCCC/ARWG/ARWG%202020%20Work%20Plan.pdf
[31] https://dnr.maryland.gov/climateresilience/Documents/2020-Coast-Smart-Program-Document-FINAL.pdf
[32] https://dnr.maryland.gov/climateresilience/Documents/2020-Coast-Smart-Program-Document-FINAL.pdf

● "Highway facility" is defined in § 3-101(f)(2) of the Transportation Article as any one or more or combination of projects involving the rehabilitation and reconstruction of highways in the State highway system to meet present and future needs and the development and construction in new locations of new highways necessitated by traffic demands to become parts of the State highway system, including federally-aided highway projects partially funded by this State and all incidental property rights, materials, facilities, and structures.

● "Construction of a Highway Facility" is limited to new State and local highway facilities and does not include projects involving the rehabilitation and reconstruction of existing highways.

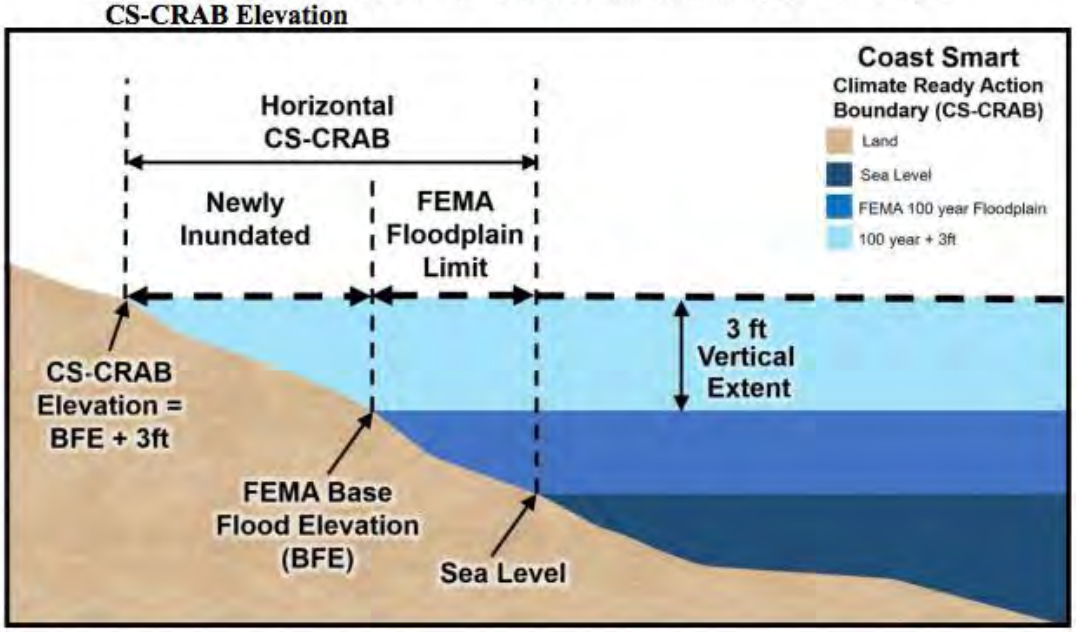
ii. Coast Smart Climate Ready Action Boundary (CS-CRAB) and CS-CRAB Elevation

Under Natural Resources Article § 3-1009(c), the Council, in consultation with DNR and MDOT, is required to establish Coast Smart siting and design criteria to address sea level rise inundation and coastal flood impacts on State and local capital projects. A component of this requirement is that structures and highway facilities "be designed and constructed or reconstructed in a manner to withstand the storm surge from a storm that registers as a Category 2 on the Saffir-Simpson hurricane wind scale, including a requirement for structures to be constructed or reconstructed at a minimum elevation above the projected storm surge."

As background, Storm Surge Inundation Maps (SSIMs) are created as one component of a Hurricane Evacuation Study and as such are traditionally used for identifying hurricane evacuation zones. According to the Federal Emergency Management Agency (FEMA), SSIMs 5 are not meant to be used for regulatory or insurance purposes. Storm surge heights are influenced by many factors, including hurricane intensity, size, forward speed, the angle of approach to the shoreline, astronomical high tide level, and local geographic features. SSIMs do not include consideration of wave action or probability. In reviewing the SSIMs and a variety of different storm scenarios, the Council's expert workgroup determined that the use of the SSIMs would not adequately characterize flood risk or accurately predict where the water may go. Due to the limitations of the SSIMs and the infeasibility of mapping a consistent, minimum elevation above a projected storm surge, the Council reviewed a variety of alternative mapping scenarios. To address inundation from long-term sea level rise risks and short-term storm effects, the Council adopted the use of a mapping layer that uses the 100-year FEMA floodplain elevations, also referred to as the Base Flood Elevation. The FEMA floodplain maps are produced in support of the National Flood Insurance Program (NFIP). In contrast to the SSIMs, the FEMA floodplain maps are regulatory documents that identify areas of possible inundation due to both riverine and coastal flooding. Flood inundation areas shown on FEMA mapping for coastal areas are based on storm surge and wave action (where applicable), and are tied to localized shoreline and elevation data. The FEMA mapping products have a documented methodology for determining a regulatory Base Flood Elevation that is used for State and local floodplain management and construction purposes. After evaluating a variety of mapping scenarios, the Council found that adding a 3-foot vertical extent above the 100-year FEMA floodplain elevations, also referred to as the Base Flood Elevation, would address the footprint of a Category 2 storm surge and would include areas inundated by an at least 2-foot rise in sea level. This also allows the Council's approach to be tied to existing floodplain regulations and to MDE's and DNR's existing reviews of State Clearinghouse projects and provides more precision for determining minimum elevation criteria. This method, which conveys resiliency by adding a vertical extent above the Base Flood Elevation, is currently the most technologically feasible and accurate approach for addressing and implementing the statutory requirement. As data improves, the Council will periodically review this mapping methodology to ensure that it remains as accurate as possible. The

Council's mapping approach resulted in the development of the CS-CRAB and the CSCRAB Elevation. The "CS-CRAB Elevation" means a selected flood elevation fixed at the Base Flood Elevation plus a 3-foot vertical extent. The CS-CRAB is the corresponding horizontal floodplain created by the CS-CRAB Elevation. See Figure 1 below:

FIGURE 1: Coast Smart Climate Ready Action Boundary (CS-CRAB) & CS-CRAB Elevation



Coast Smart Criteria Incorporation

The Coast Smart Criteria are to be incorporated into **the Maryland Procedure Manual for Professional Services** for design and preparation of contract documents for capital projects involving the construction, alteration or renovation of State buildings with an estimated construction cost greater than $2 million. It is intended that the procedures also be followed to the fullest extent practicable for other State public improvements such as facilities renewal projects, special structures, roads, utilities, and site improvements. The Coast Smart program requirements are to be incorporated into **Facility Program Manual by the Maryland Department of Budget and Management and DGS**; Section 3-602(d) of the State Finance and Procurement Article of the Annotated Code of Maryland requires that before an appropriation may be authorized for a capital project, the unit of State government requesting the appropriation shall submit a facility program justifying the project and describing, in detail, the scope and purpose of the project. The Facility Program Manual defines and describes the content of a facility program; provides instruction on the preparation of a facility program; and provides information regarding facility program submission requirements. The Coast Smart Construction Criteria are to be incorporated into all **State Hazard Mitigation Plan updates and into the State Disaster Recovery Plan**.[33]

Maryland Critical Area Commission: State projects in within 1,000 feet of the tidal waters of the Chesapeake Bay. State agencies that propose development in the **Critical Area on State owned lands** are required to seek review and approval by the Critical Area Commission for that development per

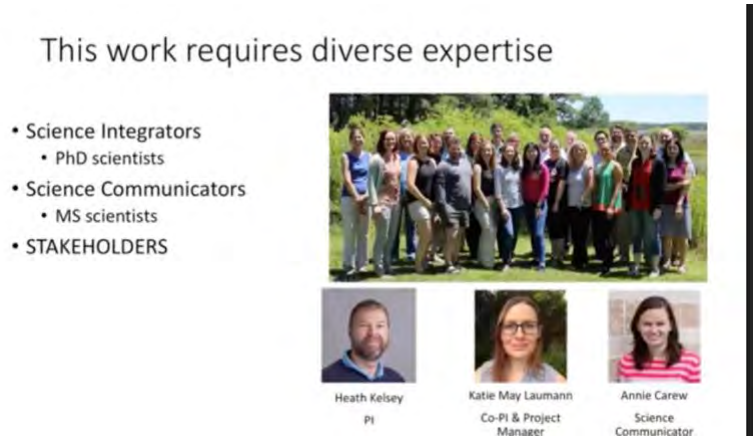
[33] https://dnr.maryland.gov/climateresilience/Documents/2020-Coast-Smart-Program-Document-FINAL.pdf

COMAR 27.02.05. This includes projects that meet the Coast Smart Construction thresholds as well as other projects on state lands. Information demonstrating consideration of climate resiliency and applicable Coast Smart Construction Program documentation should be included in State Project Submittals to the Critical Area Commission. A Climate Resilience Checklist is included in the project application materials. [34]

Public education

Maryland Commission on Climate Change maintains an up-to-date website, posts its quarterly meetings, Annual reports, as well as meetings of its working groups. There is a working group on Education, Communication and Outreach.

At the Adaptation and Resiliency Work Group's website, it posts a video describing development of the Maryland Coastal Adaptation Report Card (however one must request access to view the video).[35] The report card is developed by a team that includes a science integrator, science communicator, and stakeholders:



B. Local government

Program elements

As noted above **Coast Smart Council and Coast Smart Construction Program** : Construction of state and local capital projects and highways that meet the funding threshold of 50% of state funds and ≥ $500K and within the SFHA AND a Coast Smart Climate Ready Action Boundary. (Discussed further in State sections).

Nuisance Flooding: Local jurisdictions that experience Nuisance flooding are required to develop nuisance flooding plans under Maryland Statutes Sea Level Rise Inundation and Coastal Flooding –

[34] https://dnr.maryland.gov/criticalarea/Documents/form/StateProjectChecklist.pdf
[35] https://mde.maryland.gov/programs/Air/ClimateChange/MCCC/Pages/ARWG.aspx

Construction, Adaptation, and Mitigation (Chapter 628 and 629 of 2018[36] and Chapter 442 of 2019[37]), post to their local website, submit their plans to Maryland Dept of Planning, and update them every 5 years. The plans are to be updated every 5 years. Nuisance flooding is defined as "high tide flooding that causes public inconvenience." Nuisance flooding definition is not limited to high tide flooding, incudes fluvial, pluvial, and oceanic flooding. [38]

MD DNR; MD Dept of Planning, and workgroup of state and local partners developed a guidance document for Nuisance Flooding Plans. [39] The workgroup recommends that nuisance plans include three critical components to establish flooding baselines:

- Inventory of known flood hazard areas where tidal nuisance flooding occurs;
- Identification of flood thresholds/water levels/conditions that lead to tidal nuisance flooding;
- A mechanism to document tidal nuisance flood events and response activities from 2020–2025.

These three components will enable a jurisdiction to understand the extent of nuisance flooding, create a baseline inventory in 2019/2020 of conditions contributing to nuisance flooding and, over the next five years, document the number and location of nuisance flood events. Documentation and tracking is important to catalog the number of occurrences and severity over time to catalyze response and risk reduction actions. [40] The guidance document recommends that all jurisdictions, including municipalities, within Maryland's Coastal Zone develop an NFP even if they do not meet the requirements of the legislation. [41]

Existing plans and processes or components of such plans in a jurisdiction may meet the NFP requirement or could be used to meet the requirements in the next update of the plan or program. These extant plans could include a Flood Mitigation Plan, a Hazard Mitigation Plan, a Critical Area program, a Green Infrastructure Plan; a Comprehensive Plan. Various elements of extant plans could be brought together to meet the NFP requirement.[42] For the 2021 update to the State Hazard Mitigation Plan, Maryland will evaluate how to incorporate nuisance flooding. This could then be used as a guide for updates to local HMPs should a jurisdiction opt to incorporate nuisance flood plans into their HMPs.[43]

Maryland Critical Area Program

---

[36] Chapter 628 of 2018. Md. House Bill 1350. Sea Level Rise Inundation and Coastal Flooding – Construction, Adaptation, and Mitigation.
http://mgaleg.maryland.gov/2018RS/bills/hb/hb1350E.pdf

[37] Chapter 442 of 2019. Md. House Bill 1427. Sea Level Rise Inundation and Coastal Flooding – Construction, Adaptation, and Mitigation.
http://mgaleg.maryland.gov/2019RS/Chapters_noln/CH_442_hb1427t.pdf

[38] https://mdplanningblog.com/2019/11/20/maryland-departments-of-natural-resources-and-planning-team-up-on-nuisance-flood-planning-guidance/#:~:text=Maryland%20House%20Bill%201427%20(Chapter,plan%20to%20address%20nuisance%20flooding

[39] https://dnr.maryland.gov/ccs/Documents/NuisanceFloodPlan.pdf

[40] https://dnr.maryland.gov/ccs/Documents/NuisanceFloodPlan.pdf

[41] https://dnr.maryland.gov/ccs/Documents/NuisanceFloodPlan.pdf

[42] https://dnr.maryland.gov/ccs/Documents/NuisanceFloodPlan.pdf

[43] https://dnr.maryland.gov/ccs/Documents/NuisanceFloodPlan.pdf

Guidance for local planners who want to consider incorporation of coastal resilience and sea level rise in their local Critical Areas Program (areas within 1,000 feel of the tidal waters of the Chesapeake and Atlantic Bays) has been developed by the Maryland DNR.[44]

Authority

Coast Smart and Nuisance Flooding through both Chapter 628 and 629 of 2018[45] and Chapter 442 of 2019[46] as described below in State Programs section.

Maryland Critical Area Program through Title 27 Critical Area for the Chesapeake and Aatlatnic Coastal Bays.[47]

Funding

Nuisance Flood Plans: Maryland DNR provides technical and financial assistance to communities to meet the requirement to develop a NFP through the Maryland Department of Natural Resources.[48]

Non-financial resources

Nuisance Flood Plans: To assist local jurisdictions in assessing their nuisance flooding risks and to publish guidelines on ways to complete the plan requirement, the Maryland Department of Natural Resources (DNR), with assistance from the Department of Planning (Planning) and a workgroup of other state and local partners, developed a guidance document for jurisdictions to use when developing nuisance flooding plans. The guidance provides general direction and assistance with a local jurisdiction's decision-making process in meeting the requirement.[49]

Nuisance Flood Plans: The Eastern Shore Land Conservancy has developed a template that a jurisdiction can utilize to either amend existing planning documents or as a standalone plan. For more information, please contact Jim Bass at jbass@eslc.org or (410) 690-4603. Kent County, with the assistance of the Eastern Shore Land Conservancy, created a nuisance flooding plan that is available in Appendix I, and can serve as an example of how one jurisdiction chose to meet the NFP requirement.[50]

---

[44] DeWeese, A. et al. 2017. Critical Area Coastal Resilience Planning Guide. 2017. Critical Area Commission for the Chesapeake and Atlantic Coastal Bays. http://dnr.maryland.gov/criticalarea/Documents/Coastal_Resilience_Planning_Guide.pdf

[45] Chapter 628 of 2018. Md. House Bill 1350. Sea Level Rise Inundation and Coastal Flooding – Construction, Adaptation, and Mitigation. http://mgaleg.maryland.gov/2018RS/bills/hb/hb1350E.pdf

[46] Chapter 442 of 2019. Md. House Bill 1427. Sea Level Rise Inundation and Coastal Flooding – Construction, Adaptation, and Mitigation. http://mgaleg.maryland.gov/2019RS/Chapters_noln/CH_442_hb1427t.pdf

[47] http://www.dsd.state.md.us/comar/subtitle_chapters/27_Chapters.aspx

[48] https://dnr.maryland.gov/ccs/Documents/NuisanceFloodPlan.pdf

[49] https://mdplanningblog.com/2019/11/20/maryland-departments-of-natural-resources-and-planning-team-up-on-nuisance-flood-planning-guidance/#:~:text=Maryland%20House%20Bill%201427%20(Chapter,plan%20to%20address%20nuisance%20flooding

[50] https://dnr.maryland.gov/ccs/Documents/NuisanceFloodPlan.pdf

Coordination with other programs

Nuisance Flood Plans: The Maryland Department of Natural Resources has launched the MyCoast citizen science tool to document nuisance flooding including both tidal flooding and precipitation-based flooding. Citizens can take a photo with their smart phones and the application can pull information from smart phones that document the location, date and time and links to the nearest tide gage.[51] Maryland tool is working with state and local partners to launch an efficient and effective tool to document nuisance flood events. This tool is meant to aid in flood documentation over the next five years (2020-2025). [52] Also, an example Nuisance Flood Plan for Kent County expressed the importance of coordination across programs within the County (planning, public works, emergency management, GIS) as well as with agencies such as the local forecasting office of the National Weather Service. [53]

C. State agencies and state investment

Program elements

Maryland's Climate Change Action Plan addresses both greenhouse gas emissions reduction and climate adaptation developed under the auspices of the Maryland Commission on Climate Change. See "Background" for additional information already noted. This section identifies some specific program elements not already presented.

First thru Executive Order[54] and now mandated through legislation[55], Maryland state agencies are required to review their planning, regulatory and fiscal programs to identify and recommend actions to integrate Maryland's' emissions reductions goal and impacts of climate change, including consideration of sea-level rise, storm surges and flooding and make specific recommendations to existing programs that do not currently address climate change. These elements have been described above and additional are described below.

Community Resilience Grants / Resiliency through Restoration funding promotes and supports comprehensive, holistic planning and implementation projects that address both water quality and quantity issues. Through these projects, DNR is helping Maryland communities become more resilient to flood risks and enhance the protection and management of the state's resources including the Chesapeake Bay and the ocean. Projects funded in 2020 included risk reduction planning in Princess Anne, Calvert County, Talbot County, Dorchester County, Montgomery County and Cecil County, and implementation projects in Anne Arundel and St. Mary's counties. This work continues a decade-long

[51] Land, Sasha. 2021. Personal Communication. Maryland Department of Natural Resources.
[52] https://dnr.maryland.gov/ccs/Documents/NuisanceFloodPlan.pdf
[53] https://dnr.maryland.gov/ccs/Documents/NuisanceFloodPlan.pdf
[54] EO 01.01.2007.07 Commission on Climate Change. https://mde.maryland.gov/programs/Air/ClimateChange/MCCC/Publications/EO2007MCCC.pdf

[55] Chapter 429 of 2015. Md. House Bill 514. Maryland Commission on Climate Change. http://mgaleg.maryland.gov/2015RS/bills/hb/hb0514E.pdf

effort to provide support to local communities to assess risk, plan risk-reduction efforts and implement projects. [56]

Three separate funding sources (leveraging state and federal funds) are managed cohesively to help local communities become more resilient to flooding hazards, from initial risk assessments through on-the-ground restoration. This program supports work in three phases: Understand, Plan, or Implement. Each phase reflects where a local community may be in preparedness, andis meant to build upon complementary tasks such as community engagement. A streamlined one-stop grant portal is available thru Maryland's Chesapeake and Coastal Grants Gateway. [57]

- CoastSmart Communities is supported by funding from the National Oceanic Atmospheric Administration (NOAA) and helps local communities understand and plan for coastal impacts, such as storm surge, shoreline erosion, sea level rise, and nuisance flooding.

- Green Infrastructure Resilience is supported by funding from the Environmental Protection Agency and helps local communities understand and plan for stormwater and riparian flooding hazards.

- Resiliency through Restoration Initiative is supported by state capital funds and helps local communities design and implement natural and nature-based resilience projects. [58]

Maryland Critical Area Commission: As noted previously, State agencies that propose development on State owned lands in the Critical Area (within 1,000 feet of the tidal waters of the Chesapeake Bay) are required to seek review and approval by the Critical Area Commission for that development per COMAR 27.02.05. This includes projects that meet not only the Coast Smart Construction thresholds, but other projects on state lands. As previously noted, information demonstrating consideration of climate resiliency and applicable Coast Smart Construction Program documentation should be included in State Project Submittals to the Critical Area Commission. A Climate Resilience Checklist is included in the project application materials. [59]

Maryland Model Floodplain Ordinance (last dated 2018) provides a food protection elevation of BFE plus 2 feet of freeboard and notes that freeboard is a factor of safety that compensates for uncertainty in factors that could contribute to flood heights greater than the height calculated for a selected size flood and floodway conditions, such as wave action, obstructed bridge openings, debris and ice jams**, climate change,** and the hydrologic effect of urbanization in a watershed. [60]

[56] https://mde.maryland.gov/programs/Air/ClimateChange/MCCC/Documents/MCCCAnnualReport2020.pdf
[57] https://dnr.maryland.gov/ccs/Pages/funding/grantsgateway.aspx
[58] https://dnr.maryland.gov/ccs/coastsmart/Pages/grants.aspx
[59] https://dnr.maryland.gov/criticalarea/Documents/form/StateProjectChecklist.pdf
[60] https://mde.maryland.gov/programs/Water/FloodHazardMitigation/Documents/www.mde.state.md.us/assets/document/flood_hazards/MD_Model-FPMO_Ordinance_January2018.pdf

Historic and Archeological Resources. Maryland Historical Trust published The Flood Mitigation Guide: Maryland's Historic Buildings as a "road map" to help local governments and preservation advocates protect historic properties in their communities from flooding, as well as provides information about what communities can do before, during, and after a flood to ensure historic preservation is considered in the ongoing process of emergency management.[61]

In 2019, Maryland Historical Trust published "Planning for Maryland's Flood-Prone Archeological Resources" to aide local planners and local government efforts to identify archeological resources and sites in flood-prone areas and how flooding can affect such sites as well as considerations for protecting or examining such sites and options for resources that may not be able to be saved**.** [62]

Maryland's **Stateside Program Open Space scorecard** was updated to evaluate potential acquisition of properties for their coastal community resilience to climate change benefits. These benefits are provided by areas along the shoreline where natural habitats, such as marshes and coastal forests, have the potential to reduce the impact of coastal hazards to the adjacent coastal communities by dampening waves, stabilizing sediment and absorbing water. This recent enhancement complements existing land conservation criteria that avoids conserving lands that will be inundated by sea-level rise and targets adaptation areas important for wetland migration. The Stateside Program Open Space scorecard provides the ecological, resiliency and management justification that Maryland's Board of Public Works relies upon to approve acquisitions.[63]

Resilient Maryland Program launched in FY20, provides the opportunity to identify potential ways to incorporate clean and distributed energy resources into organization energy management plans that meet energy resilience, sustainability, affordability, and efficiency goals. The program provides funds for completion of the planning and design of DER systems including community and campus microgrids, resilient facility power systems, advanced combined heat and power (CHP) systems, and community resiliency hubs.

The program is offered to all types of entities across the State of Maryland seeking clean, efficient, resilient energy solutions. Eligible entities include but are not limited to: local governments seeking to bolster essential services (e.g. fire, rescue, emergency shelters, etc.); economic development districts seeking to attract new industries, academic organizations, businesses seeking high quality energy (e.g. biotech, datacenters, etc.); multifamily housing communities (e.g. senior housing, advanced care facilities, vulnerable populations, etc.); hospitals and medical facilities where failure is not an option; electric vehicle charging sites; and others. Resilient Maryland provides direct funding for project planning and design and connects eligible projects with other MEA programs that provide funding for equipment or installation. MEA will provide crucial funding for planning and design costs of a planned DER system after careful consideration by the program Review Committee, subject to maximum award amounts for each Area of Interest (AOI).[64] Four main AOIs (types of DER systems): community/campus microgrid; resilient facility power system; advanced CHP system; community resiliency hub. Grantees receive funds for final project deliverables: Detailed Feasibility Report; Preliminary Engineering & Designs; 20-Year Pro Forma Financial Model; Greenhouse Gas Reduction Report; Implementation

[61] https://mht.maryland.gov/documents/PDF/plan/floodpaper/2018-06-30_MD%20Flood%20Mitigation%20Guide.pdf
[62] https://mht.maryland.gov/documents/PDF/archeology/Archeo-Flood-Paper.pdf
[63] https://mde.maryland.gov/programs/Air/ClimateChange/MCCC/Documents/MCCCAnnualReport2020.pdf
[64] https://energy.maryland.gov/business/pages/ResilientMaryland.aspx

Barriers Report. LMI benefits are part of evaluation criteria; grantees will be prepped for equipment procurement and system installation. In FY20, 14 projects awarded for $1.05 million in state investment.[65]

Funding/Financing Resilient Maryland program: The funding from this program comes from MEA's Strategic Energy Investment Fund (or "SEIF" for short), which receives proceeds from the Regional Greenhouse Gas Initiative (RGGI) as well as several other sources, including alternative compliance payments (ACPs) which are paid by entities that fall short of meeting their annual Renewable Portfolio Standard (RPS) goals. MEA has a suite of incentive programs that are designed to further the installation of clean energy, energy efficiency, and resilient energy technologies. See Business Incentives, State and Local Incentives, Transportation Incentives, and Residential Incentives webpages. Projects which are awarded Resilient Maryland funds will have an excellent opportunity to apply to equipment and installation incentives, as they'll have all of the necessary design deliverables required to put forth strong proposals.[66]

65 https://energy.maryland.gov/business/Documents/FY21%20MEA%20Resilient%20Maryland%20Informational%20Webinar%20Slides.pdf

66 B. Bowser, Maryland Energy Administration. 2021. Personal communication.

Source: MEA[67]

Senate Bill 320 (Bay Restoration Fund) was signed into law on May 26, 2004 to provide a dedicated source of funds (financed by wastewater treatment plant users) to upgrade wastewater treatment plants which are one of the top three contributors to water quality decline in the Chesapeake Bay. [68] Pursuant to 2020 legislation, Bay Restoration Wastewater Funds are now available for Climate Resiliency and Flood Control grants to local governments for stormwater management measures that include volume or quality control stormwater measures relating to water quality, climate resiliency, or flood control. [69] These funds will cover 50% of the project costs and the local government must have a system of charges to fully fund the implementation of the stormwater management program.[70] For scoring purposes, additional points are awarded to an eligible project that provides flood control and assist in mitigating repeated flooding events (more than once in a five year period) that threaten public safety as confirmed by documentation submitted by the applicant (this can include FEMA maps, studies, etc.). [71] Additional points are awarded a project that can be presumed to mitigate public health and safety hazards posed by water quality problems, flooding, and climate change. (explanation, but no documentation, required) as well as for projects with co-benefits related to Climate Mitigation, Adaptation and Resiliency (e.g., increasing the resilience of treatment works to extreme weather events and sea-level rise, projects that provide for an energy use reduction or alternate energy generation, pojects that reduce risk of flood or coastal hazards).[72] Maryland also refers to the list of climate resilience for treatment works projects U.S. EPA has cited in its Overvies of Clean Water State Revolving Fund Eligibilities. [73]

---

67 https://energy.maryland.gov/business/Documents/FY21%20MEA%20Resilient%20Maryland%20Informational%20Webinar%20Slides.pdf

68 https://mde.state.md.us/programs/Water/BayRestorationFund/Pages/Index.aspx

69 Maryland House Bill 78. https://legiscan.com/MD/text/HB78/2020.

70 Dietz, Elaine. 2021. Personal communication. Maryland Department of the Environment.

71 Dietz, Elaine. 2021. Personal communication. Maryland Department of the Environment.

72 Maryland Department of the Environment. Integrated Project Priority System for Water Quality Capital Projecxts Point Sources and Nonpoint Sources. Accessed March 29, 2021.
Available at
https://mde.maryland.gov/programs/Water/WQFA/Documents/FINAL%20WQ%20IPPS%20Rev%205.pdf .

73 U.S. Environmental Protection Agency. 2016. Overview of Clean Water State Revolvoing Fund Eligibilities.

Related/Relevant/Emerging Statewide Programs Highlighted in the FY20 ARWG Workplan

Integrating Climate Change into the Phase III Watershed Implementation Plan - The ARWG and partners will continue to work with the Chesapeake Bay Program Phase III Watershed Implementation Plan (WIP) teams to determine how best to account for additional nutrient and sediment loads resulting from climate change. Through this engagement, ARWG members and partners will provide updates on activities that are listed in Maryland's WIP and milestones to ensure that comprehensive activities and progress on climate change efforts are adequately captured. Maryland's Phase III Watershed Implementation Plan (WIP)6 was submitted to EPA in August. [74]

Saltwater Intrusion Plan. In compliance with the passage of House Bill 1350/Senate Bill 1006 in 2018 and House Bill 1427 in 2019, the Maryland Department of Planning (MDP) published "Maryland's Plan to Adapt to Saltwater Intrusion and Salinization" in December 2019.[75] ARWG members reviewed and provide input during 2019. In 2020, the ARWG will support the Maryland Department of Planning in furthering the recommendations set forth in the final plan.[76]

Building Financial Resilience: Continuing discussions from 2019, ARWG will engage in discussions around building financial resilience. The Department of General Services (DGS) currently is at an exploratory stage on developing Capital Improvement Plans and Operation & Maintenance Strategies for state buildings using Asset Management as a decision-making tool. This initiative could be expanded to include the development of Climate Change Response Plans utilizing the same tool. The Response Plans could create a framework for evaluating climate change impacts on levels of service, risk and cost; optimizing climate change response projects; and identifying the best long-term funding strategies. This initiative, combined with initiatives from other ARWG partners, could build financial resilience for the state's buildings and infrastructure. [77]

Resiliency Opportunity Zones (ROZs) have been developed to define areas with restoration and conservation potential that provide high value resiliency benefits for communities, economies, public lands and important ecosystems.[78] Candidate ROZs are identified within watershed based on DNR priority assets (important ecosystems, resource-based economies, state lands); climate change impact areas (e.g., exposure to inland and coastal flooding and sea level rise); and opportunities for natural and nature-based feature projects (conservation and restoration suitability).[79] In close coordination with climate affected communities and public/private/non-profit sectors, a portfolio of projects within these zones, solicited through Grants Gateway, will be assembled that work together to avoid random acts of

[74] https://mde.maryland.gov/programs/Air/ClimateChange/MCCC/ARWG/ARWG%202020%20Work%20Plan.pdf

[75] Maryland's Plan to Adapt to Saltwater Intrusion and Salinization. https://planning.maryland.gov/Documents/OurWork/envr-planning/2019-1212- Marylands-plan-to-adapt-to-saltwater-intrusion-and-salinization.pdf published Dec 2019

[76] https://mde.maryland.gov/programs/Air/ClimateChange/MCCC/ARWG/ARWG%202020%20Work%20Plan.pdf

[77] https://mde.maryland.gov/programs/Air/ClimateChange/MCCC/ARWG/ARWG%202020%20Work%20Plan.pdf

[78] https://mde.maryland.gov/programs/Air/ClimateChange/MCCC/Documents/MCCCAnnualReport2020.pdf

[79] Conn, Christine. 2021. Personal Communication. Maryland Department of Natural Resources.

restoration, optimize resiliency benefits and leverage important habitat, water quality and GHG mitigation gains. This approach lends itself to longer budgeting timeframes, beyond a one-year cycle, which provides fiscal certainty, and generates new financing opportunities with other partners.[80]

Recognizing that the state's 2008 and 2011 plans were in need of revision and refinement, the ARWG undertook the task in 2020 to begin development of an Adaptation Framework that will lead to a new 10 year plan for Maryland's approach to climate adaptation.[81] [82] In 2020, the ARWG identified key sectors (natural resources, natural and working lands, human health, water quality and quantity and protecting critical infrastructure) and focus areas (climate jobs and training, diversity and environmental justice, and local government and state service delivery) to serve as the pillars of the framework. Through DNR funding to the University of Virginia for support, broad engagement by working group members and stakeholders and a team at DNR, the working group has made significant progress on the framework and developing strategies to guide adaptation in Maryland for the next 10 years. Looking forward to 2021, the refinement and finalization of the Adaptation Framework will be the main priority of the ARWG in coordination with state agencies and the Commission. This effort will provide the state with a 10-year framework to guide efforts around adaptation and resiliency, ensuring Maryland successfully protects its resources and communities from the impacts of climate change.

Authority

Maryland Commission on Climate Change was established first through Executive Order in 2007 (EO 01.01.2007.07) and then via Statute in 2015. [83] [see about 2018 statute as well]

Coast Smart Council and Coast Smart Siting and Design Criteria. Chapter 415 of 2014[84] established the Maryland Coast Smart Council in the Maryland Department of Natural Resources. Among other things, the legislation required the Coast Smart Council, in consultation with the Maryland Department of Natural Resources, to develop Coast Smart Siting and Design Criteria to address sea level rise and coastal flood impacts on capital projects planned and built by units of State government that were partially or fully funded with State funds. Beginning July 1, 2015, if a State capital project included the construction of a structure or the reconstruction of a structure with substantial damage, the structure must be constructed or reconstructed in compliance with those siting and design criteria. The Coast Smart Council was required to adopt the initial criteria by June 30, 2015. Until then, the legislation established the Maryland General Assembly's intent that units of State government that proposed capital projects for a new State structure or the reconstruction or rehabilitation of a substantially damaged State structure comply with the guidelines and requirements of Executive Order 01.01.2012.29. The legislation also required that the siting and design criteria include: (1) guidelines applicable to the preliminary planning and construction of a proposed capital project; (2) a requirement that the first floor elevation of each structure located with a Special Flood Hazard Area is built at an elevation of at

[80] https://mde.maryland.gov/programs/Air/ClimateChange/MCCC/Documents/MCCCAnnualReport2020.pdf
[81] https://mde.maryland.gov/programs/Air/ClimateChange/MCCC/Documents/MCCCAnnualReport2020.pdf
[82] Breitenother, A. 2021. Personal communication. Maryland Department of Natural Resources.
[83] Chapter 429 of 2015. Md. House Bill 514. Maryland Commission on Climate Change. http://mgaleg.maryland.gov/2015RS/bills/hb/hb0514E.pdf

[84] Chapter 415 of 2014. Md. House Bill 615. Coast Smart Council. http://mgaleg.maryland.gov/2014RS/Chapters_noln/CH_415_hb0615t.pdf

least two (2) feet above the base flood elevation; and (3) provisions establishing a process to allow a unit of State government to obtain a waiver from the Coast Smart Siting and Design requirements. Finally, the legislation required that the Maryland Department of Natural Resources, the Maryland Department of Budget and Management and the Maryland Department of General Services must review and incorporate the criteria developed by the Coast Smart Council into their appropriate instructions and policies.[85]

Chapter 628 and 629 of 2018[86] "Sea Level Rise Inundation and Coastal Flooding - Construction, Adaptation, and Mitigation" expanded the applicability of the Coast Smart Siting and Design Criteria established by the Coast Smart Council. Under this legislation, the criteria apply to State and local projects for which at least 50% of the project costs are funded with State funds and which include the construction of a structure or highway facility or the reconstruction of a structure with substantial damage. The legislation also specified that the criteria do not apply to projects less than $500,000. The 2018 legislation updated the first floor elevation requirement and expanded the participation of the Coast Smart Council. Finally, the legislation also required the establishment of specified plans and criteria relating to saltwater intrusion (a state plan for this), the use of State funds for specified hazard mitigation, and local plans for nuisance flooding. [87]

Chapter 442 of 2019[88] clarified the applicability of the Coast Smart Siting and Design criteria to State and local capital projects (not all State and local projects). The legislation also delayed the implementation date of the Siting and Design criteria that were modified and made more broadly applicable under the 2018 legislation. It required Maryland Dept of Planning w/ DNR and DOE to develop guidelines to assist local governments to collect data and establish nuisance flooding baselines by Oct 1, 2019 and delayed the deadline for local governments that experience nuisance flooding to develop nuisance flooding plans to October 2020.

Saltwater Intrusion Plan: Under Chapter 628 of the 2018 Laws of Maryland, the Maryland General Assembly tasked the Maryland Department of Planning (Planning) to "establish a plan to adapt to saltwater intrusion," in consultation with the Maryland Departments of Natural Resources, Environment and Agriculture, by Dec. 15, 2019, and to update the plan at least once every five years. [89] Maryland DNR is working on a coastal resiliency easement pilot project and with a state agency workgroup, the first phase of a statewide wetland adaptation plan has been established. [90]

---

[85] https://dnr.maryland.gov/climateresilience/Documents/2020-Coast-Smart-Program-Document-FINAL.pdf

[86] Chapter 628 of 2018. Md. House Bill 1350. Sea Level Rise Inundation and Coastal Flooding – Construction, Adaptation, and Mitigation.
http://mgaleg.maryland.gov/2018RS/bills/hb/hb1350E.pdf

[87] https://dnr.maryland.gov/climateresilience/Documents/2020-Coast-Smart-Program-Document-FINAL.pdf

[88] Chapter 442 of 2019. Md. House Bill 1427. Sea Level Rise Inundation and Coastal Flooding – Construction, Adaptation, and Mitigation.
http://mgaleg.maryland.gov/2019RS/Chapters_noln/CH_442_hb1427t.pdf

[89] https://planning.maryland.gov/Documents/OurWork/envr-planning/2019-1212-Marylands-plan-to-adapt-to-saltwater-intrusion-and-salinization.pdf

[90] J. Dubrow, MDP. 2021. Personal Communication.

Funding

The Chesapeake and Coastal Grants Gateway was created to streamline the grant application process for government and non-governmental organizations as well as academic institutions and provides a one-stop location for communities seeking technical and financial support for projects that foster healthy ecosystems, communities, and economies that are resilient in the face of change.[91]
Grants are made possible with funding through the Chesapeake and Atlantic Coastal Bays Trust Fund, the Coastal Resiliency Program, the Waterway Improvement Fund, the National Oceanic and Atmospheric Administration and the Environmental Protection Agency's Chesapeake Bay Program.
Through the improved connections across grant programs, the department seeks to support more comprehensive and integrated projects that achieve (at least one of) the following outcomes:
Outcome 1 – Accelerate recovery and restoration of natural resources by implementing non-point source pollution reduction projects.
Outcome 2 – Enhance capacity to understand and effectively plan to address flood risks associated with a changing climate.
Outcome 3 – Utilize natural and nature-based infrastructure to enhance resilience to climate change.
Outcome 4 – Improve student ability to take action benefiting Chesapeake and coastal ecosystems through outdoor learning and stewardship.
Outcome 5 – Foster sustainable development and use of Maryland waterways with projects that benefit the general boating public.[92]

Coordination with other programs

Maryland Commission on Climate Change (statutorily created; Chapter 429 of 2015) is composed of leaders from the State executive branch, legislature, and relevant constituencies; its functions are carried out through working groups representing public and private interests in climate change. [93] Commission members represent state agencies, legislature, local government, business, environmental nonprofits, organized labor, philanthropic interests, and State University system. The work of the Commission is supported by a Steering Committee and four Working Groups. Those related to adaptation planning include an Adaptation and Response Working Group (ARWG meetings are hosted quarterly by the Maryland Department of Natural Resources. The meetings are open to the public, and a portion of each meeting is set aside for public comment.) as well as an Education, Communication, and Outreach Working Group (ECO). The MCCC puts out an Annual Report that includes progress as well as Recommendations.

In its 2020 Annual report, the MCCC notes that the ECO will provide support to the Commission and its working groups and will collaborate where possible with the Commission on Environmental Justice and Sustainable Communities. Also in its 2020 Report, MCCC notes the Commission Chair will appoint a third co-chair who is specifically empowered to ensure that Diversity Equity Inclusion and Justice (DEIJ) is considered and included in all Commission and working group deliberations and products. The cochair will lead a team of Steering Committee members consisting of one or two Steering Committee appointees with environmental justice knowledge and one liaison from each of the Commission's working groups. The co-chair and Steering Committee environmental justice team will provide a

[91] https://dnr.maryland.gov/ccs/Pages/funding/grantsgateway.aspx
[92] https://dnr.maryland.gov/ccs/Pages/funding/grantsgateway.aspx
[93] Chapter 429 of 2015. Md. House Bill 514. Maryland Commission on Climate Change. http://mgaleg.maryland.gov/2015RS/bills/hb/hb0514E.pdf

progress report in the Commission's 2021 annual report. Environmental and climate justice considerations will be reflected in recommendations that the Commission provides to the state and will identify opportunities to better incorporate those considerations into state programs.[94]

Through the Maryland Climate Leadership Academy, Maryland has continued to support the work of the Commission, by serving as a tool that establishes a community of climate smart local government and infrastructure leaders. The Academy advances professional competencies in integrating climate change into decision-making across sectors and occupations and helps to ensure that decision-makers across sectors and Maryland communities are appropriately trained and educated to successfully integrate climate change adaptation efforts into their operations and activities

[94] https://mde.maryland.gov/programs/Air/ClimateChange/MCCC/Documents/MCCCAnnualReport2020.pdf

Massachusetts

A. Background

Massachusetts was the first state to integrate its State Hazard Mitigation Plan with its statewide Climate Adaptation Plan. The State Hazard Mitigation and Climate Adaptation Plan (SHMCAP) was issued in September 2018 in response to a directive in the 2016 Executive Order 569 to the Secretaries of Energy and Environmental Affairs and Public Safety to publish a Climate Adaptation Plan to "coordinate efforts across the Commonwealth to strengthen the resilience of our communities, prepare for the impacts of climate change, and to prepare for and mitigate damage from extreme weather events." The integrated plan complies with current federal requirements for state hazard mitigation plans and maintains the state's eligibility for federal disaster recovery and hazard mitigation funding under the Stafford Act. The integrated statewide plan is the state's primary risk assessment and risk reduction strategy for natural hazards and climate change and it serves to inform other state policies and actions. It serves as the overarching plan for climate resilience efforts of Massachusetts state agencies.

As part of the development of the SHMCAP, the interagency team leading its development identified 108 initial priority actions to increase resilience and overcome the state's risks and vulnerabilities related to natural hazards and projected climate changes. Priority action items fell into five categories:

- Integrate programs and build institutional capacity
- Develop forward-looking policies, plans and regulations
- Develop risk reduction strategies for current and future conditions
- Invest in performance-based solutions
- Increase education, awareness, and incentives to act.[1]

To ensure plan implementation, monitoring, and maintenance, Governor Baker launched the Resilient MA Action Team (RMAT)[2] in August 2019. Led by the Executive Office of Energy and Environmental Affairs (EEA) and the Massachusetts Emergency Management Agency (MEMA), the RMAT is an inter-agency team comprised of representatives from each Secretariat, called Climate Change Coordinators, who are supported by agency staff, stakeholders, and subject matter experts. The RMAT is tasked with monitoring and tracking the State Hazard Mitigation and Climate Adaptation Plan (SHMCAP) implementation process, making recommendations to and supporting agencies on plan updates, and facilitating coordination across State government and with stakeholders, including cities, towns, and businesses. The RMAT has ranked the

[1] Massachusetts State Hazard Mitigation and Climate Adaptation Plan. September 2018. Available at: https://resilientma.org/shmcap-portal/index.html#/full-plan

[2] https://www.mass.gov/info-details/resilient-ma-action-team-rmat

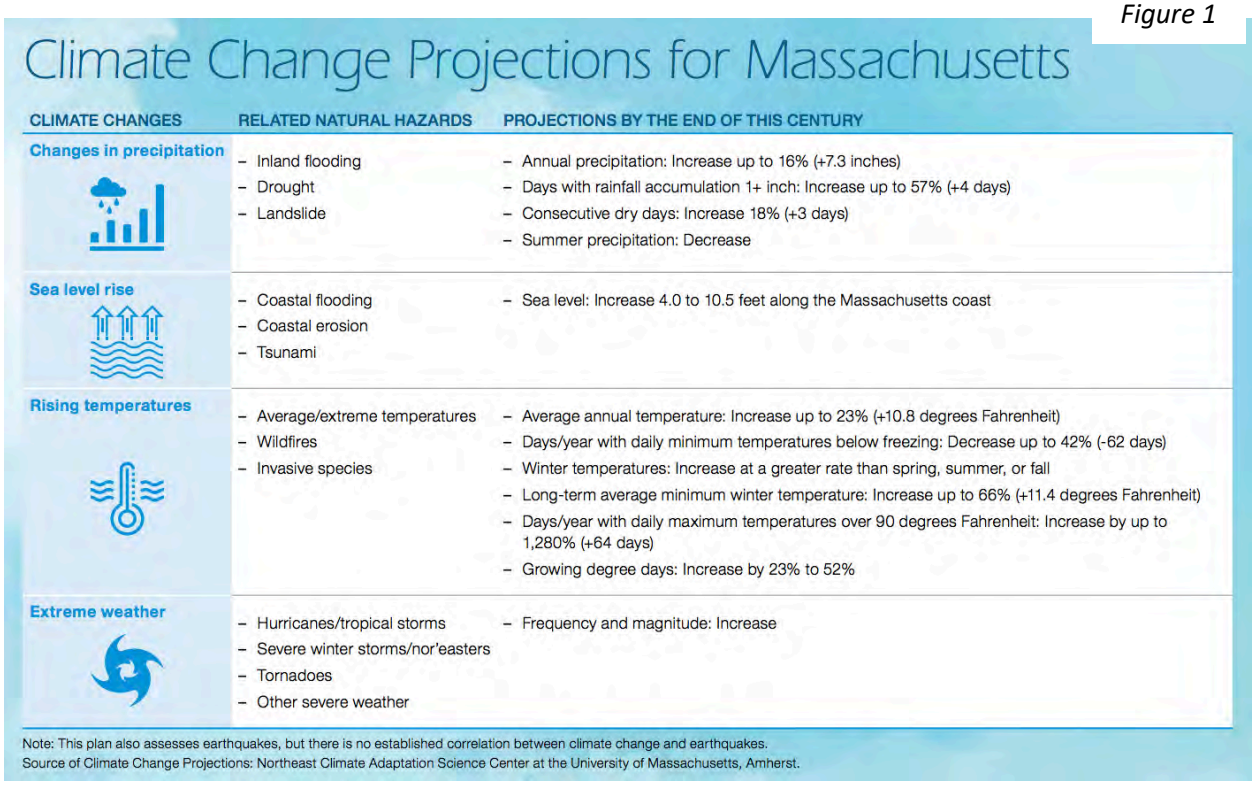
priority of each of the 108 actions as very high, high, medium or low and it has outlined an implementation timeframe for each action. The RMAT has established an online searchable "action tracker" that allows the public to assess state agencies' progress in implementing the provisions of the SHMCAP with search functions including by agency, by action, and by action type: https://resilientma.org/shmcap-portal/index.html#/action-tracker/.

Currently, Massachusetts does not impose regulatory resilience standards on private sector applicants such as through permitting programs.

Science based standards

Using data and science from the Northeast Climate Adaptation Science Center at the University of Massachusetts, the SHMCAP includes projections for changes in precipitation, sea level rise, rising temperatures and extreme weather events (Figure 1). These projections are consistently used by a variety of state programs in Massachusetts including the Municipal Vulnerability Preparedness Program, development of protocols pursuant to the Massachusetts Environmental Protection Act and development of climate design guidelines and tools. Massachusetts has efforts underway to update its sea level rise and storm surge data and models, and precipitation and temperature climate change projections.

Figure 1



Statewide goals and indicators

The SHMCAP does not currently set numeric resilience goals for the state, though development of and inclusion of such statewide resilience goals is expected to be included in the 5 year SHMCAP update set to be released in fall 2023.

Data and tools

The Massachusetts Climate Data Grapher, developed by the Northeast Climate Adaptation science Center at the University of Massachusetts is a data visualization and mapping tool that provides end-users with the science informed climate data for use in climate resilience planning: https://resilientma.org/datagrapher/?c=Temp/state/maxt/ANN/MA/. Data available includes information on temperature, precipitation, and more. The Resilient MA interactive map is also a web-based data visualization and mapping tool that includes data on climate observations (precipitation and temperature), climate projections (precipitation, sea level rise, temperature), and coastal vulnerability. It includes other data on critical assets, natural resources, and other features to support state and local climate resilience planning: https://resilientma.org/map/.

Regulatory Standards

Massachusetts does not establish regulatory standards on the private sector. The protocols developed through the Massachusetts Environmental Protection Act (MEPA) affect private sector projects but through the MEPA interagency review process.

Public education

While Massachusetts has undertaken extensive public education about climate change and impacts to the state, it has not adopted a formal interagency communications campaign that directs agencies' communications efforts.

B. Local government

Program elements[3]

The Municipal Vulnerability Preparedness grant program (MVP) is a voluntary program that provides support for cities and towns in Massachusetts to begin the process of planning for climate change resiliency and implementing priority projects. The state awards communities with funding to complete vulnerability assessments and develop action-oriented resiliency plans. The planning undertaken by communities includes the following components:

- Define extreme weather and natural and climate change related hazards
- Identify existing and future community vulnerabilities and strengths

[3] Municipal Vulnerability Preparedness (MVP) Program. Mia Mansfield, Executive Office of Energy and Environmental Affairs. Available at: https://www.mass.gov/service-details/mvp-program-resources

- Develop and prioritize actions and opportunities to reduce risk and build resilience.[4]

Program components include:

- *MVP certified providers* - The MVP program certifies an MVP certified provider program which certifies vendors who are then able to provide technical support for cities and towns participating in the MVP program. MVP certified providers are trained in workshops across the state to provide technical assistance to communities in completing the assessment and resiliency plan using the Community Resilience Building Framework (CRB). The workshops introduce relevant resources including climate change projections for the Commonwealth, data that can support resilience planning, guidance on incorporation of nature-based solutions into the planning process, and guidance on how cities and towns can integrate the MVP process with creating and/or updating a local Hazard Mitigation Plan. Communities participating in the MVP program may choose the provider of their choice from a list of certified providers. As of January 29, 2021, more than 370 providers have been certified.[5]
- *Municipal planning grants* – Municipalities may apply for MVP planning grants which include the following elements:
    - Integration with Hazard Mitigation Planning - While municipalities are not required to integrate their climate adaptation plan with their Hazard Mitigation Plan, they are encouraged to do so using the state integrated plan as a model. To date, more than 35 municipalities participating in the MVP program have produced Adaptation Plans that are combined with their Hazard Mitigation Plan.
    - A focus on three components: infrastructure, society, environmental conditions.
    - A 5 step process:
        - Engage community
        - Identify climate change impacts and hazards
        - Complete assessment of vulnerabilities and strengths
        - Develop and prioritize actions
        - Take action
    - Capacity building - Participating communities must undertake 1-2 community-based workshops using the Community Resilience Building guide (see below) and produce a written plan using the template that is incorporated in the CRB guide. Communities are expected to devote 120-200 hours of staff time and 120-240 hours of certified MVP provider time for development of workshops and their plan.

[4] MVP Program information. Massachusetts Executive Office of Environmental Affairs. Available at: https://www.mass.gov/service-details/mvp-program-information.

[5] Learn more about becoming an MVP certified provider. Massachusetts Executive Office of Energy and Environmental Affairs. Available at: https://www.mass.gov/service-details/learn-more-about-becoming-an-mvp-certified-provider

- Social equity – The guidance developed to support the MVP program includes components to address social equity.
- Grants - Grants to communities to support local resilience planning range from $15,000- $100,000 per plan.
- They are currently 312 (89%) municipalities actively engaged in the program.

- *Municipal action grants* - Communities that complete the MVP program become certified as an MVP community. They become eligible for follow-on funding opportunities, including MVP action grants, and advanced standing in other grant opportunities. Communities that complete plans become eligible for Action grants ranging from $25,000- $2M per project.
  - Action grants emphasize use of nature-based solutions and focus on Environmental Justice communities.
  - The Commonwealth has awarded more than $44M in MVP grant funding to date.[6]
  - Action grants are used to implement priority actions identified in the plan that results from the planning process.
  - Action grants can be used for:
    - Developing of a detailed vulnerability and risk assessment
    - Implementing community outreach and education
    - Updating to local Bylaws, Ordinances, Plans, and Other Management Measures • Redesigns and Retrofits
    - Implementation nature-based flood protection, drought prevention, water quality, and water Infiltration techniques
    - Implementing nature-based, Infrastructure and technology solutions to reduce vulnerability to extreme heat and poor air quality
    - Implementing nature-based solutions to reduce vulnerability to climate impacts other than flooding
    - Conducting ecological restoration and habitat management techniques to increase resiliency
    - Implementing strategies to enhance community energy resilience
    - Implementing strategies to enhance community resilience through chemical safety techniques - https://www.mass.gov/chemical-safety-and-climate-change-preparedness
    - Undertaking land acquisition for resilience
- *Creation of regional networks through establishment of regional MVP coordinator*s – Geographically regional coordinators are hosted in local field offices of the state

[6] Resilientma.org/mvp

Executive Office of Environmental Affairs to serve as a point of contact for municipalities in their region.[7]

Authority

- *Executive Order 569, 2016* - Among other actions, Executive Order 569 directs the Secretaries of Energy and Environmental Affairs and Public Safety to collaborate to develop a State Adaptation Plan and the establishment of a framework for cities and towns to assess climate change vulnerabilities and adaptation options. It also directs the two cabinet secretaries to provide technical assistance to Cities and Towns as part of their efforts to complete vulnerability assessments, identify adaptation strategies, and begin implementation of adaptation strategies.[8]
- *Environmental Bond Law, 2018* – The law codifies EO 569, including the MVP Program. It establishes a $2.4 billion bond program with more the following allocations for climate change adaptation efforts:
    - $290 million for improvements and repairs to dams and seawalls and to implement diverse coastal resiliency strategies;
    - $75 million for planning and action grants to communities through the Municipal Vulnerability Preparedness (MVP) Program;
    - $100 million for implementation of the state's Integrated State Hazard Mitigation and Climate Adaptation Plan.

  It directs the establishment of a statewide plan that integrates the provisions of the Statewide Hazard Mitigation Plan and the State Climate Change Adaptation Plan.[9]

Funding

- MVP program local community grants – Funding to support the MVP local community planning and action grants come from the 2018 Environmental Bond law.
- State agency operation of MVP program – The state's Climate Team (6 full-time staff including the MVP Program Manager) is funded from the Executive Office of Energy and Environmental Affairs operating budget as are the MVP Regional Coordinators. The operating budget is via a state appropriation.

---

[7] Contact MVP regional coordinator. Massachusetts Executive Office of Environmental Affairs. Available at: https://www.mass.gov/service-details/contact-mvp-regional-coordinator

[8] Massachusetts Executive Order 569. 2016. Available at: *https://www.mass.gov/executive-orders/no-569-establishing-an-integrated-climate-change-strategy-for-the-commonwealth*

[9] An Act Promoting Climate Change Adaptation, Environmental and Natural Resource Protection and Investment in Recreational Assets and Opportunity *(*H. 4835*),* Chapter 209.. 2018. Available at: https://malegislature.gov/laws/sessionlaws/acts/2018/chapter209.

Non-financial resources[10]

The MVP program makes several resources available to communities participating in the MVP program:

- *Temperature, Precipitation, and Sea Level Rise Projections developed by the Northeast Climate Adaptation Science Center at UMass Amherst*: https://resilientma.org/map/ and https://necsc.umass.edu/ - Researchers from the Northeast Climate Adaptation Science Center at the University of Massachusetts Amherst developed downscaled projections for changes in temperature, precipitation, and sea level rise for the Commonwealth of Massachusetts. The projections were developed with support from the state Executive Office of Energy and Environmental Affairs for the purpose of enabling municipalities, industry, organizations, state government and others to utilize a standard, peer-reviewed set of climate change projections that show how the climate is likely to change in Massachusetts through the end of this century. The downscaled, or localized, temperature and precipitation projections are based on simulations from the latest generation of climate models from the International Panel on Climate Change and scenarios of future greenhouse gas emissions. The models were carefully selected from a larger ensemble of climate models based on their ability to provide reliable climate information for the Northeast U.S., while maintaining diversity in future projections that capture some of the inherent uncertainty in modeling climate variables like precipitation. Both annual and seasonal projections are available at the statewide and major drainage basin geographic scales. Future sea level projections are provided for the Massachusetts coastline at established tide gauge stations with long-term records at Boston Harbor, MA, Nantucket, MA, Woods Hole, MA, and Newport, RI. The projections are adjusted to each station's mean sea level and converted to the North American Vertical Datum of 1988 (NAVD88). The sea level projections are based on a methodology which provides complete probability distributions for different scenarios of future greenhouse gas emissions. The methodology for developing these projections closely follows the approach utilized for the recent City of Boston's sea level rise projections in 2016 and similar analyses in California and the Rutgers University Science and Technical Advisory Panel (STAP) projections in New Jersey.
- *Guide to Community Resilience Building (CRB)* - https://resilientma.org/resources/resource::1104 – The MA EEA worked with The Nature Conservancy to use TNC's Community Resilience Building package of tools as the protocol for communities participating in the MVP program: https://www.communityresiliencebuilding.com/. The package includes a protocol, data application, handouts, a facilitator's guide and other elements of an approach for 1 and 2-day community based workshop to gain input on resilience priorities. The guide is an "anywhere and at any scale" process for developing resilience action plans for

[10] MVP Program Resources. Massachusetts Executive Office of Environmental Affairs. Available at: https://www.mass.gov/service-details/mvp-program-resources

communities including municipalities, agencies, organizations, and corporations (local to global). The Community Resilience Building Workshop employs a community-driven process, including information, experience, and dialogue, where the participants identify top hazards, current challenges, and strengths and then develop and prioritize actions to improve their community's resilience. TNC reports that the CRB has been used in more than 425 municipalities in 9 states to date and TNC is available to provide coaching.

- *Ensuring success webinars* - https://resilientma.org/resources/resource::2235 and https://www.mass.gov/service-details/ensuring-success-webinars-municipal-vulnerability-preparedness-mvp-programs-tool. This is a 7-part series of webinars about participation and best practices for the MVP program. The series is hosted by the Massachusetts Executive Office of Energy and Environmental Affairs (EEA) and The Nature Conservancy and was developed by EEA, TNC, the Massachusetts Emergency Management Agency, and MA Audubon with financial support from several private businesses, Woods Hole SeaGrant, and several regional planning commissions. The seven webinars are:
    - Working with MVP service providers
    - Advancing social equity in climate adaptation planning
    - Alternatives for engaging your community
    - The importance of listening
    - Bylaw review
    - Nature based solutions
    - Characterizing Coastal Flood Hazards and increasing resilience
- *Toolkits* – the MVP program is currently developing a set of resilience planning toolkits and guides that, when completed, will replace the use of the Ensuring Success webinars.
- *Technical assistance to communities* – The establishment of the MVP certified providers are the vehicle for the state to provide technical assistance to communities.

Coordination with other programs

- FEMA/MEMA Hazard Mitigation Planning
    - MVP program guidance on the EEA website indicates that: the Community Resilience Building (CRB) process covers most of the steps needed to fulfill FEMA hazard mitigation plan requirements; communities can use state MVP grant funding to match FEMA pre-disaster mitigation planning grants, if the timing of the grant periods line up; the plan created by communities pursuant to their participation in the MVP program can be used as the update to their HMP and that MVP communities are available for additional FEMA grant funds.
    - The MVP program coordinates with the Massachusetts Emergency Management Agency (MEMA) to, together, provide support to communities whose HMP updates coincide with the timing of MVP Planning grants to ensure that

communities can leverage both sets of funding and technical assistance if they choose to do so.

- The MVP program indicates that provisions of an HMP that are not included in their CRB process and must be undertaken in order for the adaptation plan to "count" as a HMP:
  - Development of a set of hazard maps and GIS files that can be used by the town to integrate their MVP plan with their other community plans;
  - Identification of land use and environmental vulnerabilities and strengths, including repetitive flood loss structures and structures which have incurred substantial damage (which is provided by the state Department of Conservation and Recreation Flood Hazard Management Program);
  - Assessment of community vulnerabilities that includes:
    - Types and numbers of buildings (including NFIP losses), infrastructure, and critical facilities located in the hazard areas;
    - Documentation of the communities' current capabilities to mitigate and adapt to the identified vulnerabilities using the FEMA Capability Assessment Worksheet);
    - Evaluation of the capabilities and if any need improvements, development of recommended actions;
    - Review and documentation of the communities' continued compliance with the NFIP.
  - For updates to previously approved HMPs, documentation of any changes in priorities, development, and local progress of mitigation actions taken place in the community.
  - Approval of the plan by the Massachusetts Emergency Management Agency and FEMA.[11]

- MA Department of Health Environmental Public Health Tracking (EPHT) – The MVP program is currently working with the state Department of Health to determine how to best integrate use of data generated from the state's Environmental Public Health Tracking Program to further support local community HMP and MVP planning.[12]
- Recommended resilience design standards and guidelines being developed by the state Resilient MA Action Team for use in planning for state capital assets will be made available for use by grantees of the MVP program. MVP will be piloting the use of the design standards web tool in its spring 2021 grant round. After April 2021, the following

[11] Hazard Mitigation Planning Across Massachusetts. Massachusetts Emergency Management Agency Mitigation Unit. PowerPoint. Jeffrey Zukowski Hazard Mitigation Planner Massachusetts Emergency Management Agency Office: jeffrey.zukowski@mass.gov. Available at: https://www.mass.gov/service-details/mvp-program-resources

[12] https://matracking.ehs.state.ma.us/Climate-Change/index.html

site will be fully updated to link to the design standards tool: https://resilientma.org/shmcap-portal/index.html#/action-team.

- These same design guidelines and corresponding tools will be made available as a resource for reviews under the Massachusetts Environmental Policy Act. Also, the draft interim MEPA review protocol asks whether the proposed project was developed in collaboration with an MVP effort.

C. State agencies and state investment

As directed by Executive Order 569, other state agencies are working to integrate climate resilience into their own practices and policies. Here are a few notable examples:

Program elements

- *DCAMM Statewide Resilience Master Plan* – With support from the Massachusetts Emergency Management Agency (MEMA), the state Division of Capital Asset Management and Maintenance (DCAMM) undertook a planning process with the goal of reducing the vulnerability of state facilities to climate change impacts. The SRMP process and resulting Plan document form a foundation for DCAMM's ongoing work to improve the resilience of the state's property portfolio. The SRMP lays the groundwork for DCAMM to implement resilient building strategies in future projects. The SRMP: determines potential risks to DCAMM facilities through a vulnerability assessment and mapping exercise; identifies sites for which an adaptation strategy is needed given high criticality of the site and high risk; applies design guidelines consistent with those being developed by the RMAT, and integrates the guidelines into DCAMM project oversight.

- *MEPA* – Pursuant to the Massachusetts Environmental Policy Act (MEPA), the Executive Office of Environmental Affairs conducts reviews of environmental impacts of development projects and other activities that require one or more state agency action. A project is under MEPA jurisdiction if it is undertaken by a state agency, requires a permit from a State Agency, or it involves Financial Assistance or a Land Transfer by a State Agency. Thresholds for projects that trigger a MEPA review are set in regulations (301 CMR 11.03). According to the MEPA Office website:

  MEPA review is intended to facilitate environmental planning for Projects requiring Agency Action, including an Agency's programs, regulations, or policies. It enables the Proponent and each Participating Agency to consider the positive and negative, short-term and long-term potential environmental impacts for all phases of a Project, and the cumulative impacts of the Project and any other Project or other work or activity in the immediate surroundings and region. It also enables an Agency to consider the cumulative impacts of Projects requiring

individual Agency Actions taken in accordance with each of its programs, regulations and policies that may not otherwise be subject to adequate MEPA review or that may have similar environmental impacts such that a common assessment may be necessary or appropriate. MEPA review can influence the planning and design of a program, regulations, policy, or other Project to enable an Agency to achieve these goals, provided that MEPA review is initiated sufficiently early and in any event prior to the Proponent finalizing or otherwise irreversibly committing to the program, regulations, policy, or other Project.[13]

Currently the MEPA office is engaged in a regulatory review effort to update its regulations to ensure consistency with other statewide initiatives under the 2016 Executive Order 569 regarding preparing for the impacts of climate change. In the interim, a draft protocol on climate change adaptation and resilience has been issued and the State is taking comment on it until March 2021. A final protocol is expected to be issued in mid- 2021.[14] The provisions of the interim protocol are is informed by the science and risk scenarios of the 2018 Integrate State Hazard Mitigation and Climate Action Plan.

Noteworthy provisions of the proposed interim guidance include:

- Acknowledgement of the RMAT Climate Resilience Design Standards Tool that can be used by applicants to attach a copy of the project's Climate Risk Screening and Resilience Design Standards report from the tool in lieu of completing certain sections of the draft protocol.
- Estimation of potential impact to the proposed project based on sea level rise scenarios based on the anticipated useful life of the project in relationship to sea level rise projections that the applicant is directed to find at the mapping tool at https://resilientma.org/map/. Applicants are directed to view sea level rise data at the drainage basin scale and assume the High Emissions Scenario RCP 8.5. Click on the tidal gauge bar to bring up a more detailed table of changes in sea level rise.

➢ *DHCD Resilience Masterplan* – The state Department of Housing and Community Development (DHCD) engaged consultants to undertake the Climate Hazard Adaptation and Resilience Masterplan (CHARM) project which was designed to assess the climate risk to the public housing portfolio and residents in 240 communities, develop resilience design guidelines, and advance a strategic plan for implementation. The project involved conducting risk and vulnerability assessments and development of resilience design and operational guidance to enable DHCD to direct capital funds and provide capacity building

[13] https://www.mass.gov/regulations/301-CMR-1100-mepa-regulations
[14] MEPA Interim Protocol on Climate Change Adaptation and Resiliency. Available at: https://www.mass.gov/service-details/information-about-upcoming-regulatory-updates

to local housing authorities to address climate change vulnerabilities for the 80,000 residents living in DHCD-supported, locally-managed housing.[15]

- *Resilient MA Action Team Climate Resilience Design Standards and Guidelines* - The "Climate Resilience Design Standards and Guidelines" project is being developed through collaboration of the Resilient Massachusetts Action Team (RMAT). The Design Standards and Guidelines involve development of climate resilience design standards and guidance for State agencies in order to incorporate climate resilience into the State's capital planning process. Outputs from this initiative include:
  - A web-tool for state agencies that provides a preliminary climate risk screening output and climate resilience design standards for State projects with physical assets;
  - Guidelines with best practices for State agencies to implement climate resilience design standards.[16]

The Climate Resilience Design Standards and Guidelines aim to develop climate resilience design standards, flexible adaptation pathways, guidelines, and a project screening tool grounded in scientific methodology using the best available climate science data in Massachusetts, which improves over time to incorporate new science, additional or changing climate hazards, and on-going stakeholder feedback. The focus of this project is to integrate climate resilience in projects with physical assets owned and maintained by state agencies. When complete in spring 2021, these tools will be accessible at ResilientMA.org, and will be relevant to state grant-funded projects throughout the state. The tools are intended to be useful from planning to final design for capital projects that include physical assets, such as buildings, infrastructure, and natural resources. The draft Climate Resilience Design Standards & Guidelines are intended to be applied to State projects with physical assets and incorporated into the process from preliminary planning to project review. In addition to being used to support review of state assets, the guidelines will also be made available for use by grantees funded under the state's Municipal Vulnerability Preparedness and Massworks Programs.

The draft design criteria proposed pertain to three climate hazards (sea level rise/ storm surge, extreme precipitation, and extreme heat) and are based on using the high emissions scenario Representative Concentration Pathway RCP 8.5. For sea level rise/ storm surge, this project is proposing to use the results from the Statewide Massachusetts Coastal Flood Risk Model (MC-FRM), which is also based on the sea level rise scenario corresponding to the high emissions RCP 8.5 scenario.

---

[15] https://www.newecology.org/wp-content/uploads/2020/05/Case-Study-CHARM-Resilience-2-pg.pdf

[16] Resilient MA Action Team Draft Climate Resilience Design Standards & Guidelines. Draft Document for Public Comment, dated: August 24, 2020. MA Executive Office of Energy and Environmental Affairs in partnership with the Massachusetts Emergency Management Agency. Available at: https://www.mass.gov/info-details/resilient-ma-action-team-rmat

The Design Standards and guidelines involve a preliminary project planning and identification of physical assets that will be designed during the proposed project in three categories: Infrastructure, Natural Resources, and Buildings (Figure 2). Users will provide Project Inputs to the Climate Resilience Design Standards Tool and answer questions related to overall project details, project location, project exposure, asset information (including type and useful life), and asset criticality. The tool will provide two outputs: Climate Risk Screening (inclusive of preliminary project exposure ratings and asset preliminary risk ratings), and Climate Resilience Design Standards for each asset. The Climate Resilience Design Standards include recommended planning horizons, return period/confidence interval, design criteria (by climate parameter), and tiered methodology for developing site-specific design criteria values.

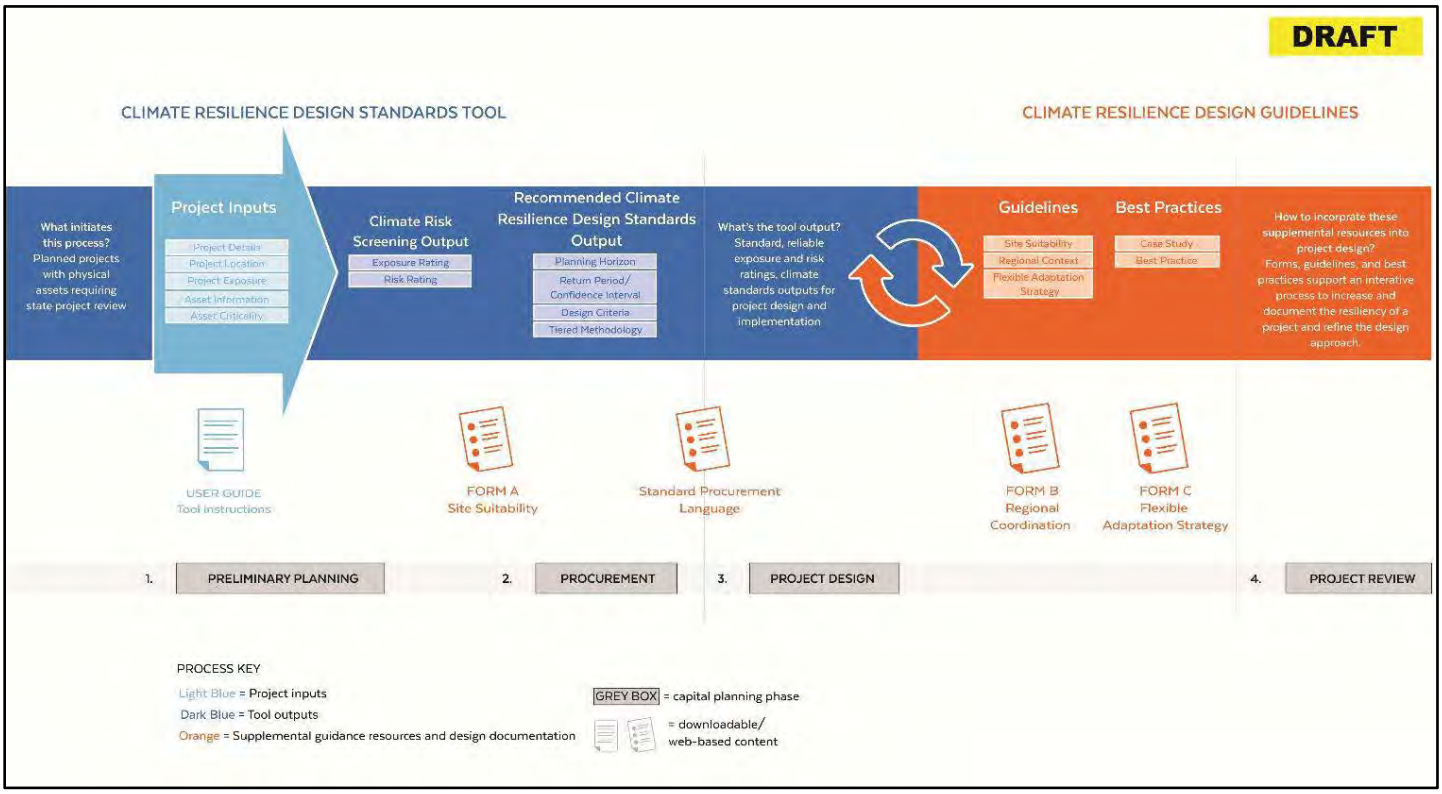


Figure 2 - MA Draft Project Overview Showing Inputs and Outputs for the Climate Resilience Design Standards Tool (in blue) and Supplemental Resources for the Climate Resilience Design Guidelines (in orange)

The Climate Design Standards and Guidelines include development of an automated data-driven tool which will be provided as web-based materials on the state's resilience clearinghouse website, ResilientMA.org. Additionally, they include downloadable forms and case studies, as well as links to other best practices. Downloadable forms will be available as PDF documents directly through the web-based tools and will be designed so that the tools

outputs can be included in state agency Requests for Proposals (RFPs) for design projects, and in standard procurement language for state agency use.

Authority

2016 Executive Order 569 is authority cited for the development of the interim MEPA protocol, the development of the Statewide Resilience Master Plan and for the development of Climate Resilience Design Standards and Guidelines. Also, the Massachusetts Environmental Protection Act (MEPA)authorizes the MEPA program activities

Funding

MEPA staff and staff and consultants working on the Design Guidelines and tool are funded through the EOEEA's operating budget which is through a state appropriation.

Coordination with other programs

The RMAT Climate Resilience Design Standards tool will be made available to inform the implementation of the climate adaptation and resilience MEPA protocol and will also be made available to inform the MVP program.

D. Private Sector

There are no current mandatory programs for private sector entities to comply with regulatory standards associated with climate projections.

New York

A. Background

A 2010 report to the legislature[1] by a Task Force established through legislative action outlined 14 recommendations for state action, such as calling for the adoption of official projections of sea level rise, establishment of financial support coupled with science informed decision support tools to support local community adaptation planning, and requiring state agencies to consider future climate change in infrastructure decisions and state investments. These recommendations informed subsequent development of new laws in New York.

The 2014 New York Community Risk and Resiliency Act (CRRA) includes provisions intended to ensure that certain state monies, facility-siting regulations and permits include consideration of the effects of climate risk and extreme-weather events. The law includes five provisions:

- Requires the Department of Environmental Conservation to adopt science based sea-level rise projections;
- Requires applicants for permits (oil and natural gas wells, sewerage service, LNG facilities, freshwater and tidal wetlands, coastal erosion hazard areas) and certain funding programs (water pollution and drinking water revolving funds, open space, historic preservation, landfill closures, coastal rehabilitation, waterfront revitalization, agricultural and farmland protection) to demonstrate that future physical climate risk due to sea-level rise, storm surge and flooding have been considered, and that these factors be incorporated into certain facility-siting regulations (hazardous waste transportation, storage, and distribution, hazardous substance storage, bulk petroleum storage). While DEC is required to adopt projections of only sea-level rise, the specified facility-siting, permitting and funding programs must consider storm surge and inland flooding as well. The inclusion of this language therefore clarifies the scope of the statute to extend beyond coastal areas.
- Adds mitigation of risk due to sea-level rise, storm surge and flooding to the list of criteria for implementation of the state Smart Growth Public Infrastructure Policy Act, which is implemented by multiple state agencies that finance infrastructure and other projects.
- Requires the state to develop model local laws that include consideration of future risk due to sea-level rise, storm surge and/or flooding. Model local laws must be based on available data predicting the likelihood of extreme-weather events, including hazard-risk analysis.

[1] New York State Sea Level Rise Task Force. Report to the Legislature. December 31, 2010.

- Requires that state to develop guidance on the use of natural resources and natural processes to enhance resiliency.
- Requires the state to develop guidance for implementation of the statute which the NY Department of Environmental Conservation developed in the form of its publication of four implementation guidance documents, including the state Flood Risk Management Guidance.[2]

The 2019 Climate Leadership and Community Protection Act (CLCPA, https://climate.ny.gov/) amended the 2014 CRRA to include all permits subject to the Uniform Procedures Act (https://www.dec.ny.gov/permits/6081.html). The CLCPA also expanded the scope of the CRRA to require consideration of all climate hazards, not only sea-level rise, storm surge and flooding, in these permit programs. (Note: the expanded scope of hazards to be considered pursuant to the 2019 CLCPA Act does not apply to the oil and gas well permit program or to the Smart Growth Public Infrastructure Policy Act).

Science based standards

In 2011, the New York State Energy Research and Development Authority (NYSERDA) issued its ClimAID assessment, including the latest observations and projections for changes to all climate hazards in New York through 2100.[3] The 2011 projections were updated by NYSERDA in 2014. In 2015 New York released projections for all climate-related hazards[4] through issuing a summary report prepared for general public consumption that incorporates the 2014 updated ClimAid projections along with references to other reports, such as the National Climate Assessment, in a format for general public consumption. In 2017, New York adopted regulations establishing sea-level rise projections for three geographic regions of the state relative to a year 2000-to-year-2004 baseline.[5] The regulations only establish the sea-level rise projections; the regulations do not establish new standards or criteria for permit issuance or funding eligibility.[6] The regulations provide recommendations to agencies regarding consideration of sea-level rise and other flood risk. Agencies are directed to consult the regulations and its associated guidance as they consider future physical risk due to climate change, and as they develop any regulatory changes and/or program-specific guidance to require that applicants demonstrate consideration of sea-level rise, storm surge, and flooding.

---

[2] https://www.dec.ny.gov/energy/102559.html

[3] Horton, R., D. Bader, C. Rosenzweig, A. DeGaetano, and W.Solecki. 2014. Climate Change in New York State: Updating the 2011 ClimAID Climate Risk Information. New York State Energy Research and Development Authority (NYSERDA), Albany, New York.

[4] Observed and Projected Climate Change in New York State: An Overview Developed for the Community Risk and Resiliency Act (CRRA) Drafting Teams. 12/31/15. Available at: https://www.dec.ny.gov/docs/administration_pdf/climbkgncrra.pdf

[5] 6 NYCRR Part 490

[6] https://www.dec.ny.gov/energy/102559.html

Statewide goals and indicators

No resilience statewide goals or indicators are set.

Data and tools

The New York Climate Change Science Clearinghouse (NYCCSC) is a gateway to data and information related to climate change adaptation and mitigation across the state. The Clearinghouse provides climate science data and other resources for policy-makers, practitioners, and the public, to support scientifically sound planning and decision-making. The Clearinghouse was initially established and supported by the New York State Energy Research and Development Authority (NYSERDA) and includes collaboration among the Northeast Regional Climate Center at Cornell University, which is part of the National Center for Environmental Information, the State University of New York, NOAA, and the Northeast States for Coordinated Air Use Management (NESCAUM), which is the non-profit association of state air quality program directors for eight states. The Clearinghouse serves as a decision-support tool with the following features:

- A customizable data grapher, which is an interactive tool to generate time-series graphs for climate change with historical data and future projections
- A web-based interactive data visualization and mapping tool (GIS viewer)
- Curated data access
- Search features that allow the end user to search by keyword and to filter by sector, resource type, climate hazards and actions

Regulatory Standards

New York's Regulatory adoption of sea-level rise projections (6 NYCRR, Part 490) does not, in and of themselves, have a regulatory effect. State agencies are intended to use the adopted regulations to inform their own programs and policies.

Public education

The state has not adopted a comprehensive strategic communications plan regarding climate change adaptation and resilience.

B. Local government

Program elements[7]

The Resilient NY program, launched in 2018, is intended to improve community resilience to extreme weather events that result in flooding and ice jam formations. The program is focused on 48 high-priority flood-prone watersheds and involves use of advanced modeling techniques and field assessments to identify priority projects and actions to reduce community flood and ice jam risks, while also improving habitat. These studies will give communities a blueprint or path forward to abate the worst effects of future flooding. Studies identify the causes of

[7] https://www.dec.ny.gov/lands/121102.html

flooding within each watershed, and recommend effective and ecologically sustainable flood and ice jam hazard-mitigation projects. Proposed flood mitigation projects will be identified and evaluated using hydrologic and hydraulic modeling to quantitatively determine which proposed recommendations will likely result in the greatest flood reduction benefits. In addition, the flood resiliency studies will incorporate the latest climate change forecasts and assess ice jam hazards where they have been identified as a threat to public health and safety.

In January 2021, New York announced $200 million for local governments as part of its "BRIDGE NY" program that supports local efforts to rehabilitate and replace bridges and culverts statewide. Competitive BRIDGE NY funding is available to all municipalities authorized to receive and administer state and federal transportation funding and is based on structural condition of a bridge or culvert and its resiliency and significance based upon traffic volumes, detour considerations, the number and types of businesses served and the overall impact on commerce. Consideration will also be given to projects that provide demonstrable benefit for Environmental Justice communities. The New York State Department of Transportation issues the NYS Bridge Manual which includes design guidelines and requirements for all state bridges, and any local bridges built or repaired with federal funds, which is most local bridges[8]. The NYYSDOT incorporated the recommended guideline elevations in the Flood Risk Management Guidance referenced above in the 2019 Bridge Manual update.

The New York Climate Smart Communities (CSC) program was established in 2009. Municipalities that adopt the CSC Pledge are designated as registered CSCs. CSCs that accumulate sufficient points through documentation of completion of qualifying certification actions are designated certified. The CSC Grant program was established in 2016 to provide 50/50 matching grants to cities, towns, villages, and counties of the State of New York and boroughs of New York City for eligible climate mitigation and adaptation projects. Funds are available for two broad project categories - implementation and certification. The first project category supports implementation projects related to the reduction of greenhouse gas emissions outside the power sector and climate change adaptation (e.g. reducing flood-risk, increasing natural resiliency, extreme-event preparation, relocation or retrofit of critical infrastructure, and improving emergency preparedness). The second project category supports completion of selected CSC certification actions, including planning, assessment and other activities. Certification grants are intended to assist municipalities that are working toward CSC certification, but all municipalities are eligible for either CSC grant category. Municipalities need not be certified, nor even participating in the CSC program (i.e., registered CSCs) to be eligible for CSC grants, although certified and registered CSCs receive limited preference in application scoring. Grants issued in 2019 range in size from $25,000 to $2 million. The CSC is a strictly

[8] https://www.dot.ny.gov/divisions/engineering/structures/manuals/bridge-manual-usc

voluntary program; there are no regulatory requirements, including no requirements for CSCs to follow the state's design guidelines, climate projections or sea-level rise regulations.[9]

Authority

2014 Community Risk and Resilience Act and 2019 Climate Leadership and Community Protection Act.

Funding

Approximately $3 million has been earmarked for implementation of the Resilient NY program from the state Environmental Protection Fund, which is financed primarily through a dedicated portion of real estate transfer taxes.

The Climate Smart Communities grants are funded through an allocation of NYS's Environmental Protection Fund. [10] Created by the state legislature in 1993, the Environmental Protection Fund is financed primarily through a dedicated portion of real estate transfer taxes.[11]

The 2014 CRRA does not provide a source of funding for state agency implementation. State staff implementing the Climate Smart communities program, development of implementation guidance and sea-level rise regulations are funded with funds collected as a surcharge on utility bills and transferred to NYSERDA. Language in the state budget legislation requires NYSERDA to transfer funds to DEC to fund OCC staff. Other Department of Environmental Conservation staff engaged in climate change adaptation efforts are primarily funded through General Fund appropriations.

BRIDGE NY funding comes from the state's more than $300 billion infrastructure plan. Funding for the plan is to be mainly dependent on federal funds coming through New York State Department of Transportation. NYSDOT announced $200 million for BRIDGE NY.[12].

Non-financial resources[13]

The New York State Department of State has released model local laws (ordinances) to increase resilience (). These model laws, which local governments may adopt voluntarily to be more resilient to sea-level rise, storm surge, flooding and erosion cover five general topics:

- Basic Land Use Tools for Resiliency
- Wetland and Watercourse Protection Measures
- Coastal Shoreline Protection Measures

[9] https://climatesmart.ny.gov/
[10] (https://www.dec.ny.gov/about/92815.html
[11] https://www.dec.ny.gov/about/92815.html
[12] https://www.dot.ny.gov/BRIDGENY
[13] https://www.dos.ny.gov/opd/programs/resilience/

- Management of Floodplain Development
- Stormwater Control Measures

Coordination with other programs

Hazard mitigation planning is overseen by the New York State Division of Homeland Security and Emergency Services. Ongoing collaboration between the Division and the Department of Environmental Conservation is the development of DHSES general guidance on consideration of climate change into local Hazard Mitigation Plans.

C. State agencies and state investment

Program elements

The CRRA requires the state to prepare guidance on implementation of the statute, including use of natural resources and natural processes to enhance community resilience. The state prepared a guide, *Using Natural Measures to Reduce the Risk of Flooding*, to inform selection and planning of natural resilience measures. The state also prepared *State Flood Risk Management Guidance* which recommends flood-risk management guideline elevations that incorporate possible future conditions, including the greater risks of coastal flooding presented by sea-level rise and enhanced storm surge, and of inland flooding expected to result from increasingly frequent extreme-precipitation events. This guidance was designed to inform state agency efforts to develop program-specific guidance to require that applicants demonstrate consideration of sea-level rise, storm surge and flooding, and incorporate such requirements into operating regulations. The state also developed a quick guide on *Estimating Guideline Elevations and Guidance for Smart Growth Public Infrastructure Assessment* with the latter being intended to guide state agencies as they assess mitigation of sea-level rise, storm surge and flooding in siting and design of public-infrastructure projects.

The New York State Environmental Quality Review Act (SEQR) governs the environmental impact assessment process of most projects or activities proposed by a state agency or unit of local government. SEQR requires the sponsoring or approving government agency to identify and mitigate significant environmental impacts of the activity it is proposing or permitting.[14] In 2019, amendments to the SEQR implementing regulations were adopted to require that SEQR reviews consider "measures to avoid or reduce both an action's environmental impacts and vulnerability from the effects of climate change such as sea level rise and flooding."[15] Since that adoption, the state has identified several proposed project that were potentially vulnerable to sea-level rise and, as such, required hazard mitigation actions. Currently, the state has an internal work group that is reviewing permit review and SEQR guidance to determine when and

[14] https://www.dec.ny.gov/permits/357.html

[15] 6 NYCRR, Part 617.9(b)(5)(iii)(i) Available at: https://www.dec.ny.gov/docs/permits_ej_operations_pdf/617revexptrms.pdf.

how to require more explicit consideration of climate change. Permitting staff are currently identifying certain permit types (e.g., power facilities) for the Office of Climate Change to review for future sea-level rise or other flood vulnerabilities as part of the SEQR review process.

Authority

2014 Community Risk and Resilience Act and 2019 Climate Leadership and Community Protection Act.

D. Private Sector

The 2014 CRRA adds mitigation of risk due to sea-level rise, storm surge and flooding to the list of criteria for implementation of the New York Smart Growth Public Infrastructure Policy Act which is implemented by multiple state agencies that finance infrastructure and other projects. Implementation of the Act is overseen by the New York Environmental Facilities Corporation (EFC).[16] The mission of the EFC is to assist communities with undertaking critical water quality infrastructure planning projects and by providing access to low-cost capital, grants and expert technical assistance. The State Clean Water State Revolving Fund and the Drinking Water State Revolving Fund are the EFC's core funding programs. In addition to the Smart Growth Public Infrastructure Policy Act, EFC also administers the Water Infrastructure Improvement Action, the Wastewater Infrastructure Engineering Planning Grant program, and the Green Innovation Grant Program[17] which provides up to $17 million in annual funding for projects that support energy efficiency, water efficiency and "green" stormwater management practices. The Smart Growth Public Infrastructure Policy Act is intended to "maximize social, economic and environmental benefits from public infrastructure development while development, while minimizing unnecessary environmental degradation, disinvestment in urban and suburban communities, and loss of open space facilitated by the development of new or expanded public infrastructure that is inconsistent with smart growth criteria."[18] The 2014 CRRA added elements to the smart growth criteria that are intended to ensure that infrastructure projects are built to mitigate future physical climate risk due to sea-level rise, storm surges and flooding as well as reduce greenhouse gas emissions. The Department of Environmental Conservation's *Estimating Guideline Elevations and Guidance for Smart Growth Public Infrastructure Assessment* is used as the basis for these reviews. Pursuant to the Act, a smart growth assessment form is required to be completed by all applicants for EFC financial assistance and the EFC and other agencies are prohibited from approving or providing any financial assistance

[16] https://www.efc.ny.gov/about

[17] https://www.efc.ny.gov/GreenGrants

[18] https://www.efc.ny.gov/smartgrowth#:~:text=The%20State%20Smart%20Growth%20Public,degradation%2C%20disinvestment%20in%20urban%20and

to a public infrastructure project unless, to the extent practicable, the project is consistent with the state's smart growth criteria.

Regulatory restrictions on private sector entities are limited to those included in the 2014 CRRA for permits associated with oil and natural gas wells, sewerage service, LNG facilities, freshwater and tidal wetlands, coastal erosion hazard areas and certain funding programs (water pollution and drinking water revolving funds, open space, historic preservation, landfill closures, coastal rehabilitation, waterfront revitalization, agricultural and farmland protection). In these cases, applicants must demonstrate that future physical climate risk due to sea-level rise, storm surge and flooding have been considered referring to the August 2020 *New York State Flood Risk Management Guidance for Implementation of the Community Risk and Resiliency Act.* [19] The guidance recommends flood-risk management guideline elevations that incorporate possible future conditions, including the greater risks of coastal flooding presented by sea-level rise and enhanced storm surge, and of inland flooding expected to result from increasingly frequent extreme-precipitation events. The guidance is accompanied by a "quick guide" for estimating guidance elevations.[20]

In addition to these provisions, the 2014 CRRA directs that future physical climate risk due to sea-level rise, storm surge and flooding be incorporated into facility-siting regulations related to hazardous waste transportation, storage, and distribution, hazardous substance storage, bulk petroleum storage.

The 2019 Climate Leadership and Community Protection Act amendments to the 2014 Community Risk and Resilience Act requires consideration of climate change in all permits covered by the state Uniform Procedures Act which, in general, includes most of the state Department of Conservation's permitting programs except oil and natural gas wells.[21] The August 2020 *New York State Flood Risk Management Guidance for Implementation of the Community Risk and Resiliency Act* are specific to sea-level rise and flooding and not other climate hazards because they were originally under development in response to the 2014 CRRA. While the 2014 CRRA and the 2019 CLCPA include provisions with regard to incorporation of climate change considerations into permitting and facility-siting regulations, implementation of these provisions has not significantly advanced for several reasons: permit program staff indicated that they could not institute climate change permit conditions until the agency issued guidance which took the Department of Conservation almost six years to release; additionally, the 2014 CRRA did not include any specific regulatory authority to require mitigation of future climate risk beyond any applicable authority provided by programs' authorizing statutes and permit program staff were reluctant to render a broad interpretation of existing statutes' authority to require

[19] https://www.dec.ny.gov/docs/administration_pdf/crrafloodriskmgmtgdnc.pdf
[20] https://www.dec.ny.gov/docs/administration_pdf/crraestelevguidelines.pdf
[21] https://www.dec.ny.gov/permits/6081.html

consideration of future conditions. The 2019 CLCPA amendment to CRRA does give the Department of Conservation explicit authority to require mitigation of significant future physical risks in its permitting, and, as such, the agency has formed an internal work group to review existing permit programs and facility-siting regulations to determine where consideration of climate/weather factors would be relevant to decision making. That group's effort has begun with a review and update to guidance regarding stream crossings (bridges and culverts) and an update to a related general permit to incorporate the flood risk management guidance. Another reason for the Department of Environmental Conservation's initial reluctance to include mitigation of future climate change risks in permits stems from the fact that there are no maps of the expanded flood risk areas defined by the flood risk management guideline elevations, and permit review staff have been reluctant to estimate the project design elevations that application of the guidance would require for all permits due to time and workload concerns. Currently, permit program staff make note of applications for certain types of projects (e.g., sold-waste management and power stations) for the Office of Climate Change to review iif theyare close to existing mapped floodplains.

Rhode Island Resiliency Planning Efforts

A. Background

The Rhode Island Climate Risk Reduction Act of 2010 established the Rhode Island Climate Change Commission.[1] The standing Commission was comprised of twenty-eight representatives from the Rhode Island General Assembly, executive agencies, business organizations, environmental organizations, and community groups. The Commission was charged with studying impacts of climate change on Rhode Island, identifying strategies to adapt to climate change impacts and approaches to integrate resilience planning into existing state and municipal programs. It issued a 2012 report "Adapting to Climate Change in the Ocean State: A Starting Point (cited in this progress report). [2] An Executive Climate Change Council (EC3) was created by EO14-01 in 2014.[3]

The Resilient Rhode Island Act (Chapter 42-6.2) established the **Executive Climate Change Coordinating Council (EC4**) in 2014. Although the 2014 statute is silent on the original Commission and EC3, it appears that the original RICCC under the 2010 statute and the EC3 are supplanted by the 2014 statute and replaced with the EC4. The EC4 includes officials from state agencies with responsibility and oversight relating to assessing, integrating, and coordinating climate change efforts. The statute sets specific greenhouse gas reduction targets; establishes two advisory bodies, the EC4 Advisory Board and the EC4 Science and Technical Advisory Board (STAB), to assist the Council; and incorporates consideration of climate change impacts into the power and duties of all state agencies. The legislation emphasizes the concept of resilience, building on our collective strength to develop practical solutions that allow Rhode Island to "weather the storm." The 12-member Council is chaired by RIDEM Director Janet Coit.[4] By Statute EC4 should issue an annual report.[5] The last EC4 Annual Report that is publicly available is from 2017. [6]

The **EC4 Science and Technical Advisory Board (STAB)** has nine members, appointed by the Governor with the advice and consent of the Senate. Four members are from institutions of higher education in the state; two are from research laboratories located in the state; and three are from state agencies with expertise in, and responsibility for, addressing issues pertaining to climate change. An ex-officio member from the RI Department of Health also serves on the STAB. The EC4 STAB is charged with keeping the EC4 abreast of important developments in scientific and technical information relating to climate change and resiliency. It shall advise the EC4 regarding opportunities to provide timely support for key policy and management decisions, inventory key climate scientific and technical work being done by public-and private-sector entities, and assist the EC4 in communicating scientific and technical information to key user groups and the general public.[7]

---

[1] https://law.justia.com/codes/rhode-island/2013/title-23/chapter-23-84/section-23-84-3/
[2] http://www.crmc.ri.gov/climatechange/RICCC_2012_Progress_Report.pdf
[3] http://climatechange.ri.gov/documents/rcc0614.pdf
[4] http://climatechange.ri.gov/state-actions/ec4/
[5] http://webserver.rilin.state.ri.us/Statutes/TITLE42/42-6.2/42-6.2-7.HTM
[6] http://climatechange.ri.gov/documents/ec4ar17.pdf
[7] http://climatechange.ri.gov/state-actions/ec4/ec4-council/stab.php

The **EC4 Advisory Board** has thirteen full members, appointed by the Governor, House and Senate. Members include municipal representatives as well as those with expertise in economic policy, workforce development, protection of natural/cultural resources, energy planning, education, public health, and housing. The Advisory Board s charged with advising the EC4 on all matters pertaining to the duties and powers of the Council, including evaluating and making recommendations regarding plans, programs, and strategies relating to climate change mitigation and adaptation. It shall also assist the EC4 in communication/outreach and improving public access to resources/information about climate change (both mitigation and adaptation) so as to build public support for making RI's communities more resilient.[8]

With respect to resiliency, among the statutory directives, the EC4 is directed to identify strategies to prepare for the effects of climate change and communicate them to Rhode Islanders, including strategies that incentivize businesses, institutions, and industry to adapt to climate change, Work with municipalities to support the development of sustainable and resilient communities; Identify and leverage federal, state, and private funding opportunities for emission reduction and climate change preparedness and adaption work in Rhode Island; work with other New England states to explore areas of mutual interest/common goals; educate the public; encouraged to use expertise at RI colleges and universities to ensure use of best available science and optimize expertise in research, analysis, modeling, mapping, applications to on-the-ground situations, technical assistance, community outreach, and public education.[9]

To support the council, state agencies shall do a number of things related to emissions reductions and adaptation but for purposes of this working group, the most pertinent requirements are: to assist the council to implement the law; encourage municipalities to incorporate climate change adaptation into local hazard mitigation plans and, when feasible, into hazard mitigation projects; and coordinate between agencies and programs to avoid duplication of work and be cost effective.[10]

The Advisory board has members representing municipal government (> 50, 000 pop; < 50<000 population, serving low income or minority communities);experts in public health, housing , youth or elderly service organization, energy planning and development, engineering and design, economic policy and/or workforce development; natural and/or cultural resources. [11]

The EC4 Advisory Board's most recent meeting materials that are publicly available are from January 2021. [12] That meeting had a focus on State Climate Justice Priorities for consideration and proposed a gap anallysis of statewide policies and programs including a comprehensive equity assessment of programs and development of metrics.[13] The EC4 AB meets the last Wednesday of the month.

Floodplain training for Municipal Planning Board Members. In 2017, a new provision was added to state law governing the powers and duties of planning boards or commissions (RIGL §45-22-7 see Public Law Chapter 403). The new provision (j) requires that each member of a planning board or commission

[8] http://climatechange.ri.gov/state-actions/ec4/ec4-council/advisory-board.php
[9] http://webserver.rilin.state.ri.us/Statutes/TITLE42/42-6.2/INDEX.HTM
[10] http://webserver.rilin.state.ri.us/Statutes/TITLE42/42-6.2/42-6.2-3.HTM
[11] http://webserver.rilin.state.ri.us/Statutes/TITLE42/42-6.2/42-6.2-4.HTM
[12] http://climatechange.ri.gov/documents/ec4-2101-pres.pdf
[13] http://climatechange.ri.gov/documents/ec4-2101-pres.pdf

must participate in training and education classes concerning the effects of development in a flood plain and the effects of sea-level rise once every two years.[14] (more below under Local)

EO 17-10 created the position of **Rhode Island Chief Resiliency Officer** in September 2017 to drive climate resilience efforts across the state, both within government and in collaboration with business, academic, and nonprofit partners, with the mission to develop a **statewide Climate Resilience Action Strategy** to be submitted to the Governor by July 1, 2018 (See **Resilient Rhody further below**). The goal of the Strategy is to identify actions - e.g., projects, policies and legislation, or funding and financing opportunities - that the state can take to better prepare for a changing climate. Rhode Islanders are seeing the impacts of climate change in our communities already so the actions included in the Strategy prioritize things we can begin work on *now*.[15] The Executive Order identified the following components to be included in the comprehensive climate preparedness strategy: community resilience, economic resilience, critical infrastructure and environmental resilience, implementation strategies, and strategies for state agencies to "lead by example."[16]

MUNICIPAL RESLIENCE PROGRAM. Municipal Resilience Program: Designation of as a Resilient Rhody Municipality. Municipalites in Rhode Island can apply to the Rhode Island Infrastructure Bank to participate in the State's Municipal Resilience Program. This is a statewide program. Upon successful completion of the Community Resilience Building, municipalities will be designated as a "**Resilient Rhody Municipality"** which enables municipalities to apply for dedicated action grants to implement identified projects. [17] Goal of achieving 100% RI municipal participation by end of 2023.[18] Municipalities will be required to match grants with a 25% local project cost share.[19] (See more details below about the MRP program under "Local Programs and State Programs" including financing information).

In 2018, the Rhode Island Coastal Resources Management Council adopted a **Shoreline Change Special Area Management Plan (SAMP), known as the Beach SAMP** using authorities under the federal Coastal Zone Management Act of 1972. The SAMP sets forth the process through which development permit applicants will use the state's sea-level rise projections and coastal hazard exposure assessment tools to address coastal hazards associated with climate change.[20] This process applies to applications for new and substantial improvements to properties within the planning boundary for the Shoreline Change Special Area Management Plan (Shoreline Change SAMP). The Shoreline Change SAMP Planning Boundary is defined as the land area along the Rhode Island coastline (all 21 coastal communities) projected to be inundated by a 100- year return period storm event (1% annual chance) plus seven feet of sea level rise as illustrated in STORMTOOLS (www.beachsamp.org/stormtools). [21]

The Coastal Hazard Analysis (CHA) is an educational approach to enable property owners to understand their risks while also a form of disclosure as the CHA is registered on the "land evidence record" for the

[14] http://climatechange.ri.gov/cities-towns/toolkits-guidance.php
[15] http://climatechange.ri.gov/resiliency/
[16] https://governor.ri.gov/documents/orders/ExecOrder-17-10-09152017.pdf
[17] https://www.riib.org/mrp
[18] http://climatechange.ri.gov/documents/ec4-2012-resilience-pres.pdf
[19] https://www.riib.org/mrp
[20] https://www.beachsamp.org/beachsamp-document/
[21] http://www.beachsamp.org/wp-content/uploads/2018/07/BeachSAMP_CH5_CRMCCoastalApp_061218_CRMCApproval.pdf

property [22] (**see more below under Statewide Programs regarding the RI CRMC Coastal Hazard Application Guidance**).

Science based standards

The EC4 Science and Technical Advisory Board most recent publicly accessible report on climate is dated 2016; it includes sea level rise, warming air temperatures, warming water, storm frequency and intensity, biodiversity, precipitation and inland flooding. [23] It is not clear the degree to which the STAB continues to provide analyses on sea level rise data and the degree to which these may be used for regulatory purposes. The RI CRMC SAMP, however, which does have a regulatory requirement that a Coastal Hazard Assessment be completed for development or redevelopment proposed within the 200 foot contiguous Shoreline Change SAMP Planning Boundary or within 200 feet of a coastal feature.

RI SAMP recognizes that sea level rise values are ever changing. Importantly, scenarios developed for the Shoreline Change SAMP document, planning tools and analyses are based on 2012 NOAA SLR analyses which projected up to 6.6 feet of SLR in Rhode Island in 2100 under the high curve. In the shorter term, the NOAA 2012 SLR scenarios predicted. 0.75 feet of SLR by 2030 0, 1.9 feet by 2050, and 4.39 feet by 2080 (NOAA 2012). Scenarios in the Shoreline Change SAMP are based on these 2012 projections because these were the best available data at the time when Shoreline Change SAMP analyses and tools were undergoing development. CRMC plans to update Shoreline Change SAMP tools and analyses with the newest SLR projections as time and resources allow. [24]

Sea level rise projections continue to change. Just as observed sea level rise has accelerated in recent years (see discussion above), so has the development of new sea level rise projections. Over the course of the Shoreline Change SAMP development process (2011 to 2018), three different sets of sea level rise projections have been in use. Early Shoreline Change SAMP analyses and tools began with consideration of 3- 5 feet of SLR by 2100, which was determined by a team of scientific advisors to the CRMC, based on Rahmstorf 2007 and Rahmstorf et al. 2011, and was incorporated into CRMC policy (see RICRMP section 1.1.10). NOAA's 2012 SLR scenarios offered new projections of up to 6.6 feet of SLR by 2100 under the high curve, and NOAA's most recent 2017 SLR scenarios offered newer projections of up to 9.6 feet of SLR under the high curve and the 83% confidence interval. See Figure 2 for a comparison of 2012 and 2017 SLR projections. This rapid succession of SLR scenarios illustrates the rapidly changing nature of the science and the need for policymakers to be prepared to absorb and incorporate new data and science on these sources of coastal hazard risk.[25]

CRMC has adopted the NOAA high curve. The CRMC has adopted the NOAA "high curve" at the 83% confidence interval as the foundation of its sea level rise policy as reflected in the Shoreline Change SAMP as well as the RICRMP. CRMC has adopted NOAA's SLR scenarios as foundational to the Shoreline Change SAMP because NOAA, as the nation's leading ocean and atmospheric science agency, has a wealth of experience and longstanding credibility in performing cutting-edge research using high-tech instrumentation to understand and predict changes in climate, weather, oceans, and coasts. **C**RMC has adopted the high curve and 83% confidence interval, a worse-case scenario, for two reasons. First,

[22] Crean, Teresa. 2021. Personal communication. Rhode Island Coastal Services Center.
[23] http://climatechange.ri.gov/documents/ec4-science-and-technical-advisory-board-report.pdf
[24] http://www.beachsamp.org/wp-content/uploads/2018/07/BeachSAMP_Ch2_Trends_061218_CRMCApproval.pdf
[25] http://www.beachsamp.org/wp-content/uploads/2018/07/BeachSAMP_Ch2_Trends_061218_CRMCApproval.pdf

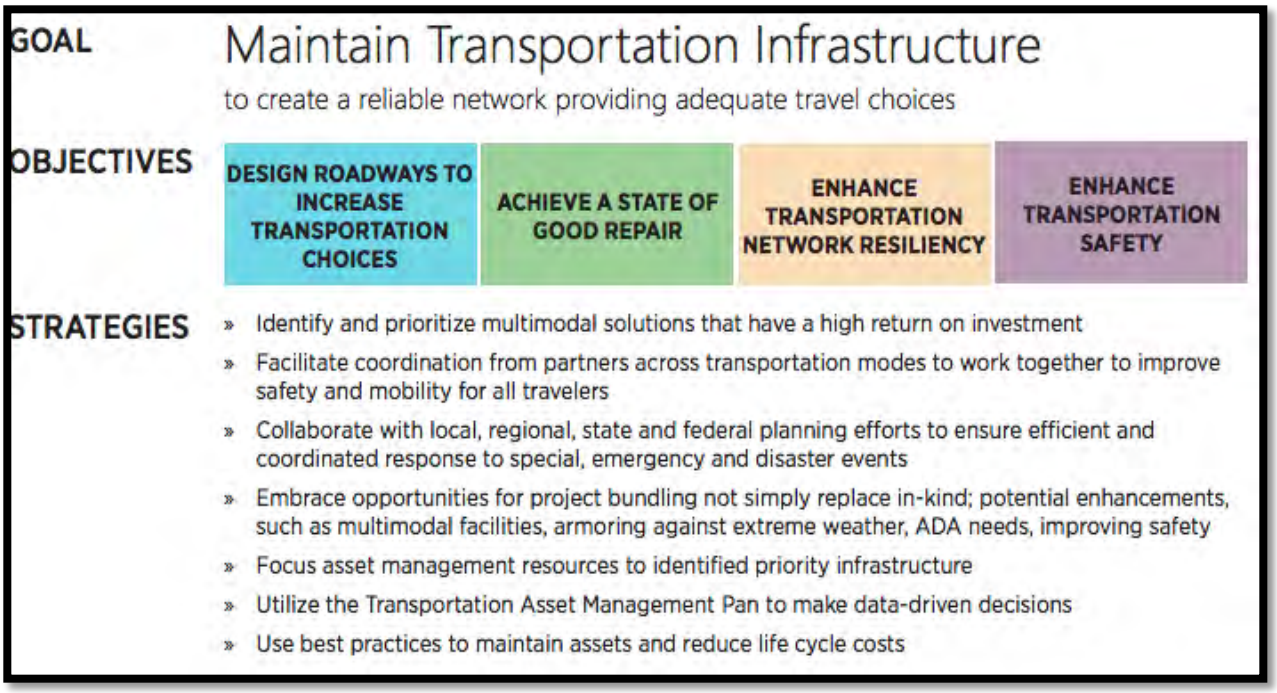
NOAA (2017) has recommended using the "worst-case" or "extreme" scenario to guide overall and long-term risk and adaptation planning. Second, CRMC views use of worse-case scenarios as a way to hedge against the uncertainties inherent in projecting future SLR.[26]

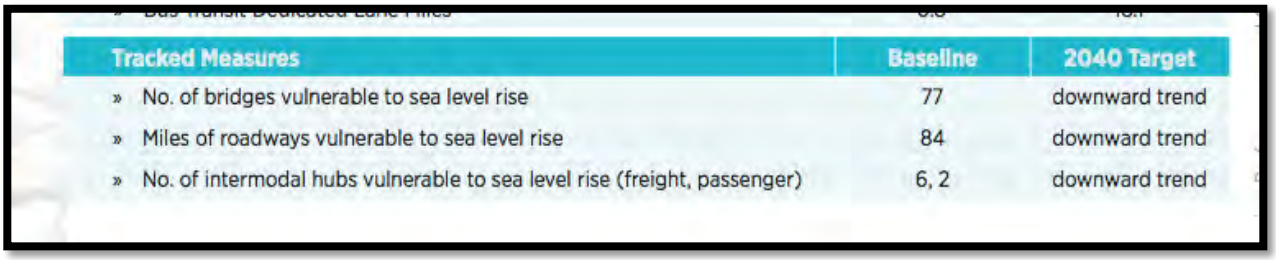
CRMC has adopted the U.S. Army Corps of Engineers Sea Level Change Curve Calculator. The CRMC has also adopted the USACE's sea level change curve calculator for use in identifying and plotting sea level change scenarios. This online calculator offers a simple way for decision-makers to view, for themselves, the latest SLR scenarios and to view short, mid, and long-range SLR projections in both graph and table form. The CRMC has adopted this calculator because of ease of access and use, both for state and local decision-makers and individual coastal property owners. The calculator here: http://www.corpsclimate.us/ccaceslcurves.cfm. [27]

Statewide goals and indicators

Rhode Island's Long range Transportation (Moving Forward RI 2040) has goals and indicators related to climate resilience.[28] On December 10, 2020, the State Planning Council adopted State Guide Plan Element 611, Moving Forward Rhode Island 2040, the State of Rhode Island's Long Range Transportation Plan (LRTP). Under the umbrella of Moving Forward Rhode Island 2040, the State Planning Council also adopted the Transit Master Plan, Bicycle Mobility Plan , and Congestion Management Process.[29]

[26] http://www.beachsamp.org/wp-content/uploads/2018/07/BeachSAMP_Ch2_Trends_061218_CRMCApproval.pdf
[27] http://www.beachsamp.org/wp-content/uploads/2018/07/BeachSAMP_Ch2_Trends_061218_CRMCApproval.pdf
[28] http://www.planning.ri.gov/documents/trans/2020/Final-LRTP-December-2020.pdf
[29] http://www.planning.ri.gov/planning-areas/transportation/transportation-2037.php





Tracked Measures	Baseline	2040 Target
» No. of bridges vulnerable to sea level rise	77	downward trend
» Miles of roadways vulnerable to sea level rise	84	downward trend
» No. of intermodal hubs vulnerable to sea level rise (freight, passenger)	6, 2	downward trend

Data and tools

URI Decision support tools tied to BEACH SAMP permit applicants

Vulnerability of Transportation Assets to Sea Level Rise.[30]

Packaged by RI under "Climate Change RI: Cities & Towns: Toolkits and Guidance"

Planning Guide regarding Mandatory Education for Planning Boards and Commissions.

RI Floodplain Mapping Tool is RIEMA's interactive floodplain viewer app. This web app uses FEMA floodplain information as a base layer, but should only be used for planning purposes only. *Anyone searching for a definitive floodzone determination must use* ***FEMA's National Flood Hazard Layer.*** [31] Includes SFHA Castal A zone, Effective FIRM Panels; 500 yr Floodplain, Coastal Barrier Resource System Units, CBRS Buffer Zone; Floodway Area, Riverine Cross Sections.

Stormtools (Mapping tool) Use these maps to turn on/off individual layers to visualize the potential impacts from storm events and sea level rise. STORMTOOLS is a methods to map storm inundation, with and without sea level rise, for varying return period storms that covers all of Rhode Island's coastal waters. Predictions are provided that show water extent and depth at any given point for nuisance floods (1, 3, 5, and 10 year recurrence intervals) and 25, 50, 100, and 500 year storm scenarios at a 95% confidence interval. Sea level rise of 1, 2, 3, 5, and 7 feet on their own on their own as well as combined with each storm scenario are also modeled. Flood maps are also provided for historical hurricanes to include 1938, 1954 (Carol), 1991 (Bob), and 2012 (Sandy). STORMTOOLS are linked to the RI CRMC Coastal Hazard Application Guidance (described elsewhere in detail).

- STORMTOOLS for Beginners: One-map stop for all residents of RI to better understand risk from coastal inundation. Enter property address and can find out if 1) Is my property vulnerable to storm surge; 2) How deep will the water be on my property during a 100 year (1% chance) coastal storm? 3) Will projected SLR affect my property? [32]

- Advanced STORMTOOLS provides a series of maps that illustrate what coastal flooding could look like in the future under different storm scenarios. It enables Rhode Island's municipal officials and decision makers to better understand their risk from coastal inundation. [33]

- Coastal Environmental Risk Index: One of the challenges facing coastal zone managers and municipal planners is the development of an objective, quantitative assessment of the risk to structures, infrastructure, and public safety that coastal communities face from storm surge in the presence of changing climatic conditions, particularly sea level rise and coastal erosion. Here we use state of the art modeling tool (ADCIRC and STWAVE) to predict storm surge and wave, combined with shoreline change maps (erosion), and damage functions to construct a Coastal Environmental Risk Index (CERI). Access to the state emergency data base (E-911) provides information on structure characteristics and the ability to perform analyses for individual

[30] https://ridoa.maps.arcgis.com/home/item.html?id=66285526ea454e0a8e6c110128780733
[31] https://hazards-fema.maps.arcgis.com/apps/webappviewer/index.html?id=8b0adb51996444d4879338b5529aa9cd
[32] https://stormtools-for-beginners-crc-uri.hub.arcgis.com/
[33] https://advanced-stormtools-crc-uri.hub.arcgis.com/

structures. CERI has been designed as an on line Geographic Information System (GIS) based tool, and hence is fully compatible with current flooding maps, including those from FEMA. The basic framework and associated GIS methods can be readily applied to any coastal area. The approach can be used by local and state planners to objectively evaluate different policy options for effectiveness and cost/benefit.[34]

- Rhode Island E911 Exposure Assessment This page offers a summary of all exposed structures in each of the 21 coastal municipalities in Rhode Island within a variety of coastal flooding scenarios:

  From twice-daily tides based on sea level rise projections to the year 2100; and,
  From coastal storm events with and without sea level rise scenarios
  The data contained in the spreadsheets below present the E911 structure type data sorted by coastal flooding scenario. [35]

- STORMTOOLS Design Elevation Maps for uws within the RI CRMC Coastal Hazard Application Guian Permit process. The information included here can be used to populate ethe worksheet requried by RI CRMC for coastal permits. [36] Includes 100 yr, SLR
  For South Coast [37]
  For Narragansett Bay[38]

Rhode Island Coastal Property Guide : What Coastal Property owners, renters, builders and buyers should know about Rhode Island's Shoreline (10 questions Coastal residents should ask about coastal property; FEMA Zones & Flood Insurance; Coastal Storms Is your Property at Risk)[39]

[34] https://coastal-environmental-risk-index-ceri-crc-uri.hub.arcgis.com/

[35] https://rhode-island-e911-exposure-assessment-crc-uri.hub.arcgis.com/
[36] https://stormtools-design-elevation-sde-maps-crc-uri.hub.arcgis.com/
[37] https://stormtools-design-elevation-sde-maps-crc-uri.hub.arcgis.com/app/d4526699d1ef4cf4a04c031052a7e50d
[38] https://stormtools-design-elevation-sde-maps-crc-uri.hub.arcgis.com/app/3c877dcc316f400abab23b20c74892d8
[39] http://climatechange.ri.gov/documents/rhode-island-coastal-property-guide-2014.pdf

	Question	Page
1	What kinds of coastal features are on or near the property, and what kinds of setbacks or regulations apply?	3
2	Are there restrictions on the property due to the adjacent CRMC water classification?	6
3	Is the property in a flood zone according to FEMA maps?	8
4	If I am in a flood zone, do I have to obtain flood insurance? How can I find out what my flood insurance premiums will be?	10
5	How will erosion and sea-level rise impact the property and surrounding area?	12
6	Can I install structures along the shore to protect the property and buildings from erosion or flooding?	14
7	How will coastal storms and flooding affect the property and structures? Will I be allowed to rebuild in the event of a flood or storm that partially or completely destroys the building?	16
8	How do I determine if the buildings on the property meet the current design and construction standards for the flood zone?	20
9	What kinds of septic systems are permitted in the coastal zone? Can I repair or replace a damaged septic system?	22
10	Can I make the existing building more resilient? How do I build a new resilient structure?	24

Additional Information

Introduction 2
Coastal Property Topics & Terms 27
Resources & Links 28

Other

PREP-RI: Providing Resilience Education for Planning in Rhode Island. ($ from State, Fed, and private charities). Developed by Coastal Resource Center and Sea Grant at URI and Narragansett Bay NERR. Initially comprising a web based series of education modules, PREP now encompasses a diverse portfolio of tools and technical assistance examples that coastal communities, businesses, and leaders can use to act today and plan for tomorrow. There are training modules on climate change in RI, adaptation, stormwater, flooding, infrastructure and mapping tools. Upon completion a certificate is provided. [40]

Regulatory Standards

RI Beach SAMP requires permit applicants to include SLR , storms and coastal erosion impacts as noted above and below.

Rhode Island enacted a "freeboard bill" in 2018 that measured building height from the base flood elevation, and where freeboard is utilized or proposed, the area is not to exceed 5 feet above Base Flood Elevation and this area is excluded from the building height calculation (in essence allowing a property owner in a Special Flood Hazard Area to build 5 feet above BFE). [41] Notably, this bill was opposed by some in the planning community who cited concerns that the bill would increase structure size in coastal areas susceptible to storms and sea level rise; while endorsed by other groups including Conservation Law Foundation who noted the statute provides for property owners to elevate structures higher in at risk areas without forfeiting building height to do so.[42]

Public education

Press Release about Campaign to Educate Public/Business sectors

[40] https://prep-ri.org/
[41] http://webserver.rilin.state.ri.us/BillText18/SenateText18/S2413.pdf
[42] Rhode Island Senate. 2018. Committee on Housing & Municipal Government. Testimony to the Committee. https://static1.squarespace.com/static/546d61b5e4b049f0b10b95c5/t/5b2fd30888251b30910f5c51/1529860902732/2413.pdf

CRMC talks to Realtors on front lines of climate change
February 5, 2019:
In Rhode Island, there is little to no memory of the last major hurricane - Hurricane Carol in 1954 – and that's a problem, says Grover Fugate, executive director of the Rhode Island Coastal Resources Management Council (CRMC).

"There's no institutional memory of the last big hurricane," he said to a classroom of Rhode Island Association of Realtors members earlier this month. "We don't want to wait for a 100-year event to find out what it's going to do to us. We want to predict it now."

That's what the CRMC is doing, precisely, through a series of sea level rise, storm surge, flooding, erosion, and risk assessment mapping tools developed through its R.I. Shoreline Change (Beach) Special Area Management Plan. The SAMP evaluates the changing conditions along the entire state's shoreline, and provides guidance for both coastal applicants and homeowners, and coastal municipal managers.

Fugate, along with Senator Sheldon Whitehouse (D-RI), ha....s been on a campaign of sorts for more than two years, visiting trades, economic, and other stakeholder groups all over Rhode Island, pitching them on the value of the SAMP tools and the costs of not planning for sea level rise. Fugate and Whitehouse talk about the science behind climate change (rising CO2) and sea level rise (expansion of water as global temperatures increase). Fugate warns them all about the impacts of melting ice sheets:
"We will feel the effect of that warming even more here – the loss of the west Antarctic ice sheet can cause up to 25 percent more sea level rise on the U.S. coast," he told the Realtors at the recent talk on January 15.

He points out the fatal flaws in the Federal Emergency Management Agency (FEMA) floodplain maps, which actually showed lowered risk in known vulnerable coastal areas in the state.[43]

B. Local government

Program elements

Floodplain training for Municipal Planning Board Members. In 2017, a new provision (see Public Law Chapter 403) was added to RIGL §45-22-7. of the Rhode Island General Laws. This portion of State Law describes the powers and duties of a planning board or commission. The new provision (j) requires that each member of a planning board or commission must participate in training and education classes concerning the effects of development in a flood plain and the effects of sea-level rise once every two years. Each member must complete two hours of training by September 30, 2019 and file with the municipal clerk a statement asserting that the training has been completed. [44] A sample "Statement of Completion" is included in a Planning Guidance: New Mandatory Education for Planning Boards/Commissions from the Division of Statewide Planning. In order to meet this requirement, planning board/commission members can watch six educational modules regarding making informed choices for supporting resilience to the impacts from climate change. (It appears these six training modules called

[43] http://www.crmc.ri.gov/news/2019_0205_realtors.html
[44] http://climatechange.ri.gov/cities-towns/toolkits-guidance.php

PREP-RI have now been moved to this new website: https://prep-ri.org/training-modules [45]but the states's website describing the program has an old link. [46] In addition, members are strongly encouraged to review or watch the additional resources listed below to round out the 2-hour training requirement.[47] [48] (Municipal resources are noted under the Data and Tools section).

Municipal Resilience Program: Designation of as a Resilient Rhody Municipality
Municipalities in Rhode Island can apply to the Rhode Island Infrastructure Bank to participate in the State's Municipal Resilience Program. This is a statewide program. Upon successful completion of the Community Resilience Building, municipalities will be designated as a "**Resilient Rhody Municipality"** which enables municipalities to apply for dedicated action grants to implement identified projects. [49] Goal of achieving 100% RI municipal participation by end of 2023.[50] Municipalities will be required to match grants with a 25% local project cost share.[51] (See more details below about the MRP program under "State Programs" including financing information).

Authority

For Floodplain training: Public Law Chapter 403 of 2017 "An Act Relating to Towns and Cities-Local Planning Board or Commission[52]

For Resilient Rhody Towns see Resilient Rhody Statute and RIIB authorities.

Funding

Funding for MRP denoted in Sections below on the MRP program.

Floodplain Training for Municipal Officials (PREP-RI) was developed by Coastal Resources Center and Rhode Island Sea Grant, both at URI Graduate School of Oceanography, and by Narragansett Bay National Estuarine Research Reserve.

Non-financial resources

Coordination with other programs

C. State agencies and state investment

Program elements

Division of Statewide Planning (under EC4) has completed several technical papers on *Vulnerability of Transportation Assets to SLR* (2014); *Vulnerability of Municipal Transportation Assets to SLR and Storm*

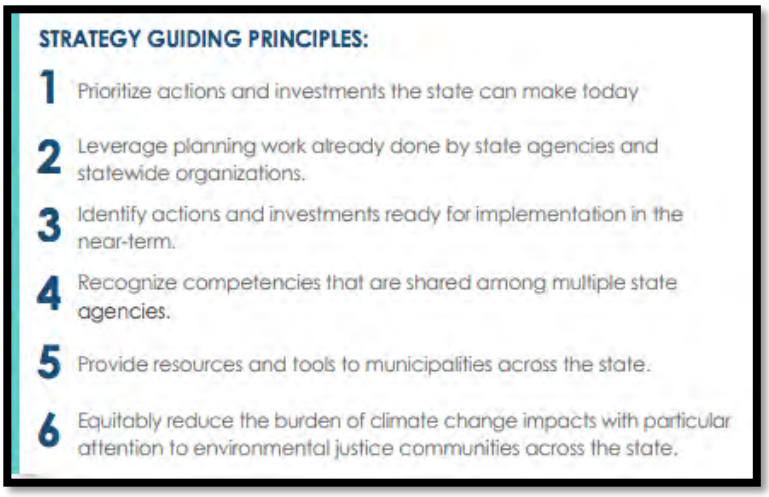
[45] https://prep-ri.org/training-modules/
[46] http://climatechange.ri.gov/cities-towns/toolkits-guidance.php
[47] http://climatechange.ri.gov/cities-towns/toolkits-guidance.php
[48] http://www.planning.ri.gov/documents/about/PGM_Pl-Bd-Education_Final.pdf
[49] https://www.riib.org/mrp
[50] http://climatechange.ri.gov/documents/ec4-2012-resilience-pres.pdf
[51] https://www.riib.org/mrp
[52] http://webserver.rilin.state.ri.us/PublicLaws/law17/law17403.htm

Surge (2016) and has a project on the Socioeconomics of Sea Level Rise to idnetify the social economic and demographic makeup of the populations located withing 1,3,5, and 7 foot sea level rise inundation zones in the state's coastal communities, as well as highlights the Title VI and EJ populations. [53] The Socioeconomics of Sea Level Rise Project incorporates the best available data in an effort to identify the social, economic and demographic characteristics of the populations located within the 1, 3, 5 and 7 foot SLR inundation zones in the state's 21 coastal communities. Housing characteristics were also evaluated. While many sea level rise projects in the state focus on structural vulnerability, the Socioeconomics of Sea Level Rise project is uniquely focused on people and serves as a complimentary data piece for sea level rise projects of various concentrations. This agency also completed development of an interactive map on Vulnerability of Transportation Assets to Sea Level Rise.[54]

Resilient Rhody 2018 is Rhode Island's comprehensive plan focusing on all climate hazards.
It provides a timeline of natural disaasters and selective state agency reports and tools:

The strategy was developed under the Governor's leadership in partnership with a range of state agencies, municipal officials and representatives, and statewide organizations. Strategy developed with Six guiding Principles:

[53] http://www.planning.ri.gov/planning-areas/climate-change/sea-level-rise.php
[54] https://ridoa.maps.arcgis.com/home/item.html?id=66285526ea454e0a8e6c110128780733



Developing the strategy was started with 10 roundtables across Rhode Island (September–December 2017) in partnership with local organizations and municipalities. The goal was to listen to local and regional leaders, learn what has been done, understand what local assets are at risk, and hear future priorities for local climate resilience. Over 350 individuals attended the Resilience Roundtables, including municipal planners/staff, environmental organizations, community organizations, business owners, state employees, and residents. The data and input gathered from the Roundtables were then organized and fed into five working groups: (1) critical infrastructure and utilities; (2) natural systems; (3) emergency preparedness; (4) community health and resilience; (5) financing climate resilience projects. Members of the working groups represented expert stakeholders on climate resilience and included state agency staff and statewide organization leaders. Each of the working groups led the drafting process for their respective chapters in the Strategy in close collaboration with the Chief Resilience Officer.[55]

The Strategy is organized into six chapters, directly linked to input received at the Resilience Roundtables. Chapter 1 provides the evidence base for why climate resilience is essential in Rhode Island by summarizing research and data on climate change impacts currently affecting the state as well as estimates and predictions for future impacts. Chapters 2, 3, 4, and 5 introduce the four thematic areas at the core of the Strategy: critical infrastructure and utilities, natural systems, emergency preparedness, and community health and resilience. Each chapter identifies critical asset types and other factors vulnerable to climate change and provides actionable recommendations for strengthening climate resilience. Some chapters also provide current and planned resilience initiatives. While presented as discrete asset types and chapters, the actions will be implemented in collaboration with multiple state agencies. The final chapter explores challenges and opportunities related to paying for climate resilience projects in Rhode Island and offers potential financing mechanisms that could support the implementation of the climate resilience projects and recommendations in previous chapters. A full list of actions and initiatives concludes the strategy and serves as the framework for implementation.[56]

[55] http://climatechange.ri.gov/documents/resilientrhody18.pdf
[56] http://climatechange.ri.gov/documents/resilientrhody18.pdf

WATER

Drinking Water Systems

- Assist water suppliers in developing local Emergency Interconnection Programs to address supply vulnerability among small systems throughout the state. Emergency Water System interconnections provide redundancy of supply and the ability to address water emergencies rapidly and efficiently across water supply districts.
- Assess the vulnerability of near coastal drinking water reservoirs to storm surge and sea level rise.
- Advance common goal setting and communication between water suppliers that manage reservoirs and downstream municipalities. Ensure downstream flood mitigation via proactive spillway management without adverse impacts on safe yield.
- Ensure that all major suppliers have current contingency contracts for the purchase of emergency supplies and have established emergency interconnection/distribution process.

Wastewater Treatment Facilities

- Accelerate treatment system and pumping station hardening projects identified in *Implications of Climate Change for RI Wastewater Collection & Treatment Infrastructure* to include the installation of submarine doors; elevated, watertight protections of motor control centers; waterproofing and elevated instrumentation, windows, hatches, and vents; and installation of standby power systems.
- Provide additional fuel-storage capacity at major wastewater systems where it is necessary to maintain self-sufficient standby power during times of long-term power grid outages.
- Expand flood modeling/mapping efforts within inland areas to enhance the recommendations in *Implications of Climate Change for RI Wastewater Collection & Treatment Infrastructure*. Data should include statewide precipitation projections that can be used for other sectors as well.

Dams

- Prioritize remediation actions and investments identified in RIDEM's 2017 dam hazard study to ensure compliance and downstream safety.
- Establish a notification system for dam safety to coordinate the actions of officials at the federal, state, and local levels. The system should use the process developed by the National Weather Service for severe weather, including a dam advisory, a dam watch, and a dam warning.

- Develop Emergency Action Plans (EAPs) for all statewide high hazard and significant hazard dams. Responding to an emergency at a dam without an EAP increases the risk to life and property yet many statewide dams do not have plans filed. RIDEM and RIEMA have been working to increase the number of filed EAPs but a more robust program is needed to ensure compliance.

Stormwater

- Work with local governments to establish sustainable revenue sources for the operation and maintenance of local stormwater management systems (e.g., applying asset management approaches commonly used with wastewater and drinking water systems) to ensure drainage systems are functioning as designed/intended and repaired/upgraded as needed.
- Encourage the use of green infrastructure to enhance the capacity of traditional stormwater systems to provide multiple community and ecosystems benefits to enhance water quality and provide multiple community benefits.
- Update the Stormwater Design and Installation Standards Manual/Rules to reflect changing precipitation patterns.
- Use Total Maximum Daily Loads (TMDLs) and other watershed plans to identify areas of existing impervious surface that can be removed and to prioritize retrofitting of existing drainage systems.
- Identify existing stormwater management structures that are subject to frequent coastal and riverine flooding and take steps to mitigate the impacts of this flooding on stormwater infrastructure and its performance.
- Update the state land use plan, Land Use 2025, to include climate change and resilience topics as well as stormwater water management needs, policies, and actions for stormwater utility districts.
- Develop a bridge loan at Rhode Island Infrastructure Bank to provide upfront capital to communities and organizations who are RIDOT and RIDEM reimbursement stormwater grant recipients.

Ports

- Strengthen storm resilience and post-storm recovery at the ports through strategic partnerships and planning. Shipping lines will turn to ports that rapidly resume normal operations after hurricanes. Rhode Island and cities like Providence and East Providence should approach storm resilience and climate change as a business opportunity through inclusion of resilience planning. For example, state agencies should support the ports in developing pre-contracts for debris removal after hurricanes or businesses could implement data backup mechanisms to help the ports resume operations more quickly after a storm.
- Establish a new collaborative partnership between the state and port community to understand the economic implications of severe weather events and benefits of storm resilience planning.

POWER

Electric Grids

- Design and implement a comprehensive, targeted strategy addressing energy security vulnerabilities at the municipal or facility level, based on findings of the *Energy Assurance Plan*. This strategy should address risks specific to discrete critical infrastructure assets, including hospitals, police and fire stations, water and sewage treatment plants, senior centers and nursing homes, shelters, correctional facilities, fueling stations, and grocery stores. Smart energy security investments at these locations and energy resilience solutions could alleviate the impacts of power outages and fuel supply disruptions in energy emergencies. Examples of such solutions are backup generation, fuel reserves, distributed generation, combined heat and power, energy storage, and microgrids.
- Act on the policy recommendations outlined in the OER report, *Resilient Microgrids for Rhode Island Critical Services*, and remove market barriers to implementing microgrids at critical facilities.
- Modernize the grid and complementary efforts through the Power Sector Transformation initiative currently under review at the PUC, as recommended by the state energy plan and the House Energy Security Resolution Report. The initiative includes recommendations for the utility business model, grid connectivity and meter functionality, distribution system planning, and beneficial electrification. These facets will help accelerate the integration of non-conventional resources and support the development of a more resilient, reliable, efficiency, and flexible electric grid.
- Reduce the number and extent of power outages as described in *Division Docket No. D-17-45: Review of National Grid Storm Preparedness and Restoration Efforts Related to the Storm of October 29-30, 2017*, including:
  - Supplement weather forecasting services with additional tools to achieve more accurate storm forecasts.
  - Develop a mechanism to rapidly adjust weather classifications based on actual, current impacts and review classification system, planned resources, and staging locations based on classifications. A utility's emergency response plan should incorporate methods to rapidly adjust when storm impacts are more severe than anticipated.
  - Consider enhancements to existing vegetation management programs. Strategic tree removal, for example, can mitigate power outages due to tree-related downed power lines.
  - Enhance communications systems to respond quickly to changes in storm severity from what was predicted. Better communication systems and protocol are needed to properly convey changes in urgency and actions both internally and to the public.
  - Improve guidelines and contracts for mutual aid to allow for more appropriate magnitude and timing of crew additions in the state.

Fuel Supply

- Ensure fuel terminals have undertaken all appropriate hardening and resilience measures to protect their facilities from future storms and have made provisions to restore operations after storms. This includes continuing strategic long-term planning for improving the resilience of marine terminals.
- Develop a Petroleum Set-Aside Program, as recommended by the *Energy Assurance Plan*, to ensure essential public needs are met during a severe fuel shortage. This program should specify best practices to ensure fuel delivery to priority end-users, such as hospitals, police and fire stations, water and sewage treatment plants, senior centers and nursing homes, shelters, correctional facilities, fueling stations, and grocery stores. This program should also define best practices and prioritize critical infrastructure assets.

TRANSPORTATION

Roads, Bridges, and Culverts

- Develop a *Transportation Asset Management Plan* for RIDOT assets that integrates future climate risks into a comprehensive asset management approach for transportation assets to ensure adequate investment and a state of good repair.
- Align the *Transportation Improvement Program and Transportation Asset Management Plan* processes to ensure asset management and risked-based planning for infrastructure maintenance and new projects.
- Update the state land use plan, Land Use 2025, to include climate change and resilience actions for transportation infrastructure and updated goals and priorities set by the Long-Range Transportation Plan.

Public Transportation

- Ensure continuity of RIPTA operations following extreme weather events through implementation of backup power generation at key facilities.
- Develop a *Transportation Asset Management Plan* for RIPTA assets that integrates a comprehensive asset management approach to ensure a state of good repair and investments that consider all future climate risks.

All Critical Infrastructure

- Ensure that data are consistent across agencies and municipalities. This is critical to maximizing limited resources and capacity. Updating, coordinating, and standardizing foundational resilience data including GIS layers (e.g., STORMTOOLS, critical infrastructure, precipitation projections) and related metadata should be centralized. Hosting coordinated data will provide

support for municipal/agency decision-making on infrastructure/ public facility investments.

- Develop a tracking system for implementation of identified actions to measure progress and demonstrate alignment with EC4 climate resilience goals.
- Build relationships and learn from climate adaption efforts in neighboring states to accelerate technical assistance to municipalities for local implementation. Rhode Island should look to the region for examples of how to model municipal and nonprofit partnerships that move from planning to prioritized project identification and funding.

CHAPTER THREE:
Natural Systems

COASTAL

Coastal Wetlands

- Continue monitoring and assessment of coastal wetland habitats and management practices to evaluate and prioritize future actions. Statewide models, such as the Sea Level Affecting Marshes Model (SLAMM), should be updated to identify opportunities for restoration and assist in planning for future marsh migration. To minimize loss and preserve the benefits of coastal wetland habitats, conservation and management must be approached at multiple scales and timeframes.
- Identify opportunities for retreat and infrastructure removal on state-owned properties, which can serve as demonstration sites for shoreline adaptation. State agencies and their partners should continue to work with municipalities to identify opportunities for retreat, removal of derelict infrastructure, and enhancement of natural shoreline areas. Where possible, retreat rather than fortification should be emphasized as a coastal adaptation strategy. Implemented restoration projects should continue to be monitored to evaluate the effectiveness of different restoration practices.

Beaches and Barriers

- Preserve the dynamic nature of beaches and barriers in future management of these critical natural systems. Differentiation between developed and undeveloped systems is necessary when considering management approaches. New development should be minimized in undeveloped beach and dune areas and retreat incentivized as a coastal adaptation strategy where possible.
- Develop initiatives for coastal resilience activities, such as monitoring existing pilot projects, developing offshore sand sources suitable for beach replenishment, prioritizing beaches to be re-nourished, and creating beach and barrier migration pathways through property acquisition and relocation of structures.

INLAND

Forests

- Encourage protection of significant portions of the remaining intact forest cover in Rhode Island and conserve the landscape values of larger, unbroken tracts of land. This will require considerable collaboration with private landowners, who own about 72% of the forested land area in the state, as well as creative sustainable investment ideas.
- Incentivize the creation of Forest Stewardship Plans to help protect soil and water quality, fish and wildlife habitat, timber and other wood products, and outdoor recreation. Landowners with completed/updated Forest Stewardship Plans can take advantage of the Farm, Forest, and Open Space Act, which can provide significant reductions in property taxes.
- Support municipalities in developing urban tree inventories and implementing urban forest master plans with a goal toward mitigating increased urban heat.

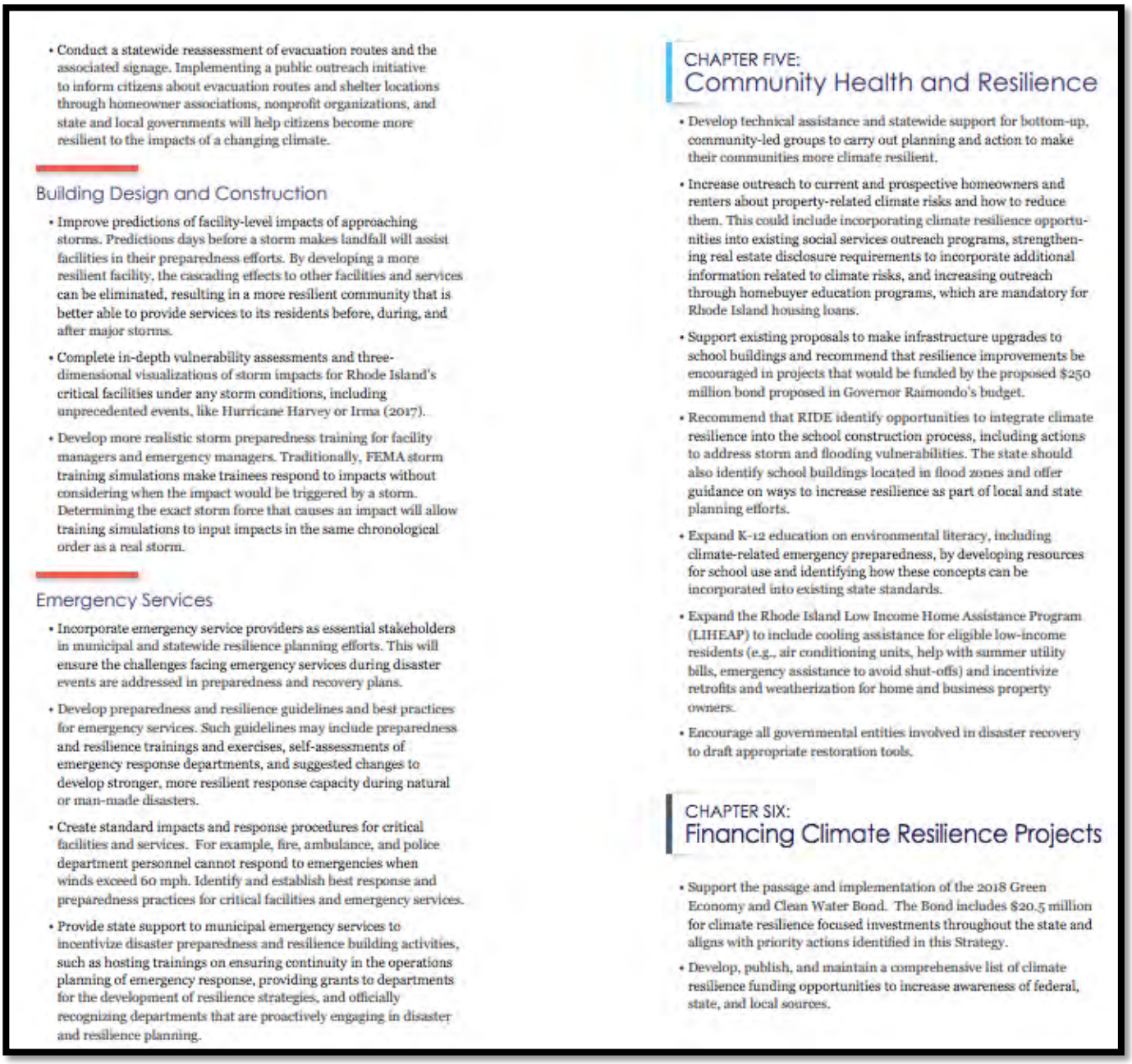
Water Resources

- Identify and assess inland riparian buffer conditions statewide (e.g., using aerial photos and field reconnaissance). Identifying and mapping small headwater streams and their riparian buffers should be a high priority. These areas can be more effectively protected by state and local land use policies/regulations once they are identified. The assessment can also be used to develop priority areas for buffer restoration and protection.
- Develop a comprehensive environmental monitoring strategy, prioritize gaps, and continue to strengthen coordination of upland water resource monitoring activities. Monitoring programs should be aligned with regional data collection strategies relating to climate change, aquatic ecosystems, and water quality.

CHAPTER FOUR:
Emergency Preparedness

Evacuation Shelters and Routes

- Prioritize protection of the local fuel supply along evacuation routes during climate-related disasters. During Hurricane Irma (2017) in Florida, the large number of residents attempting to evacuate at the same time created a burden on the fuel supply and many evacuees were stranded without fuel, stalling their evacuation, and increasing calls for assistance from emergency services personnel.
- Inform residents of evacuation routes and shelter locations in the event of severe weather necessitating an evacuation. Some evacuation routes within the state have been altered, changed, and revised since the last update.



- Conduct a statewide reassessment of evacuation routes and the associated signage. Implementing a public outreach initiative to inform citizens about evacuation routes and shelter locations through homeowner associations, nonprofit organizations, and state and local governments will help citizens become more resilient to the impacts of a changing climate.

Building Design and Construction

- Improve predictions of facility-level impacts of approaching storms. Predictions days before a storm makes landfall will assist facilities in their preparedness efforts. By developing a more resilient facility, the cascading effects to other facilities and services can be eliminated, resulting in a more resilient community that is better able to provide services to its residents before, during, and after major storms.
- Complete in-depth vulnerability assessments and three-dimensional visualizations of storm impacts for Rhode Island's critical facilities under any storm conditions, including unprecedented events, like Hurricane Harvey or Irma (2017).
- Develop more realistic storm preparedness training for facility managers and emergency managers. Traditionally, FEMA storm training simulations make trainees respond to impacts without considering when the impact would be triggered by a storm. Determining the exact storm force that causes an impact will allow training simulations to input impacts in the same chronological order as a real storm.

Emergency Services

- Incorporate emergency service providers as essential stakeholders in municipal and statewide resilience planning efforts. This will ensure the challenges facing emergency services during disaster events are addressed in preparedness and recovery plans.
- Develop preparedness and resilience guidelines and best practices for emergency services. Such guidelines may include preparedness and resilience trainings and exercises, self-assessments of emergency response departments, and suggested changes to develop stronger, more resilient response capacity during natural or man-made disasters.
- Create standard impacts and response procedures for critical facilities and services. For example, fire, ambulance, and police department personnel cannot respond to emergencies when winds exceed 60 mph. Identify and establish best response and preparedness practices for critical facilities and emergency services.
- Provide state support to municipal emergency services to incentivize disaster preparedness and resilience building activities, such as hosting trainings on ensuring continuity in the operations planning of emergency response, providing grants to departments for the development of resilience strategies, and officially recognizing departments that are proactively engaging in disaster and resilience planning.

CHAPTER FIVE: Community Health and Resilience

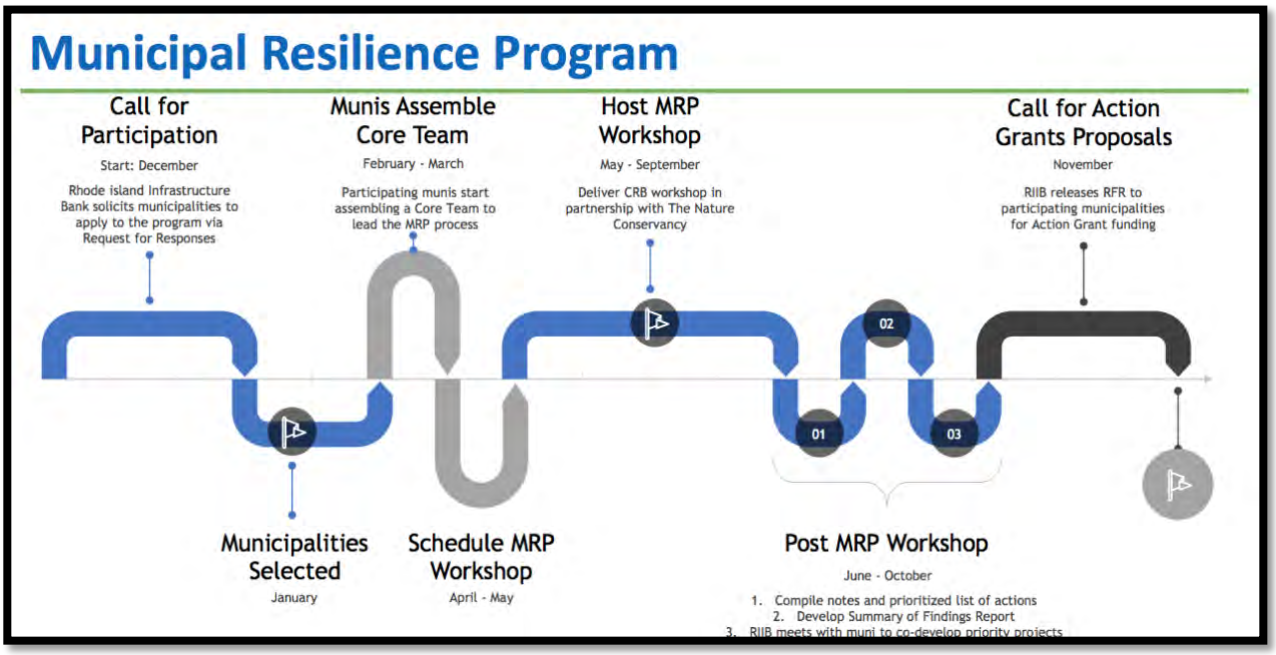
- Develop technical assistance and statewide support for bottom-up, community-led groups to carry out planning and action to make their communities more climate resilient.
- Increase outreach to current and prospective homeowners and renters about property-related climate risks and how to reduce them. This could include incorporating climate resilience opportunities into existing social services outreach programs, strengthening real estate disclosure requirements to incorporate additional information related to climate risks, and increasing outreach through homebuyer education programs, which are mandatory for Rhode Island housing loans.
- Support existing proposals to make infrastructure upgrades to school buildings and recommend that resilience improvements be encouraged in projects that would be funded by the proposed $250 million bond proposed in Governor Raimondo's budget.
- Recommend that RIDE identify opportunities to integrate climate resilience into the school construction process, including actions to address storm and flooding vulnerabilities. The state should also identify school buildings located in flood zones and offer guidance on ways to increase resilience as part of local and state planning efforts.
- Expand K-12 education on environmental literacy, including climate-related emergency preparedness, by developing resources for school use and identifying how these concepts can be incorporated into existing state standards.
- Expand the Rhode Island Low Income Home Assistance Program (LIHEAP) to include cooling assistance for eligible low-income residents (e.g., air conditioning units, help with summer utility bills, emergency assistance to avoid shut-offs) and incentivize retrofits and weatherization for home and business property owners.
- Encourage all governmental entities involved in disaster recovery to draft appropriate restoration tools.

CHAPTER SIX: Financing Climate Resilience Projects

- Support the passage and implementation of the 2018 Green Economy and Clean Water Bond. The Bond includes $20.5 million for climate resilience focused investments throughout the state and aligns with priority actions identified in this Strategy.
- Develop, publish, and maintain a comprehensive list of climate resilience funding opportunities to increase awareness of federal, state, and local sources.

MUNICIPAL RESLIENCE PROGRAM. Rhode Island Infrastructure Bank (RIIB) in partnership with The Nature Conservancy (TNC). Common throughout Resilient Rhody is the need to work collaboratively with and in support of municipalities statewide. The Municipal Resilience Program (MRP) provides direct support to cities and towns to complete a municipal-driven process that brings together climate change information and local knowledge to identify top hazards, current challenges, and community strengths. This process identifies priority projects and strategies to improve the municipality's resilience to all natural and climate-related hazards using a flexible, tested approach called Community Resilience Building (CRB).

Upon successful completion of the CRB process, municipalities will be designated as a "**Resilient Rhody Municipality"** which enables municipalities to apply for dedicated action grants to implement identified projects. [57] Goal of achieving 100% RI municipal participation by end of 2023.[58]



MRP Program Graphic Source from RIIB: [59]

RIIB and TNC provide municipalities with a community-focused Community Resilience Building Framework process to assess current hazard and climate change impacts and to surface projects, plans, and policies for improved resilience. The city forms a core team and organizes a CRB workshop lead by TNC in partnership with RIIB. The workshop engages stakeholders, identifies top climate hazards, local and regional existing and future vulnerabilities and strengths, prioritized actions for the municipality, opportunities for collaboration to advance/increase resilience. [60]

Program Outcomes . Understand connections between ongoing community issues, climate change and natural hazards, and local planning and actions in the municipality;
Understand how climate change will exacerbate or lead to new community issues, hazards and other challenges the municipality faces;
Identify infrastructural, societal, and environmental vulnerabilities and evaluate strengths that help make the community more resilient to climate change and natural hazards;
Explore nature-based solutions to build resiliency in the municipality;
Develop and prioritize actions and clearly delineate next steps for the municipality, local organizations, businesses, private citizens, neighborhoods, and community groups; and

[57] https://www.riib.org/mrp
[58] http://climatechange.ri.gov/documents/ec4-2012-resilience-pres.pdf
[59] http://climatechange.ri.gov/documents/ec4-2012-resilience-pres.pdf
[60] See Summary of Findings Reports at https://www.riib.org/mrp

Implement identified actions and apply for available action grants.[61]

Workshop Facilitators.
MRP facilitators are trained to provide technical assistance to communities in completing the assessment and resiliency plan using the Community Resilience Building Framework. Towns and cities will be assigned a lead facilitator and workshop facilitators upon acceptance into the program.
The MRP workshops are being delivered and funded with support from the Nature Conservancy (TNC).[62]

COMMUNITY RESILIENCE BUILDING FRAMEWORK
This is a TNC process for communities to develop resilience action plans (also applicable to agencies, organizations, corporations). Stakeholder participants identify top hazards, current challenges, strengths, develop and prioritize actions to improve communities' resilience to all natural and climate related hazards today, and in the future.[63] Uses a Risk Matrix and facilitated process. Large team sessions and small team sessions, session grouping options by sectors, by location, etc.

CRB process[64]

[61] https://www.riib.org/mrp
[62] https://www.riib.org/mrp
[63] https://e710de78-1039-4687-962d-33c9ec6dc9c6.filesusr.com/ugd/29a871_ed557c1fca834ca898961d7705dfef03.pdf
[64] https://e710de78-1039-4687-962d-33c9ec6dc9c6.filesusr.com/ugd/29a871_ed557c1fca834ca898961d7705dfef03.pdf

Community Resilience Building Workshop Risk Matrix

-M-L priority for action over the Short or Long term (and Ongoing) = Vulnerability S = Strength				Top 4 Hazards (tornado, floods, wildfire, hurricanes, snow/ice, drought, sea level rise, heat wave, etc.)				Priority	Time
eatures	Location	Ownership	V or S	Coastal Flooding	Extreme Precipitation Events	Heat Waves	Wind	H M L	Short Long Ongoing
Infrastructural									
Societal									
Environmental									

CRB Risk Framework[65]

Relationship to Other Planning Needs including FEMA and local HMPs.

The CRB notes a goal setting question could be a whether the workshop will augment other specific planning needs such as HMPs, Master Plans, Supply Chain stability assessments, sustainability plans, capital improvements, equity/inclusion plans, among others. The connection to these types of plans are identified with the municipal Core Team in early planning, discussed in surveys and pre-workshop, included in workshop packets and referenced in the Action Grant selection process (see below). Projects that have been already identified are prioritized in the scoring criteria for Action Grants.[66]

CRB does provide resources for a cross-walk between FEMA's Local Mitigation Plan Review Guide and the Community Resilience Building Process. The intent is to clearly identify where and how the Community Resilience Building Process can satisfy specific Elements of the Regulatory Checklist. [67] More on this from CRB: To help assist Federal and State officials assess and ensure Local Mitigation Plans meet the Stafford Act and Title 44 Code of Federal Enforcement (CFR) §201.6.1 requirements in a fair, equitable, and consistent manner the Local Mitigation Plan Review Guide was developed (https://www.fema.gov/medialibrary-data/20130726-1809-25045-7498/plan_review_guide_final_9_30_11.pdf). This "Review Guide" is FEMA's official source for interpreting and defining the statutory and regulatory requirements of Local Mitigation Plans. This "Review Guide" works in tandem with the Local Mitigation Planning Handbook so practitioners developing plans have a clear understanding of technical requirements and approaches to meet these requirements. [68]

Action Grants. **MRP Action Grants are available through the RI Infrastructure Bank** to each cohort for eligible projects in the year they participate. Eligible projects are required to be identified through the Community Resilience Building process, improve climate resilience, and a capital investment resulting in

[65] https://e710de78-1039-4687-962d-33c9ec6dc9c6.filesusr.com/ugd/29a871_ed557c1fca834ca898961d7705dfef03.pdf
[66] O'Rourke, Shaun. 2021. Personal Communication. Rhode Island Infrastructure Bank.
[67] https://e710de78-1039-4687-962d-33c9ec6dc9c6.filesusr.com/ugd/29a871_ddb30a9fe1ee424bb8a03996bd139273.pdf
[68] https://e710de78-1039-4687-962d-33c9ec6dc9c6.filesusr.com/ugd/29a871_ddb30a9fe1ee424bb8a03996bd139273.pdf

construction. MRP Action Grants are not available for research-related activities such as studies and strategic plans. Grant eligibility must fall under Rhode Island Infrastructure Bank's broad portfolio of programs and can include but not limited to, dam repair and removal, road elevation, hardening or elevation of pump stations, berms and levies, culvert repair, green stormwater infrastructure, back-up power and energy efficiency, watershed restoration, urban tree planting, and coastal erosion control. Municipalities will be required to match grants with a 25% local project cost share, half of which can include in-kind services while the other 12.5% can be from other sources (e.g., municipal budget allocation, other state funding).[69] [70]

RI CRMC Beach SAMP/Hazard Application Guidance

The **Coastal Resources Management Council** is an independent state regulatory agency composed of ten members in accordance with R.I. General Laws § 46-23-2 (created by statute in 1971). Members of the Council are appointed by the Governor for terms of three years. The CRMC's enabling legislation requires that representation include members from coastal communities; state and local government officials, the general public, and the director of the Department of Environmental Management, who serves ex officio. When contested cases are heard, the Council must include a representative from the community involved when no CRMC member is from that town.[71]

It is a management agency with regulatory functions. Its primary responsibility is for the preservation, protection, development and where possible the restoration of the coastal areas of the state via the implementation of its integrated and comprehensive coastal management plans and the issuance of permits for work with the coastal zone of the state.[72] Each year for the past decade, the CRMC processes an average of over 1,100 applications. These proposed activities comprise of residential renovations and new homes, boat docks, subdivisions of land, and commercial and industrial work, and everything in-between.[73]

The legislative findings recognized the paramount importance that the coastal resources provide to the social and economic welfare of the state, and charged the CRMC with the explicit policy. The Coastal Resources Management Council (CRMC) is authorized under the federal Coastal Zone Management Act of 1972 to develop and implement Special Area Management Plans (SAMPs) to address specific regional issues. These plans are ecosystem-based management strategies that are consistent with the council's legislative mandate to preserve and restore ecological systems. The CRMC coordinates with local municipalities, as well as government agencies and community organizations, to prepare the SAMPs and implement the management strategies.[74]

Reg Jurisdiction: The regulatory authority of the CRMC is generally defined by the area extending from the territorial sea limit (three miles offshore), to two hundred (200) feet inland from any coastal feature, to watersheds, and to certain activities that occur anywhere within the state. Activities which occur in the State's tidal waters are under the jurisdiction of the CRMC. These waters have been categorized into six prioritized Water Types, and range from Conservation areas to Industrial Ports.[75]

[69] https://www.riib.org/mrp
[70] O'Rourke, Shaun. 2021. Personal communication. Rhode Island Infrastructure Bank.
[71] http://www.crmc.ri.gov/aboutcrmc.html
[72] http://www.crmc.ri.gov/aboutcrmc.html
[73] http://www.crmc.ri.gov/aboutcrmc.html
[74] http://www.crmc.ri.gov/samps.html
[75] http://www.crmc.ri.gov/samps.html

After water types, coastal features are the most identifiable element of the CRMC's jurisdiction. These coastal features are: coastal beaches; dunes; barrier islands; coastal wetlands; cliffs, bluffs, and banks; rocky shores; and manmade shorelines. Each coastal feature has an extended contiguous area of two hundred (200) feet from their inland border. Cultural features that have historical or archaeological significance are also within the jurisdiction of the CRMC as required by the Federal regulations. Freshwater wetlands in the vicinity of the coast also come under the authority of the CRMC.
Also, for activities which occur within watersheds of poorly flushed estuaries, the CRMC has developed Special Area Management Plans to address the specific environmental concerns of those priority management areas. In addition to those activities captured under other CRMC management programs, certain activities which occur throughout these SAMP watersheds are regulated.
Lastly, certain proposed state-wide activities also come under the authority of the CRMC. These include power-generating plants; petroleum storage facilities; chemical or petroleum processing; minerals extraction; sewage treatment and disposal plants; solid waste disposal facilities; and, desalination plants. The CRMC assumes the responsibility of informing parties proposing these activities if a CRMC application needs to be submitted.[76]

Recognizing the need for comprehensive planning to address the impacts of storm surge, flooding, sea level rise and erosion, in 2018, the Rhode Island CRMC adopted a **Shoreline Change Special Area Management Plan (SAMP), known as the Beach SAMP** using authorities under the federal Coastal Zone Management Act of 1972. SAMPs have been a valuable management tool for CRMC to tackle challenging coastal issues such as water quality, coastal development patterns, and siting offshore renewable energy. The Shoreline Change SAMP builds off previous work completed through the Salt Ponds SAMP and the Metro Bay SAMP, where the impacts of development and coastal hazards were examined.[77] The SAMP sets forth the process through which development permit applicants will use the state's sea-level rise projections and coastal hazard exposure assessment tools to address coastal hazards associated with climate change.[78]

Note: The Shoreline Change SAMP has been designed purposefully to be a guidance and planning document rather than a more prescriptive regulatory document with explicit policies, regulations or standards, in order to provide the flexibility to local and state decision makers on the frontline in protecting the health and welfare of their residents, to identify strategies most appropriate for a specific community**.**[79]

Chapter 5 of the Shoreline Change SAMP outlines the process through which applicants will address the coastal hazards associated with climate change as part of coastal applications for new and substantially improved projects, as specified in Section 110 of the Rhode Island Coastal Resources Management Program (RICRMP, also known as the "Red Book"). The goal of this process is to ensure that CRMC approved projects are designed and built with the applicant's acknowledgement of the risks of building in coastal hazard areas exposed to storm surge, erosion and future sea level rise conditions.
Additionally, this process will help to: protect public health, safety, and welfare; minimize damage and losses to nearby infrastructure and properties; and, reduce overall impacts to coastal resources. Adapting to these ongoing and future conditions will ensure Rhode Island is building resilient

[76] http://www.crmc.ri.gov/aboutcrmc.html
[77] https://www.beachsamp.org/beachsamp-document/
[78] https://www.beachsamp.org/beachsamp-document/
[79] http://www.beachsamp.org/wp-content/uploads/2017/09/BeachSAMP_Ch1_Intro_061218_CRMCApproval.pdf

communities, as well as a strong coastal economy and environment. The guidance outlined here is intended to help CRMC applicants recognize and minimize risks to protect their investments for the design life of their project. The information is to assist the applicant in evaluating potential impacts from storm surge, erosion and projected future sea level rise, as well as the cumulative impacts of these risks over time (hereafter "Coastal Hazards") based on the best available science. [80]

This process applies to applications for new and substantial improvements to properties within the planning boundary for the Shoreline Change Special Area Management Plan (Shoreline Change SAMP). The Shoreline Change SAMP Planning Boundary is defined as the land area along the Rhode Island coastline (all 21 coastal communities) projected to be inundated by a 100- year return period storm event (1% annual chance) plus seven feet of sea level rise as illustrated in STORMTOOLS (www.beachsamp.org/stormtools). [81]

The worksheet and online viewer provide guidance for property owners to address coastal hazards for certain projects in the design and permitting process when applying to the CRMC for proposed activities. Chapter 5 of the Beach SAMP gives additional background information for this application process, and is designed to educate property owners on the risk they inherit when building or performing other activities in a coastal area. Applicants must follow the step-by-step process in the worksheet by first choosing a design life for their project (how long they want it to last), using CRMC shoreline change maps and projected sea level rise rates. Then using the coastal hazard mapping tool STORMTOOLS, they must evaluate the rate of sea level rise their property will be subjected to over the life of their structure, and list any roads or access routes that might also be impacted. Applicants must also use STORMTOOLS design elevation data and identify erosion rates (using tools provided) to determine their property's vulnerability to storm surge and erosion. They must also utilize the CRMC's Coastal Environmental Risk Index (CERI) to view the projected damage to the location in the case of a storm. Lastly, the applicant must use Chapter 7 of the Beach SAMP as a guide to consider mitigation options for the exposure determined through the previous steps, and sign the worksheet.[82]

The primary purpose and use of the Coastal Hazard Application (CHA) Worksheet and Viewer is to notify the applicant of potential coastal hazards that should be taken into consideration when planning shoreline development. These hazards include sea level rise (SLR), storm surge and associated flooding and shoreline erosion. The CRMC's goal is to increase understanding and awareness of these potential hazards among the development community (property owners, builders, realtors, financial institutions and insurers) with the hope of guiding development and investment away from vulnerable areas. While the CHA is required for projects meeting specific thresholds (see below), the CRMC encourages all applicants to consider using the CHA process to assess future risks to their proposed projects.[83]

Once the permit application has been approved by the CRMC, the applicant must record the decision in its entirety with the land evidence records of the municipality for the property. The Coastal Hazards

[80] http://www.beachsamp.org/wp-content/uploads/2018/07/BeachSAMP_CH5_CRMCCoastalApp_061218_CRMCApproval.pdf

[81] http://www.beachsamp.org/wp-content/uploads/2018/07/BeachSAMP_CH5_CRMCCoastalApp_061218_CRMCApproval.pdf

[82] http://www.crmc.ri.gov/news/2019_0628_chworksheet.html

[83] http://www.crmc.ri.gov/coastalhazardapp.html

Analysis is part of the record, noting whether the project meets: the anticipated rate of SLR; accelerated erosion rate; or storm tools design elevation. [84]

RI CRMC Notes: Our understanding of the impacts of climate change and the pace at which these changes are likely to occur is constantly evolving. Adaptation to these impacts will require frequent adjustment as conditions and our understanding of those conditions change. The Coastal Hazard Application and Viewer are a first step to educate applicants and increase understanding of present and future coastal hazard risks. For the CHA process, the CRMC recommends a minimum 30 year "design life" be considered when evaluating the impacts of future coastal hazards. However, in some cases, depending upon the site characteristics and the type of development proposed, impacts may be expected to occur within a shorter period of time.[85]

The CRMC decided to call attention to the 30-year design life for most residential coastal property owners as a minimum. The applicants can choose to ignore this and select a shorter design life, as the 30-year is simply a recommended minimum. For public projects or bigger infrastructure efforts, the pre-application meeting is intended to advise the applicants to the longer design life scenarios (7-ft or 9.6 ft to represent the 2080 or 2100 scenarios). Outreach efforts in RI have found that municipalities and property owners are mostly concerned with and can relate to the 30-year timeframe for their property.[86]

Applicants are advised that CRMC staff will utilize the full suite of STORMTOOLS maps to identify potential impacts to proposed development that may not be included in the CHA analysis. These may include flooding scenarios projected to occur within shorter time intervals or during lower-magnitude storm events, and impacts to site elements such as onsite wastewater treatment systems, private drinking water wells, parking and access. Staff may make recommendations for avoiding such impacts to applicants based on these analyses.[87]

The list of projects below must complete the RICRMC Coastal Hazard Application WORKSHEET to be filed in addition to and with your standard CRMC application (http://www.crmc.ri.gov/applicationforms.html).

Any of the following **new projects**, including tear downs and rebuilds, located on a coastal feature or within the 200-foot contiguous area:

1. construction of new residential buildings as defined in § 1.1.2;
2. construction of new commercial and industrial structures as defined in § 1.1.2;
3. construction of new beach pavilions as defined in § 1.1.2;
4. construction of any new private or public roadway, regardless of length;
5. construction of any new infrastructure project subject to §§ 1.3.1(F), (H), and (M); and
6. construction of any new subdivisions with six (6) or more lots, any portion of which is within 200 feet of a shoreline feature.

Any of the following **modifications to existing projects**, including tear downs and rebuilds or elevation of existing structures, located on a coastal feature or within the 200-foot contiguous area:

1. any expansion of existing commercial structures over tidal waters;

[84] Crean, Teresa. 2021. Personal communication. Coastal Resources Center, Rhode Island.
[85] http://www.crmc.ri.gov/coastalhazardapp.html
[86] Crean, Teresa. 2021. Personal communication. Coastal Resources Center, Rhode Island.
[87] http://www.crmc.ri.gov/coastalhazardapp.html

2. any expansion greater than 600 square feet to existing residential, commercial, industrial or beach pavilion structures;
3. second story additions greater than 600 square feet to any existing residential, commercial, industrial or beach pavilion structures; and
4. any modification to existing residential, commercial, industrial or beach pavilion structures when such structures are located within the CRMC minimum setback specified by § 1.1.9.

See Section 1.1.6 (I) of the CRMC Red Book (650-RICR-20-00-1) for specific regulatory requirements for the coastal hazard analysis application requirements.
The tools on this site provide guidance for applicants to address Coastal Hazards for specified projects in the design and permitting process for the Rhode Island Coastal Resources Management Council. [88]

"This worksheet and online viewer are designed to help the applicant learn of the inherent risks they take on when buying coastal property, or doing work to an existing coastal property both today and in the future," said CRMC Executive Director Grover Fugate. "We're encouraging folks to educate themselves on the risk today and within their mortgage period, and figure out which strategies work best for them: elevating, moving inland on the site, or flood proofing their structure. We also want people to pay attention to how access to their site is impacted into the future. These viewers help potential buyers consider the risks before buying coastal properties, and now we have the tools through the Beach SAMP to really bring that message home."
For the downloadable worksheet, as well as the link to the online viewer, go to http://www.crmc.ri.gov/coastalhazardapp.html. For more information on Chapters 5 and 7 of the Beach SAMP, go to http://www.crmc.ri.gov/samp_beach.html.[89]

The worksheet is shown below.[90] One can go to the guidance document and get step by step detailed instructions for how to fill out the worksheet. [91] Some example pages from the guidance document are also below. [92]

[88] http://www.crmc.ri.gov/coastalhazardapp.html
[89] http://www.crmc.ri.gov/news/2019_0628_chworksheet.html
[90] http://www.crmc.ri.gov/coastalhazardapp/CH_App_Worksheet_Interactive.pdf
[91] http://www.beachsamp.org/wp-content/uploads/2018/07/BeachSAMP_CH5_CRMCCoastalApp_061218_CRMCApproval.pdf
[92] http://www.beachsamp.org/wp-content/uploads/2018/07/BeachSAMP_CH5_CRMCCoastalApp_061218_CRMCApproval.pdf

RI CRMC COASTAL HAZARD APPLICATION WORKSHEET

APPLICANT NAME:

PROJECT SITE ADDRESS:

STEP 1. PROJECT DESIGN LIFE

☐ A. For properties in a FEMA-designated **A** or **X** Zone, provide the first floor elevation (FFE) of the proposed structure referenced to NAVD88, **OR** For properties in a FEMA-designated **V** or **Coastal A** Zone, please provide the elevation of the lowest horizontal structural member (LHSM) referenced to NAVD88.

FFE _____ ft

OR

LHSM elevation _____ ft

☐ B. How long do you want your project to last? Identify the expected design life for the project (CRMC recommends a **minimum of 30 years**)

Design Life: _____ yrs

☐ C. Add the number of years you identified in 1B to the current year. (For example, if you are completing this form in the year 2020, and you want your project to last 30 years, your design life year will be 2050.)

Design Life Year: _____

☐ D. **CHECK** beneath the sea level rise (SLR) projection that matches or comes closest to project design life year.

Year	2020	2030	2040	2050	2060	2070	2080	2090	2100
SLR	1.05	1.67	2.33	3.25	4.20	5.35	6.69	8.14	9.61
	○	○	○	○	○	○	○	○	○

Source: Sea Level Rise (SLR) Projections (Feb. 2017): NOAA High Curve, 83% Confidence Interval. Newport, RI Tide Gauge. All values are expressed in feet relative to NAVD88. http://www.corpsclimate.us/ccaceslcurves.cfm

NOTE: The STORMTOOLS sea level rise scenarios depict how high the water will be above the average height of the daily high tide over the 19-year period between 1983 and 2001. There have been between 4 and 5 inches of sea level rise in Rhode Island since then. The higher modeled water level accounts for the uncertainties in ice sheet and ocean dynamics.

STEP 2. SITE ASSESSMENT

☐ A. Open *RICRMC Coastal Hazard Mapping Tool*. Following the tutorial along the left side of the screen, enter the project site address and turn on the sea level layer closest to the number you circled in 1D.

☐ B. **ENTER** the STORMTOOLS SLR map layer closest to the SLR value you checked in Step 1D above. If the value falls between the available STORMTOOLS SLR map layers, round up to the closest of these sea level rise (SLR) numbers: 1ft, 2ft, 3ft, 5ft, 7ft, 10ft, or 12ft

_____ ft

☐ C. Does the STORMTOOLS SLR map layer you circled above expose your project site to future tidal inundation? **CHECK YES or NO**

○ YES
○ NO

☐ D. List any **roads or access routes** that are potentially inundated from SLR. To do this, ZOOM OUT from your project location, change BASEMAP on the viewer to "street view" – see Step 2A.

_____

Please be advised that CRMC staff may also review the implications of sea level rise in combination with nuisance storm flooding and discuss these potential project concerns with the applicant. Nuisance flooding impacts may be viewed in STORMTOOLS here.

STEP 3. STORMTOOLS DESIGN ELEVATION (SDE)

☐ A. Based on the project location, CHECK the SDE Viewer for your site, and open the corresponding tab in Mapping Tool:

○ South Coast SDE Viewer: Napatree to Pt. Judith ○ Narragansett Bay SDE Viewer: North and East of Pt. Judith

☐ B. Follow the tutorial included along the left panels of the viewer to enter the address of your project site. Select the tab across the top that corresponds to the sea level rise projection you identified in STEP 1

☐ C. Click on the map at project site to identify **STORMTOOLS Design Elevation (SDE)** from the pop up box. **Enter the SDE value:** _____ ft

STEP 4. SHORELINE CHANGE

☐ A. Using the *CRMC Shoreline Change maps*, indicate the transect number closest to your site, and erosion rate listed for that transect. **Transect Number:** **Erosion Rate:** **ft/year**

B. **CHECK** below the Projected Erosion Rate that corresponds to the design life you identified above.

Year	2050	2060	2070	2080	2090	2100
Projected Future Erosion Multiplier	1.34 ○	1.45 ○	1.57 ○	1.70 ○	1.84 ○	2.00 ○

Source: Projected Shoreline Change Rate multipliers. (Oakley et al., 2016)

C. **COMPLETE EROSION SETBACK CALCULATION:**

Historic shoreline change rate, STEP 4A		Design Life, STEP 1C		Projected Future Erosion Multiplier, STEP 4B		Erosion Setback (ft) 4A x 1C x 4B
	X		X		=	

***NOTE:** Setbacks are required per the CRMC Red Book, Section 1.1.9. **A minimum setback of 50-feet is required**, but a greater setback may be necessary and/or desirable based on this analysis.*

STEP 5. CERI & OTHER SITE CONSIDERATIONS

☐ A. If you live in a community where a Coastal Environmental Risk Index (CERI) has been completed (Barrington, Bristol, Charlestown, Narragansett, South Kingstown, Warren, Warwick, Westerly), CHECK the level of projected damage to your location, as indicated on the map that corresponds to the design life identified in STEP 1.

CERI Level:	Moderate ○	High ○	Severe ○	Extreme ○	Inundated by 2100 ○	Not applicable ○

☐ B. Consider and discuss with your design consultant other forces or factors that might impact the development, such as coastal habitats, shoreline features, public access, wastewater, storm water, depth to water table/groundwater dynamics, saltwater intrusion, or other issues not listed above. In addition, pressure from rising sea levels will result in rising subsurface groundwater levels ultimately effecting wells and septic systems.

STEP 6. LARGE PROJECTS

This step is for Large Projects and Subdivisions only, six (6) or more units, as defined by the CRMC Red Book Section 1.1.6.I(1)(f). This step may be skipped for other projects.

☐ A. Use the Sea Level Affecting Marshes Model (SLAMM) Maps to assess potential impacts to large projects and subdivisions from salt marsh migration resulting from projected sea level rise. CRMC SLAMM maps can be accessed here. ○ **YES** ○ **NO**

The CRMC recommends using the 5-foot SLR projection within SLAMM to assess future potential project impacts on migrating marshes. Does the SLAMM map that corresponds to the design life you identified in STEP 1 expose your project site to future salt marsh migration? **CHECK YES or NO**

STEP 7: DESIGN EVALUATION

☐ A. Using Chapter 7 of the RI Shoreline Change SAMP as a guide, investigate mitigation options for the exposure identified above and include that in the final application.

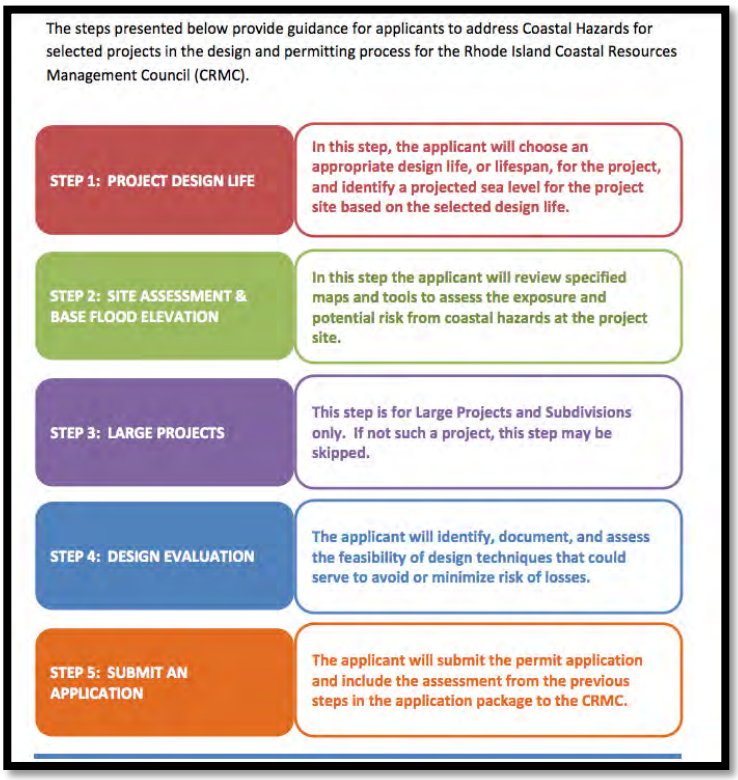
This fully completed Coastal Hazard Application Guidance worksheet must accompany the application. If you are a design or engineering professional, please print and sign here that you have discussed the findings of this worksheet with the Owner.

DESIGN/ENGINEER SIGNATURE: _____ **DATE:**

OWNER'S SIGNATURE: _____ **DATE:**

Source: RICMRC Coastal Hazard Application Worksheet [93]

Examples of step by step guidance:



Source: Shoreline Change SAMP 2018 Volume 1, Chapter 5[94]

[93] http://www.crmc.ri.gov/coastalhazardapp/CH_App_Worksheet_Interactive.pdf

[94] http://www.beachsamp.org/wp-content/uploads/2018/07/BeachSAMP_CH5_CRMCCoastalApp_061218_CRMCApproval.pdf

STEP 1: PROJECT DESIGN LIFE

In this step, the applicant will choose a projected design life, or lifespan, for the project, and identify a projected Sea Level Rise (SLR) for the project site for exposure to coastal flooding.

STEP 1 ***(Please see Page 11 for background information.)***

1. The applicant or their chosen design professional will contact the municipal building official to document their FEMA Flood Insurance Rate Map (FIRM) Base Flood Elevation (BFE) for the project site.
2. Using the CRMC Shoreline Erosion Maps available on the CRMC's website, identify the historic erosion rate for the project site.
3. Choose an expected design life of your proposed project by considering how long the development is expected to last on the project site. ***NOTE: CRMC recommends a minimum 30-year design life to correspond to the length of a typical mortgage.***
4. Using *Table 1 – Sea Level Rise (SLR) Projections (Feb. 2017)* below, identify the sea level projections that match the expected design life of your proposed project.
5. *Expected outcome from STEP 1:* ***Take the SLR value from Table 1 and carry it forward to STEP 2 to define the risk profile for the project site.***

Year	2020	2030	2040	2050	2060	2070	2080	2090	2100
SLR	1.05	1.67	2.33	3.25	4.20	5.35	6.69	8.14	9.61

Table 1 – Sea Level Rise (SLR) Projections (Feb. 2017). NOAA High Curve, 83% Confidence Interval. Newport, RI Tide Gauge. All values are expressed in feet relative to NAVD88. http://www.corpsclimate.us/ccaceslcurves.cfm

STEP 2: SITE ASSESSMENT AND BASE FLOOD ELEVATION

The applicant will review available maps and tools to assess the exposure and potential risk from coastal hazards at the project site.

STEP 2 *(Please see Page 12 for background information.)*

Step 2A: What does SLR do to my site (plus access roads)?

- Go to STORMTOOLS for CRMC Permit Applicants. This online Map Journal will provide interactive maps that assist applicants in addressing the requirements of this Step.
- Select the SLR Map Layer that comes closest to the SLR value you derived from STEP 1 to see how SLR impacts your project site and access roads. If your SLR value is between two values, round up to the higher SLR Map Layer.
- Type in or Zoom to your project site address in the address field.
- Identify the roads that connect to your project site and if they show exposure to SLR.

Step 2B: STORMTOOLS Design Elevation (SDE)

- Determine your recommended STORMTOOLS Design Elevation (SDE) using (xxx.xxxx.xxx) ***NOTE: SDE maps are currently under development and are expected to be online and available for the entire Rhode Island coastline by mid-2018.***
- Reference State Law Elevation Allowances. ***NOTE: 1-foot of freeboard (elevation) is required, above BFE is required but up to 5-feet of additional freeboard may be provided voluntarily.***
- Applicant should coordinate with the design engineer on this issue.

Step 2C: Erosion

- See Erosion Maps in RICRMP and meet the Regulatory setbacks (Section 140).
- To calculate projected erosion at the project site, select the multiplier in the Table 2 below that corresponds to the design life year you selected in STEP 1. Multiply the historic erosion rate you identified in STEP 1.2 by the multiplier in the Table 2 to determine projected future erosion for the project site.

Year	2020	2030	2040	2050	2060	2070	2080	2090	2100
Projected Future Erosion Multiplier	1.05	1.14	1.23	1.34	1.45	1.57	1.70	1.84	2.00

Table 2 – Projected Erosion Rate multipliers. (Oakley et al., 20161)

Step 2D: Other Site Considerations

- Consider other risk factors that might impact the development, such as coastal habitats, shoreline features, public access, wastewater, stormwater, depth to water table/groundwater dynamics, saltwater intrusion, or other issues not listed above.

Step 2E: STORMTOOLS/Coastal Environmental Risk Index (CERI) - ***UNDER DEVELOPMENT***

Authority

The Resilient Rhode Island Act (Chapter 42-6.2) as noted above established the **Executive Climate Change Coordinating Council** (EC4) in 2014 and incorporates consideration of climate change impacts into the powers and duties of all state agencies.

CRMC and SAMP authority

The **Coastal Resources Management Council** is an independent state regulatory agency with R.I. General Laws § 46-23-2 (created by statute in 1971). The Coastal Resources Management Council (CRMC) is authorized under the federal Coastal Zone Management Act of 1972 to develop and implement Special Area Management Plans (SAMPs) to address specific regional issues. In 2018, the Rhode Island Coastal Resources Management Council adopted a **Shoreline Change Special Area Management Plan (SAMP), known as the Beach SAMP** using authorities under the federal Coastal Zone Management Act of 1972.

Funding

The Resilient Rhody Strategy includes a chapter that identifies barriers to financing. The strategy also includes a discussion of new and emerging financing mechanisms:

- Env Impact Bond
- Stormwater Utility
- Stormwater Accelerator thru the RI Infrastructure Bank
- Resilience Zone Overlay District
- Resilience Bond
- Property Assessed Resilience
- Credit Trading Market.

In addition, as previously noted above a series of recommendations on financing is identified In the Resilient Rhody Plan. RRP also notes Rhode Island Infrastructure Bank stands ready to assist policymakers as they implement these new solutions to protect the state and its communities from climate change. As Rhode Island's central hub for local infrastructure investment, the Infrastructure Bank is ready, willing, and able to provide information, resources, and technical assistance on resilience financing. [95]

MRP program Funding and Eligibility RI Infrastructure Bank/Other State sources/Local match:
With support from The Nature Conservancy, municipalities complete a **Community Building Resilience Workshop** and develop actionable plans and projects that are eligible for funding through the Rhode Island Infrastructure Bank. Funding for the workshops has been provided by both TNC and RIIB.[96] TNC provides facilitation services for workshops and RIIB contracted with TNC for some workshops [97] A minimum of $1M in MRP Action Grants are available to each cohort for eligible projects in the year they participate. Eligible projects are required to be identified through the Community Resilience Building process, improve climate resilience, and a capital investment resulting in construction. MRP Action Grants are not available for research-related activities such as studies and strategic plans. Grant eligibility must fall under Rhode Island Infrastructure Bank's broad portfolio of programs and can include

[95] http://climatechange.ri.gov/documents/resilientrhody18.pdf
[96] O'Rourke, Shaun. 2021. Personal communication. Rhode Island Infrastructure Bank.
[97] http://climatechange.ri.gov/documents/ec4-2012-resilience-pres.pdf

but not limited to, dam repair and removal, road elevation, hardening or elevation of pump stations, berms and levies, culvert repair, green stormwater infrastructure, back-up power and energy efficiency, watershed restoration, urban tree planting, and coastal erosion control. Municipaliites have a 25% local project cost share requirement. [98]

The most recent round of funding announced $1,500,000 in action grants for participants of the 2020 Resilient Rhody Municipal Resilience Program (MRP). [99] Funds for the action grants come from RIIB and the 2021 Beach Clean Water and Green Economy Bond. [100]Municipalities can also access other funds through DEM Climate Resilience Fund, and DEM WWTF Resilience fund (see below). Half of the local match can be provided as in-kind services (such as staff time) and the other 12.5% has been in the form of municipal budget allocation, leveraging other state grants or from state DOT on stormwater projects.[101]

RI DEM Climate Resilience Fund: $ from 2018 Green Economy and Clean Water Bond

DEM grants ($25-$500K possibly $750K) from the Climate Resilience Fund to implement climate resilience projects for climate-driven challenges facing Rhode Island communities, both inland and coastal categories include nature-based solutions and/or removal, relocation or redesign of infrastructure. Scientific research, data analyses, vulnerability assessments not eligible. Planning processes not supported. Land acquistion may be considered if < 50% of overall cost. Must have clear nexus between climate change impacts to ecological/evnvironmental health of area and proposed resiilience actions and project; near term (0-10 yrs) and long term benefits (10-25 yrs) should be highlighted and be consistent with state resilience plans, local HMPs, all laws. 2020 grant proposal for projects that will support governmental and non-profit entities in restoring and improving the climate resilience of vulnerable coastal habitats, as well as river and stream floodplains and related habitat. Fund from 2018 (Green Economy and Clean Water Bond). The funds will provide matching grants (75%/25%) to governmental and non-profit entities. [102] [103] March 2nd Special election vote on 2021 Beach, Clean Water and Green Bond fund $74 million passed with 78% of vote. [104] [105]

RI DEM Wastewater Treatment Facility Resilience Fund

DEM grants to assist in the implementation of projects that enhance the climate resilience of government-owned wastewater treatment facilities in Rhode Island. Specifically, projects that will harden, relocate, repair/replace, and/or provide redundancy to government-owned wastewater treatment facilities (and/or critical equipment/components within) to protect these facilities from hazards/impacts related to climate change. State funding to support this RFP will be available from proceeds of state environmental bond referendums approved by voters in 2018 (Green Economy and Clean Water Bond). [106] It appears this program is the outgrowth of a study that was published in March 2017 "Implications of Climate Change for RI Wastewater Collection & Treatment Infrastructure."[107]

---

[98] https://www.riib.org/mrp

[99] http://www.pawtucketri.com/news/rhode-island-infrastructure-bank-announces-15-million-municipal-resilience-program-action

[100] O'Rourke, Shaun. 2021. Personal communication. Rhode Island Infrastructure Bank.

[101] O'Rourke, Shaun. 2021. Personal communication. Rhode Island Infrastructure Bank.

[102] http://www.dem.ri.gov/programs/environmentalprotection/climate-resilience-fund.php

[103] http://www.dem.ri.gov/programs/environmentalprotection/documents/clim-res-fund-pres.pdf

[104] http://dem.ri.gov/greenclean/

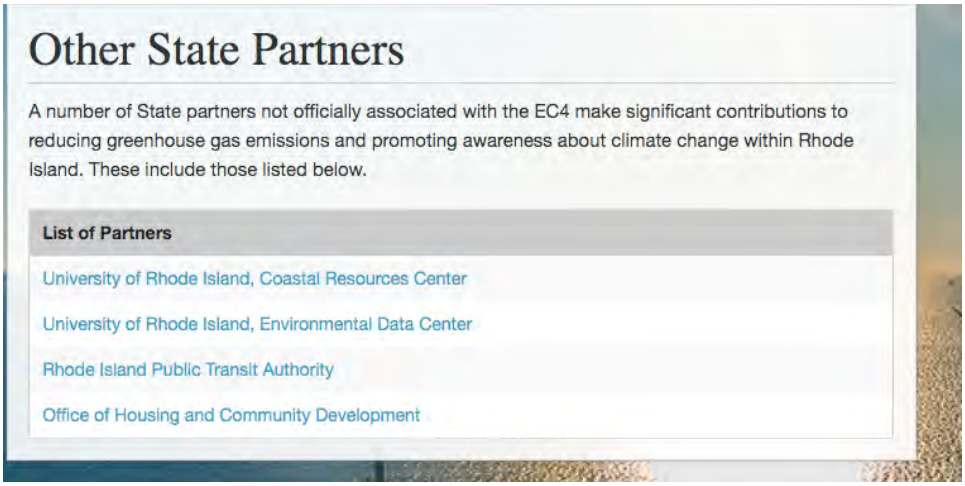
[105] https://www.wpri.com/news/elections/ri-voters-approve-more-than-400-million-in-funding-for-projects/

[106] http://www.dem.ri.gov/programs/water/wwtf/wwtf-climate.php

[107] http://www.dem.ri.gov/programs/benviron/water/pdfs/wwtfclimstudy.pdf

Non-financial resources

Coordination with other programs



Other State Partners

A number of State partners not officially associated with the EC4 make significant contributions to reducing greenhouse gas emissions and promoting awareness about climate change within Rhode Island. These include those listed below.

List of Partners
University of Rhode Island, Coastal Resources Center
University of Rhode Island, Environmental Data Center
Rhode Island Public Transit Authority
Office of Housing and Community Development

Member Agencies in the EC4[108]

RI Coastal Resources Management Council
RI Department of Administration
RI Department of Environmental Management
RI Department of Health
RI Department of Transportation
RI Division of Planning
RI Emergency Management Agency
RI Infrastructure Bank
RI Office of Energy Resources
RI Public Transit Authority
RI Division of Public Utilities and Carriers
The Rhode Island Commerce Corporation (CommerceRI)

The Shoreline Change SAMP is a collaborative effort between the state's coastal agency, the CRMC, and a University of Rhode Island (URI) team comprised of both researchers from the College of the Environment and Life Sciences [CELS], the Graduate School of Oceanography, the College of Engineering, and outreach experts from the Coastal Resources Center/Rhode Island Sea Grant College Program [CRC/Sea Grant]. Invaluable expertise is also provided by Roger Williams Law School's Marine Affairs Institute, the Rhode Island Sea Grant Legal Program, and Eastern Connecticut State University. Close collaboration with other state agencies and coastal municipalities is also a key component of the

[108] http://climatechange.ri.gov/state-actions/ec4/

Shoreline Change SAMP. This collaboration ensures that cutting-edge science informs an inclusive policy development process focused on practical solutions and outcomes. [109]

[109] http://www.beachsamp.org/wp-content/uploads/2017/09/BeachSAMP_Ch1_Intro_061218_CRMCApproval.pdf