

# Policy Considerations for the Maryland Commission on Climate Change

Adaptation



# Recommendations for the Maryland Adaptation and Response Working Group

January 2017

## INTRODUCTION

Maryland and other states have begun to take important actions to prepare for the impacts of climate change and are developing innovative programs, plans, and policies for promoting adaptation. This report was prepared to help the Adaptation and Response Working Group (ARWG) of the Maryland Climate Change Commission (Commission) report on the progress the state is making as it prepares for the impacts of climate change and also to help the ARWG develop priorities for future actions based upon best-practice examples from other states. The Commission was first established in an April 2007 [Executive Order](#),<sup>1</sup> issued by then-Governor Martin O'Malley, which directed the Commission to create a Climate Action Plan including recommendations for how the state can prepare for the impacts of climate change. In 2015, the state legislature passed legislation codifying the Commission and requiring it to report on the status of its efforts to reduce greenhouse gas emissions and prepare for the impacts of climate change. The Commission finalized a report in September 2016 reporting on its progress and conveyed the report to the legislature and governor in November 2016.

The purpose of this report is to help the state document the important work it is already doing to prepare for the impacts of climate change and to provide recommendations for additional steps that the state could take, drawing on examples of practices from other states. In order to protect lives, health, property, economies, and natural systems, states need to adapt how they plan, regulate and make investments to incorporate projections of what future conditions will look like with a changing climate. State decisions regarding public lands, infrastructure investments, and regulatory programs will have important implications for the nation's preparedness. State leaders and agencies can bolster climate resilience by planning for and integrating adaptation into state programs through executive orders, state legislation, and agency actions. They can also ensure that climate change is incorporated into the long-term planning and management of state-owned land and assets. Additionally, states can play an important role requiring or encouraging local government and private sector preparedness and participation. They can encourage local planning and action through regulation, funding, and technical support. States can also facilitate individual and private sector adaptation action through incentives and requirements. Finally, states can work with federal partners to leverage resources that support state adaptation goals.

Maryland's adaptation work is directed by two adaptation plans: (1) the [Comprehensive Strategy for Reducing Maryland's Vulnerability to Climate Change, Phase I: Sea-level rise and coastal storms](#), which was published on September 12, 2008, and includes recommendations for how the state can adapt to impacts from sea-level rise and coastal storms; and (2) the [Comprehensive Strategy for Reducing Maryland's Vulnerability to Climate Change, Phase II: building societal, economic, and ecological resilience](#), which was published on January 24, 2011 and provides recommendations for adapting to changes in precipitation patterns and increased temperature.

To develop this report, the Georgetown Climate Center leveraged our [State Adaptation Progress Tracking tool](#).<sup>2</sup> GCC actively tracks the progress states are making in preparing for the impacts of climate change through our state progress-tracking tool. We have been working with state officials to ensure that Maryland's progress in implementing its adaptation plans is incorporated into our tool and that important adaptation developments at the state level are highlighted. Through this tool, GCC has identified elements and best practices that make for

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<sup>1</sup> O'Malley signed an additional Executive Order in 2015, which superseded the 2007 EO and updated the priorities of the Commission.

<sup>2</sup> Georgetown Climate Center, State and Local Adaptation Plans, <http://www.georgetownclimate.org/adaptation/plans.html>.

actionable plans. We have also captured the leading examples of where states are implementing those plans on the ground to increase the resilience of state assets, infrastructure, and communities. We have captured some of those examples below, and this tool may be a useful resource to the ARWG as members consider next steps in state efforts to prepare for climate change impacts.

We divide our recommendations into three primary topic areas based upon the ARWG’s stated priorities:

1. *Managing state affairs* – ways that state agencies can improve and build upon their own adaptation policies and programs.
2. *Support for local and private adaptation*– efforts the state can take to encourage local and non-governmental parties to adapt to climate change, and
3. *Cross-cutting actions* – priority topics like equity and cultural preservation that will take both state and local action.

For each topic, we include the following pieces of analysis:

1. *Recommended action* – A short summary of the recommendation and why it is important to adaptation
2. *State efforts underway* – A summary of actions the state is already taking to implement the recommendation, and
3. *Ideas for building upon existing state efforts and examples* – A description of how the state could improve or build upon existing policies and programs to improve state adaptation efforts, with examples from other states that could serve as models for the Working Group.

## SUMMARY OF RECOMMENDATIONS

### Managing State Affairs

1. Expand the Adaptation Working Group to include other stakeholders or create a citizen advisory council.
2. Establish risk-based climate change projections that provide a baseline for state and local decisionmaking.
3. Establish research priorities and coordinate with academic researchers.
4. Expand the scope of the Coast Smart rules to include other impacts of climate change, such as increasing precipitation and temperatures.
5. Consider climate change in all state plans.
6. Track state progress and develop indicators to assess the efficacy of adaptation initiatives.

### Support for Local Governments

7. Provide technical assistance and build local capacity.
8. Use state funding programs as a “carrot” to encourage local adaptation.
9. Provide funding or financing to support private adaptation.
10. Require or encourage local governments to consider climate change in local plans.

### Cross-Cutting Actions

11. Ensure equity in adaptation efforts at all levels of government.
12. Protect cultural and historic resources.

## MANAGING STATE AFFAIRS

### 1. Expand state agency coordination and include additional stakeholders

Adaptation planning requires states to coordinate across agencies and departments, across levels of government, and with outside experts and stakeholders representing a range of sectors. To ensure cross-silo, cross-sector coordination, many states are establishing interagency commissions, citizen advisory councils, and stakeholder working groups to bring additional voices into adaptation discussions and decisionmaking, including university researchers, local officials, and stakeholders from key sectors, such as insurance, real estate, agriculture, tourism, and others.

Because the impacts of climate change will not respect jurisdictional lines, Maryland should continue to work with its neighbors in the Mid-Atlantic region to explore regional responses to climate change and to learn from the work of other states through the Mid-Atlantic Regional Council on Oceans and the Chesapeake Bay Program.

This section provides examples of how other states are establishing interagency working groups, citizen advisory councils, and other bodies to ensure coordination across levels of government and with the range of stakeholders that will be affected by state decisionmaking.

#### a. What Maryland is already doing

*Maryland Climate Change Commission (EO, to state legislation) and Adaptation Response Working Group:* In May 2015 the Maryland state legislature passed [HB 514](#),<sup>3</sup> codifying the Maryland Commission on Climate Change, which advises the Governor and General Assembly on mitigation and adaptation proposals. The Commission was first established in 2007 by Executive Order and includes members from various state agencies, nongovernmental organizations, business, and local government. In 2008 the Commission released the Maryland Climate Action Plan and in 2011 it published an updated strategy. HB 514 expands the Commission's mandate to include more working groups and to create a new partnership with the University of Maryland, ensuring that the state continues to leverage a wide range of expertise.

*Other interagency partnerships:* Maryland has also created partnerships and interagency task forces to address more specific risks relating to climate change. For example, in 2015 five state agencies came together to form the Maryland Resiliency Partnership for the purpose of better leveraging funding, staff capacity, and agency projects in order to better integrate floodplain management, hazard mitigation, and coastal resiliency. The Partnership has hosted flood risk outreach workshops in vulnerable coastal communities to provide residents with information on grant programs and best practices for reducing flood risk. In 2003, the Governor issued Executive Order 01.01.2003.08, creating the MDE's Advisory Committee on the Management and Protection of the State's Water Resources. In 2008, the Committee issued a two-volume report, [Water for Maryland's Future: What We Must Do Today](#),<sup>4</sup> calling for greater state investment in water resource conservation efforts to sustain both human needs and healthy aquatic ecosystems.

*Chesapeake Bay Agreement:* In 2007, Governor Martin O'Malley issued an Executive Order creating Maryland [BayStat](#)<sup>5</sup> – an interagency program involving the Departments of Agriculture, Environment, Planning, and Natural Resources as well as scholars and scientists, designed to assess, coordinate, and report on statewide efforts to restore the Chesapeake Bay by 2025. The Chesapeake Bay Program (CBP), a regional partnership that leads Bay restoration

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<sup>3</sup> For a summary, see Georgetown Climate Center, Adaptation Clearinghouse, HB0514/SB0258 Maryland Commission on Climate Change, <http://www.adaptationclearinghouse.org/resources/hb0514-sb0258-maryland-commission-on-climate-change.html>.

<sup>4</sup> "Water for Maryland's Future: What We Must Do Today," Final Report of the Advisory Committee on the Management and Protection of the State's Water Resources (July 1, 2008), available at [http://www.mde.state.md.us/programs/ResearchCenter/ReportsandPublications/Documents/www.mde.state.md.us/assets/document/WolmanReport\\_Vol1.pdf](http://www.mde.state.md.us/programs/ResearchCenter/ReportsandPublications/Documents/www.mde.state.md.us/assets/document/WolmanReport_Vol1.pdf).

<sup>5</sup> BayStat, State of Maryland, <http://baystat.maryland.gov/>.

and protection,<sup>6</sup> has looked at how climate change will affect the Bay including impacts from sea-level rise, increased water temperatures, acidification, and changes in the abundance and migration patterns of wildlife and habitats. The CBP published a *State of the Science Review and Recommendations* in 2008 with a plan for adapting the Bay to the impacts of climate change. Recognizing the importance of incorporating adaptation into the management of the watershed, the Bay and headwater states signed a new Chesapeake Bay Watershed Agreement in 2014 that includes Climate Resiliency as one of its ten key goals.

*MARCO*: Maryland officials participate in a climate adaptation work group through the Mid-Atlantic Regional Council on the Ocean (MARCO). This group has identified strategies for regional approaches to reducing risks to priority coastal resources. The state should continue, enhance, and improve upon ongoing efforts to coordinate with neighboring states through MARCO to reduce transboundary coastal impacts.

### **b. Examples**

*In California*, State planning and implementation is organized through ten sectoral and cross-cutting Climate Action Teams (CATs) – agriculture, biodiversity, coastal and ocean, interagency forest, intergovernmental, land-use and infrastructure, public health, research, state government, and water and energy. Each CAT is charged with identifying both short- and long-term adaptation goals for implementation and periodically reporting on their progress. The CATs also help the state develop its Climate Change Research Plan (described below), which sets state priorities for research to fund that will inform state decisionmaking around climate change. The state also coordinates with local governments through the Alliance of Regional Collaboratives for Climate Adaptation (ARCCA). ARCCA brings together representatives from five regional collaboratives of local governments and other organizations working at the regional scale in the regions of San Diego, Los Angeles, the San Francisco Bay Area, Sacramento, and the Sierra Nevadas. These regional collaboratives represent the needs and challenges faced by local governments and regions across the state, which are all experiencing a variety of different impacts. The participation of the Governor’s Office of Planning and Research in ARCCA allows the state to vet new ideas and initiatives through these leading local government officials and to learn from the work of these communities and regions.

*In Hawaii*, state legislation ([Act 83](#), passed in June 2014)<sup>7</sup> established an interagency adaptation committee charged with developing a sea-level rise vulnerability and adaptation report addressing statewide impacts to 2050. This committee incorporates *county* and *community representatives*, and is overseen by the Land and Natural Resources Department in an effort to create cross-jurisdictional consensus.

*The New Hampshire* state legislature created the Coastal Risk and Hazards Commission in 2013 ([SB 163](#))<sup>8</sup> and charged the Commission with recommending “legislation, rules, and other actions to prepare for projected sea-level rise and other coastal and coastal watershed hazards...” The legislation required that the Commission include members of the state House of Representatives and Senate, state agencies, academic institutions, *regional planning commissions*, one representative from every *coastal community*, and representatives from the *insurance, building, and emergency planning sectors*. The Commission established a Science and Technical Advisory Panel and a Steering Committee to expedite their work. The first phase of the Commission’s work was to assess the state’s vulnerabilities, identify what adaptation work is occurring throughout the state, and identify barriers to incorporating climate change science and information into planning and practice. The Commission is working to

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<sup>6</sup> The Chesapeake Bay Program has federal and state agencies, nonprofit organizations, and academic institutions among its program partners. See Chesapeake Bay Program, <http://www.chesapeakebay.net/>.

<sup>7</sup> For a summary, see Georgetown Climate Center, Adaptation Clearinghouse, Hawaii Climate Adaptation Initiative Act (House Bill 1714, Act 83), <http://www.adaptationclearinghouse.org/resources/hawaii-climate-adaptation-initiative-act-house-bill-1714-act-83.html>.

<sup>8</sup> For a summary, see Georgetown Climate Center, Adaptation Clearinghouse, New Hampshire Senate Bill 163: Establishing a commission to recommend legislation to prepare for projected sea level rise and other coastal and coastal watershed hazards, <http://www.adaptationclearinghouse.org/resources/new-hampshire-senate-bill-163-establishing-a-commission-to-recommend-legislation-to-prepare-for-projected-sea-level-rise-and-other-coastal-and-coastal-watershed-hazards.html>.

finalize adaptation recommendations to the legislature, including identifying possible legislative reforms to promote adaptation at the state and local levels.

## 2. Establish risk-based climate change projections for the state

Supporting the production of climate science is a critical state function. State participation in assessing climate risks can provide key information that local governments and individual state agencies could not easily or efficiently produce themselves. Even when climate projections already exist, state participation can have a number of benefits. Local planners and state agencies can easily become overwhelmed when trying to choose between the many climate models and tools. The state can get in front of potential planning paralysis by endorsing one set of projections and providing clear guidance for conducting vulnerability assessments. It also increases opportunities for cross-jurisdictional and cross-agency collaboration; if everyone is working off the same assumptions, it is easier to plan together. Importantly, determining climate risks at the state level cannot and should not be a one-time event. Instead, projections must be updated to reflect new information and scientific improvements periodically.

Maryland has not required the use of specific risk-based climate projections in state and local planning and decisionmaking. While Maryland has set requirements for regularly updating sea-level rise projections (under HB 514), and for considering and mitigating sea-level rise impacts in certain state developments, more could be done to understand other climate impacts and ensure that the most up-to-date projections are factored into decisionmaking and investments. State agencies and local governments are often individually developing climate projections to use to assess vulnerability to the impacts of climate change. As a result, the projections that are being used can vary greatly based upon the scenarios utilized and how the data is downscaled based upon local conditions. This process can also lead to an inefficient allocation of resources as each state agency and local government has to individually go through the technically difficult process of evaluating and downscaling climate models to establish the climate projections they will use for their vulnerability analyses. Instead, the state could improve the efficient allocation of resources, by providing state-level guidance on the projections that government officials should be using in their own analysis. For Maryland, specific projections for sea-level rise, increases in temperature, and changes in precipitation will be critical to the development of actionable responses to future impacts.

### a. What Maryland is already doing

*Maryland 2008 Climate Change Impact Assessment:* Maryland's Scientific and Technical Working Group as initially established under the 2007 Executive Order produced a comprehensive [Climate Change Impact Assessment](#)<sup>9</sup> that looked at likely future conditions for Maryland and the consequences of climate change for different sectors. The assessment included analysis of how sea-level rise, temperature changes and heat waves, precipitation changes, soil moisture, drought, and flooding are likely to impact the economy and agriculture, ecosystems and water resources, and human health. But the Assessment notes the importance of continuous reassessment of climate change projections, impacts, and actions that can help manage those impacts. It identifies a need for better monitoring of changing conditions in Maryland, and downscaling models to incorporate locally important phenomena like urban heat islands and forest cover effects.

*Updates to sea-level rise projections:* Since the Assessment was released, Maryland has developed one [update](#) to the state's sea-level rise projections (in 2013),<sup>10</sup> and HB 514 further requires updates to these projections every 5 years. HB 514 also directs the Commission to prioritize certain actions for the working groups, including assessing impacts that climate change may have on the economy, revenues, and investment decisions, and on agriculture. So far, consideration of sea-level rise and coastal flood risks have been incorporated into some requirements relating to state-level development and investments, in particular through the state's coast-smart guidelines and state

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<sup>9</sup> "Comprehensive Assessment of Climate Change Impacts in Maryland," Report of the Scientific and Technical Working Group, Maryland Commission on Climate Change (July 2008), available at [http://www.mde.state.md.us/programs/Air/ClimateChange/Documents/FINAL-Chapt%202%20Impacts\\_web.pdf](http://www.mde.state.md.us/programs/Air/ClimateChange/Documents/FINAL-Chapt%202%20Impacts_web.pdf).

<sup>10</sup> "Updating Maryland's Sea-level Rise Projections," Scientific and Technical Working Group, Maryland Commission on Climate Change (June 26, 2013), available at <http://www.umces.edu/sites/default/files/pdfs/SeaLevelRiseProjections.pdf>.

developments in the Critical Area. Maryland could work to develop more localized projections and require regular monitoring and updates of these projections for impacts other than sea-level rise, and further expand the use of best available science in requirements relating to state and local decisionmaking.

### **b. Examples**

*Army Corps of Engineers:* In January 2015, the Army Corps of Engineers released its [North Atlantic Coast Comprehensive Study](#),<sup>11</sup> which detailed strategies for reducing risks from coastal storms and flooding due to sea-level rise in the North Atlantic region from Maine to North Carolina.<sup>12</sup> The study is designed to help communities better understand and prepare for changing flood risks, building on lessons learned from Hurricane Sandy.

*California* adopted [official sea-level rise projections and guidance](#) for how state agencies and local governments should account for future sea-level rise in plans and project design.<sup>13</sup> The state also regularly produces a state [Climate Assessment](#) to report on potential impacts to the state from climate change. It is currently working on producing the 2016 Assessment.

*New York* passed the Community Risk and Resiliency Act (CRRA, [A06558B](#))<sup>14</sup> which required the state Department of Environmental Conservation to adopt official projections for sea-level rise by January 1, 2016 and update the projections every five years. The state has completed an assessment of sea-level rise projections, [Observed and Projected Climate Change in New York](#),<sup>15</sup> and issued a revised [proposed rule](#)<sup>16</sup> establishing sea-level rise projections for the state in November 2016. The proposed rule establishes projections for three geographic regions of the state (Long Island, Lower Hudson-New York City, and the Mid-Hudson regions) and over three time intervals (2020, 2050, and 2080). To address uncertainty in rates of land-based ice melt, each projection is additionally broken down by likelihood (low, low-medium, medium, high-medium, and high). The State Department of Environmental Conservation is taking comments on the proposed rules through the end of 2016, and expects to finalize the rules in 2017. The rules are intended to provide a common source for sea-level rise projections that are used by state and local entities to inform implementation of CRRA. The projections used for the proposed rule were based upon the ClimAID report developed by the New York State Energy Research and Development Authority (NYSERDA).<sup>17</sup>

## **3. Establish a state research-needs plan**

Much of the state's work on adaptation will require additional research and assessment. Local research institutions and universities can play a key role in developing the science needed to support state and local decisionmaking. Some states are developing state research plans to set priorities for state-funded research. Maryland could develop a state research plan to communicate research needs to academic partners to ensure that academic research in the state is relevant and actionable to inform government decisionmaking around climate preparedness.

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<sup>11</sup> U.S. Army Corps of Engineers, North Atlantic Coast Comprehensive Study, <http://www.nad.usace.army.mil/CompStudy.aspx>.

<sup>12</sup> The study was called for in the Disaster Relief Appropriations Act of 2013, Pub. Law 113-2, Chapter 4, which was signed into law to assist recovery in the states and communities affected by Hurricane Sandy

<sup>13</sup> For a summary, see Georgetown Climate Center, Adaptation Clearinghouse, State of California Sea-Level Rise Guidance Document 2013 Update, <http://www.adaptationclearinghouse.org/resources/state-of-california-sea-level-rise-guidance-document-2013-update.html>.

<sup>14</sup> A. 6558B, 2013-2014 Sess. (N.Y. 2014). For a summary, see Georgetown Climate Center, Adaptation Clearinghouse, New York Community Risk and Resiliency Act, <http://www.adaptationclearinghouse.org/resources/new-york-community-risk-and-resiliency-act-s06617b.html>.

<sup>15</sup> "Observed and Projected Climate Change in New York State: An Overview," Report Developed for the community Risk and Resiliency Act (CRRA) Drafting Teams (Final, Dec. 31, 2015), available at [http://www.dec.ny.gov/docs/administration\\_pdf/climbkgnccrra.pdf](http://www.dec.ny.gov/docs/administration_pdf/climbkgnccrra.pdf).

<sup>16</sup> 2016 N.Y. Reg. Text 408706 (to be codified at 6 NYCRR Part 490); available at Department of Environmental Conservation, Part 490, Projected Sea-level Rise – Express Terms, [www.dec.ny.gov/regulations/103877.html](http://www.dec.ny.gov/regulations/103877.html).

<sup>17</sup> 2016 N.Y. Reg. Text 408706; available at Department of Environmental Conservation, Part 490, Projected Sea-Level Rise – Regulatory Impact Statement, <http://www.dec.ny.gov/regulations/103889.html>.

### **a. What Maryland is already doing**

*Research requirements under HB 514:* Maryland has already put in place requirements designed to help ensure that the state has regularly updated sea-level projections as scientific capabilities improve. HB 514 requires the University of Maryland Center for Environmental Science to establish science-based sea-level rise projections for the state's coastal areas and to update the projections at least every 5 years. HB 514 also provides for the participation of Maryland universities in the Commission's work, and in the working groups established to report to the Commission. Working group priorities identified in the legislation include assessing impacts of climate change on agriculture, the economy, revenues, and investment decisions, and assisting local governments in supporting community-scale climate vulnerability assessments. These existing requirements and priorities can provide a starting point for Maryland to identify research needs for developing locally actionable climate science.

### **b. Examples**

*California* develops a [state research plan](#)<sup>18</sup> to inform state investments in research and to enhance partnerships with universities, which help ensure that climate change research can be applied and used by state and local policymakers to better inform decisionmaking. Other states have specifically created state entities to provide climate change research and analysis to support state policymakers.

In *New York*, the New York State Energy Research and Development Authority (NYSERDA) supports New York State's climate change research priorities through development and regular update of a statewide research plan, based upon input from multiple stakeholder groups, including other state agencies.

The *Southeast Florida Regional Climate Change Compact* (a collaborative of four counties in the Southeast Florida Region) formalized a collaboration with the Florida Climate Institute (FCI), a network of southeast Florida universities providing research on climate change. The FCI was established to facilitate a streamlined process for coordination between local officials and Florida universities seeking grants for climate projects. When a participating FCI university wants to apply for a grant related to climate change, the Compact can voice support of their grant application and ensure that the research is relevant to local needs. The agreement also better connects Compact counties with Florida universities to increase local government access to the technical expertise that university researchers can bring to local planning efforts.

## **4. Ensure the resilience of state investments**

Through its Coast-Smart guidelines, Maryland is already a leader in ensuring that state investments will be resilient to the impacts of sea-level rise. The state should consider how it can ensure that other impacts are also considered when designing and siting state infrastructure. Heavier precipitation will increase riverine and inland flooding and more extreme heat days will also affect infrastructure and the communities that rely on these investments. Maryland could consider opportunities to expand the coast-smart policies or adopt or amend other policies to ensure that state investments are built to withstand other impacts of climate change (non-coastal flood impacts).

The state should also work ensure that the coast-smart guidelines align with new federal requirements that are being put in place in response to President Obama's January 2015 Executive Order setting a Federal Flood Risk Management Standard<sup>19</sup> (the Standard). The order directs federal agencies to consider future flood risks posed by climate change in the siting and design of all federally funded "projects." Under the Standard, Agencies must select from a menu of three options to establish the vertical flood elevation and corresponding horizontal extent of the design floodplain for consideration when siting and designing federally funded projects. Agencies can:

- (1) Use the best-available climate science to identify the depth and breadth of the design floodplain (Climate Informed Science Approach);

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<sup>18</sup> For a summary, see Georgetown Climate Center, Adaptation Clearinghouse, Climate Change Research Plan for California, <http://www.adaptationclearinghouse.org/resources/climate-change-research-plan-for-california.html>.

<sup>19</sup> Exec. Order No. 13690, 80 Fed. Reg. 6425 (Jan. 30, 2015).



- (2) Take the 100-year flood elevation from the Federal Flood Insurance Rate Maps and Studies as a baseline, add two or three feet of elevation depending on the criticality of the facility, and then extrapolate the corresponding horizontal extent (the Freeboard Approach); or
- (3) Rely on the 500-year floodplain.

The Standard also calls on agencies to avoid, preserve and enhance natural floodplains and to use natural systems, ecosystem processes, and nature-based approaches where possible. In October 2015, FEMA published final guidelines to assist federal agencies, which must adopt their own implementation plans. In August 2016, FEMA promulgated its own proposed rule and policy to implement the Standard, selecting the Freeboard Approach as its default for FEMA-funded programs, including pre- and post-disaster hazard mitigation.<sup>20</sup> (FEMA proposes to allow the use of the Climate Informed Science Approach only for critical facilities, such as hospitals, and only when this approach yields a deeper broader, floodplain than the Freeboard Approach). The Department of Housing and Urban Development issued a proposed rule implementing the Standard in October 2016, also adopting the Freeboard Approach as default for HUD-assisted or -financed projects involving new construction or substantial reconstruction.<sup>21</sup> Other federal agencies have yet to propose their own implementation plans. Because the Standard applies to all federally funded projects, it may affect how states invest federal dollars depending on whether the Standard is maintained by the new administration and Congress. As a result, the state may want to consider revisiting coast-smart guidelines to ensure that they are consistent with federal requirements imposed through the FFRMS.

The state should also work to translate lessons learned from implementing the coast-smart guidelines to apply in design and siting of projects that are not subject to the rules. The state could also improve the guidelines by incorporating learnings from other state and federal projects in the region including the Army Corps of Engineers [North Atlantic Coast Comprehensive Study](#) (which detailed strategies for reducing risks from coastal storms and flooding due to sea-level rise in the North Atlantic region from Maine to North Carolina)<sup>22</sup> and the Maryland's State Highway Administration Federal Highway Administration (FHWA) pilot study.

#### **a. What Maryland is already doing**

*Coast-smart guidelines:* In May 2014, the Maryland legislature passed [HB 615](#)<sup>23</sup> to address risks related to sea-level rise and coastal flooding by requiring that all new and reconstructed state structures take steps to minimize future flood damage. The law established the Coast Smart Council to oversee state infrastructure projects and to draft siting and design criteria that would address coastal risks. The Coast Smart Council (within MD-DNR) developed criteria for the siting and design of state capital projects in consideration of future sea-level rise and coastal flooding, and the [State of Maryland Climate Change and Coast Smart Construction Infrastructure Program](#)<sup>24</sup> went into effect on July 1, 2015. The criteria require that the state avoid, to the fullest extent practicable, new construction or substantial reconstruction in areas likely to be inundated by sea-level rise within 50 years, and that all projects be designed to avoid or minimize future impacts from sea-level rise or other coastal flooding. State construction within Special Flood Hazard Areas, as defined under the National Flood Insurance Program, must be built at least two feet above the 100-year base flood elevation (three feet for “critical and essential” facilities). The criteria also prioritize onsite mitigation that restores, enhances, or creates natural and nature-based features to buffer against flooding. The Program includes a project screening checklist for state agencies to identify vulnerabilities and resilience features

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<sup>20</sup> Updates to Floodplain Management and Protection of Wetlands Regulations To Implement Executive Order 13690 and the Federal Flood Risk Management Standard, Proposed Rule, 81 Fed. Reg. 57401 (Aug. 22, 2016) (to be codified at 44 C.F.R. 9).

<sup>21</sup> Floodplain Management and Protection of Wetlands; Minimum Property Standards for Flood Hazard Exposure; Building to the Federal Flood Risk Management Standard, Proposed Rule, 81 Fed. Reg. 74967 (Oct. 28, 2016) (to be codified at 24 C.F.R. pts. 200, 50, 55, 58).

<sup>22</sup> U.S. Army Corps of Engineers, North Atlantic Coast Comprehensive Study, <http://www.nad.usace.army.mil/CompStudy.aspx>.

<sup>23</sup> H.B. 615, 2014 Sess. (Md. 2014); for a summary, see Georgetown Climate Center, Adaptation Clearinghouse, Maryland HB 615: Coast Smart Council Law, <http://www.adaptationclearinghouse.org/resources/maryland-hb-615-coast-smart-council-law.html>.

<sup>24</sup> Maryland Coast Smart Council, Coast Smart Construction Program (effective July 1, 2015), available at [http://dnr2.maryland.gov/ccs/coastsmart/Documents/2015\\_CS\\_ConstructionProgram.pdf](http://dnr2.maryland.gov/ccs/coastsmart/Documents/2015_CS_ConstructionProgram.pdf).

of a proposed project.

*State development in the Critical Area:* In December 2014, the Critical Area Commission updated regulations governing developments proposed by state agencies on state-owned land in the Critical Area. State agencies must demonstrate to the Critical Area Commission that they have considered the likelihood of inundation from sea-level rise over the design life of a proposed development. They must demonstrate that the development identifies and incorporates climate resilient practices in order to avoid or minimize environmental and structural damage associated with a coastal hazard, an extreme weather event, sea-level rise, and other impacts.<sup>25</sup>

*Transportation investments:* Maryland's State Highway Administration completed a [Climate Resilience Pilot Project](#) funded in part by the Federal Highway Administration.<sup>26</sup> The project involved a detailed vulnerability assessment of roads and bridges in two pilot counties to sea-level rise, increased storm surge, and changes in precipitation. As a result of the pilot project, SHA developed a framework that it is using to complete vulnerability assessments for roadways in all other tidal counties as well. SHA expects to have completed these assessments by the end of 2017, and is looking at ways to incorporate these findings into transportation planning and programming. The Maryland Port Administration and the Maryland Transit Administration have also analyzed vulnerabilities at major facilities like the Port of Baltimore and METRO stations, and are identifying adaptation strategies and modifications to asset management programs to increase resilience. One way that Maryland is expected to incorporate resilience and local priorities into major transportation programming is through the Maryland Open Transportation Investment Decision Act of 2016 ([HB 1013](#)), passed in April 2016.<sup>27</sup> The Act established state transportation goals and measures for the Maryland Department of Transportation to use when ranking certain major capital projects. System preservation is one of the overall goals, which will require consideration of the degree to which a project renders a transportation facility more resilient. Local governments' land use plans and goals also factor into project ranking, helping to prioritize projects that align with local priorities and planning efforts. The state could also use the vulnerability analysis and modelling conducted by SHA to inform and improve the Coastal Atlas and Coast-Smart Guidelines.

*Natural resource conservation priorities and investments:* The Department of Natural Resources (DNR) has led the state's efforts to incorporate consideration of climate change impacts into state investments in land conservation and restoration of natural areas. DNR manages state parks and has authority to purchase and manage land types suitable for conservation (i.e., watershed protection, state parks, scenic preserves). In 2010, DNR issued [Policy 2010: Building Resilience to Climate Change](#),<sup>28</sup> establishing an agency-wide policy to make investments that help mitigate and adapt to climate change and foster a better understanding of climate change impacts. In keeping with this policy, DNR has conducted assessments and modified planning, land conservation targeting processes, and restoration efforts to better prioritize actions that will increase resilience. For example, [GreenPrint](#), the state's initiative for targeting lands for conservation and restoration, has been updated to include information relating to climate change.<sup>29</sup> Maryland has factored sea-level rise considerations into the designation of "targeted ecological areas" (the state's most ecologically valuable lands), and GreenPrint also now includes a data layer for "wetland adaptation areas" where wetlands will migrate as sea levels rise. GreenPrint is used to target funds for land acquisition (primarily through Program Open Space - stateside) and conservation easements (e.g. through the Maryland Environmental Trust), so these new data layers help to ensure that funding is used wisely for acquiring

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<sup>25</sup> COMAR 27.02.05.03.

<sup>26</sup> Maryland State Highway Administration Climate Change Adaptation Plan with Detailed Vulnerability Assessment, Final Report, Oct. 11, 2014, available at [http://www.fhwa.dot.gov/environment/climate\\_change/adaptation/resilience\\_pilots/2013-2015\\_pilots/maryland/final\\_report/index.cfm](http://www.fhwa.dot.gov/environment/climate_change/adaptation/resilience_pilots/2013-2015_pilots/maryland/final_report/index.cfm).

<sup>27</sup> H.B. 1013, 2016 Sess. (Md. 2016).

<sup>28</sup> Maryland Department of Natural Resources, "Building Resilience to Climate Change," Policy No. 2010:11, Oct. 15, 2010, available at [http://dnr2.maryland.gov/climate/resilience/Documents/climate\\_change.pdf](http://dnr2.maryland.gov/climate/resilience/Documents/climate_change.pdf).

<sup>29</sup> See Maryland Department of Natural Resources, Land Acquisition and Planning, Maryland's Green Infrastructure Assessment, <http://dnr.maryland.gov/land/Pages/Green-Infrastructure-Mapping.aspx>.

and conserving areas that will maximize ecological and climate resilience benefits. In addition, in March 2016, DNR completed a [Coastal Resilience Assessment](#) in partnership with The Nature Conservancy, that evaluates the ability of and potential for natural features and habitats to reduce coastal hazards like flooding and erosion caused by tides, storm surge, and sea-level rise.<sup>30</sup> The assessment identifies priority areas where natural features can provide the most risk reduction for communities, the economy, and ecosystems, so that state agencies and decisionmakers can also prioritize these areas for preservation and conservation. Areas are prioritized based upon population density and social-vulnerability factors (such as age, income, and language proficiency).

*Forest Preservation Act:* In recent years, Maryland has also added programs to support conservation and stewardship on private lands. Maryland’s Forest Preservation Act of 2013<sup>31</sup> ([HB 706](#)) established a no-net-loss conservation policy for forestland in the state. In support of this policy, the law extended tax benefits for private landowners engaging in forest stewardship and management practices. Additionally, in early 2014 the Maryland Forest Service implemented a new “Lawn to Woodland” program in partnership with the Arbor Day Foundation, which provides trees, tools, and technical assistance to help landowners convert unused lawn to forest cover at no cost.

### **b. Examples**

*New York’s Community Risk and Resilience Act*<sup>32</sup> requires state agencies to consider climate change in the planning, permitting, and funding process for a variety of state programs. The act charges the Department of Environmental Conservation with adopting sea-level projections (described above), and updating those projections every five years, creating a baseline for planning and design considerations. Additionally, the act requires that climate change inform state funding for agricultural land protection, smart growth public infrastructure criteria, siting of hazardous waste facilities, and state assistance for waterfront revitalization programs, among other programs.<sup>33</sup>

*New York* also provides support and funding to utilities to encourage resilience measures. In 2010, NYSERDA published an assessment of the state’s vulnerability to climate change: [Responding to Climate Change in New York State: ClimAID Integrated Assessment for Effective Climate Change Adaptation - Synthesis Report](#).<sup>34</sup> NYSERDA is also administering the \$40 million New York State competition program [NY Prize](#), which challenges communities and entrepreneurs to design microgrid projects, making them more resilient to power outages caused by extreme weather.<sup>35</sup>

*Massachusetts* is using its [State Revolving Fund \(SRF\)](#)<sup>36</sup> to encourage municipalities to consider predicted climate change impacts in SRF-funded improvements to wastewater infrastructure and to integrate onsite energy generation

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<sup>30</sup> The Nature Conservancy, Maryland Coastal Resiliency Assessment (2016). M.R. Canick, N. Carlozo and D. Foster. Bethesda, MD, available at [http://dnr2.maryland.gov/ccs/Documents/MARCH-2016\\_MDCoastalResiliencyAssessment.pdf](http://dnr2.maryland.gov/ccs/Documents/MARCH-2016_MDCoastalResiliencyAssessment.pdf).

<sup>31</sup> H.B. 706, 2013 Sess. (Md. 2013).

<sup>32</sup> A. 6558B, 2013-2014 Sess. (N.Y. 2014). For a summary, see Georgetown Climate Center, Adaptation Clearinghouse, New York Community Risk and Resiliency Act, <http://www.adaptationclearinghouse.org/resources/new-york-community-risk-and-resiliency-act-s06617b.html>.

<sup>33</sup> N.Y. Assembly Bill AO6558B, [http://assembly.state.ny.us/leg/?default\\_fld=&bn=A06558&term=2013&Summary=Y&Actions=Y&Memo=Y&Text=Y](http://assembly.state.ny.us/leg/?default_fld=&bn=A06558&term=2013&Summary=Y&Actions=Y&Memo=Y&Text=Y).

<sup>34</sup> See Georgetown Climate Center, Adaptation Clearinghouse, Responding to Climate Change in New York State: ClimAID Integrated Assessment for Effective Climate Change Adaptation – Synthesis Report, <http://www.adaptationclearinghouse.org/resources/responding-to-climate-change-in-new-york-state-climaid-integrated-assessment-for-effective-climate-change-adaptation-synthesis-report.html>.

<sup>35</sup> New York State, NYSERDA, NY Prize, <https://www.nyserda.ny.gov/ny-prize>.

<sup>36</sup> State of Massachusetts, Executive Office of Energy and Environmental Affairs, State Revolving Fund, <http://www.mass.gov/eea/agencies/massdep/water/grants/state-revolving-fund.html>.

projects.

*Port Authority of New York and New Jersey:* The state could consider expanding the guidelines to include other impacts of climate change. The PANYNJ Engineering Department developed Climate Resilience Design Guidelines to ensure that new agency infrastructure and buildings are designed to account for sea-level rise and changes in temperature and precipitation. The guidelines describe examples of how agency infrastructure could be modified to increase resilience to particular climate change impacts (e.g. modifying rails to account for more extreme heat). They also include a ten-step process for project engineers and architects to increase resilience of projects to flooding. The guidelines utilize climate change projections produced by the New York City Panel on Climate Change.

*New Jersey:* Following Hurricane Sandy, New Jersey passed S2815 (2013) authorizing the Natural Disaster Relief Emergency Loan Financing Program to support critical improvements to drinking water and wastewater infrastructure projects. Sandy proved how vulnerable the state's water supply was to extreme weather, damaging 100 wastewater treatment plants that served approximately 3.5 million people and causing a large number of water supply systems to lose power. The legislation specifically allocated a percentage of the funding to infrastructure that was damaged during Hurricane Sandy, but also established a permanent source of emergency funding for water or wastewater utilities damaged in future events. *Green Banks:* Some states have also found innovative ways to leverage private financing for resilience. In December 2013, New York established the NY Green Bank, partially funded with state funds and proceeds from the Regional Greenhouse Gas Initiative (RGGI) allowance auctions, to support energy investments aimed at a cleaner and more resilient power grid. New York also created an Infrastructure Bank using state and federal relief funds, to coordinate infrastructure investments following Hurricane Sandy. The bank seeks to use public funds to encourage private investment in projects that strengthen critical infrastructure against future threats such as winds, flooding, and other climate impacts.

## 5. Mainstream adaptation in all state plans

State agencies should also be encouraged to identify opportunities to mainstream adaptation in existing state plans, particularly where states will be required to consider climate change pursuant to new federal requirements. Many existing state plans present useful vehicles for assessing climate change risks to certain sectors or from certain hazards, such as the State Hazard Mitigation Plan, State Wildlife Action Plan, and Long-Range Transportation Plan. By doing so, the state can ensure that state decisions in these sectors consider climate risks.

In updating state plans, state agencies should strive to set concrete actions, lead agencies, and definitive timelines for implementation. State plans should also strive to identify legal and policy barriers that have hindered state and local adaptation efforts to dates. By identifying concrete recommendations for legal and policy changes that are needed to implement responses, state agencies can help set clear benchmarks for legislative, regulatory, or policy changes and establish a legislative agenda for needed statutory fixes. Agencies should also be encouraged to identify where cross-agency coordination will be useful and specific funding sources that could be tapped to implement projects on the ground.

### a. What Maryland is already doing

*Wildlife and Habitat Planning:* Maryland has incorporated climate change into planning documents, including the [Land Preservation and Recreation Plan](#)<sup>37</sup> (LPRP, last updated in 2014), the [State Wildlife Action Plan](#)<sup>38</sup> (SWAP, last updated in 2015), and the [Forest Action Plan](#)<sup>39</sup> (last updated in 2015). The LPRP, developed every five years,

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<sup>37</sup> Maryland Department of Natural Resources, Maryland Land Preservation and Recreation Plan 2014-2018, [http://dnr2.maryland.gov/land/Pages/Stewardship/LPRP\\_2014-2018.aspx](http://dnr2.maryland.gov/land/Pages/Stewardship/LPRP_2014-2018.aspx).

<sup>38</sup> Maryland Department of Natural Resources, 2015 Maryland State Wildlife Action Plan, [http://dnr.maryland.gov/wildlife/Pages/plants\\_wildlife/SWAP\\_Submission.aspx](http://dnr.maryland.gov/wildlife/Pages/plants_wildlife/SWAP_Submission.aspx).

<sup>39</sup> Maryland Department of Natural Resources, Maryland 2015 Forest Action Plan: Strategy (2016-2020), available at [http://dnr2.maryland.gov/forests/Documents/2015\\_DRAFT%20ForestStrategyUpdate.pdf](http://dnr2.maryland.gov/forests/Documents/2015_DRAFT%20ForestStrategyUpdate.pdf).

describes the critical issues affecting outdoor recreation and natural resource protection and guides land conservation and development of recreational opportunities. The SWAP, updated every ten years, identifies threats and conservation priorities for wildlife and their habitats in Maryland. The state's 2015 SWAP includes a chapter focused on the impacts of climate change and related vulnerabilities for Species of Greatest Conservation Need, informed by a vulnerability assessment that DNR conducted using Nature Serve's Climate Change Vulnerability Index. Finally, since 2010, Maryland's five-year Forest Action Plan has included climate change as one of the top five action areas, and Maryland's Forest Service within DNR is working to incorporate adaptation into forestry programs.

*Hazard Mitigation Planning:* Maryland recently finalized and adopted its 2016 [State Hazard Mitigation Plan](#),<sup>40</sup> which incorporates consideration of climate change impacts on location, extent, intensity, and frequency of hazard events in the future. The plan was developed with input from the Maryland Resiliency Partnership, and efforts were made to integrate hazard mitigation planning with other planning initiatives at the local, state, and federal levels. The Plan also emphasizes the several hazards that are most likely to affect Maryland now and in the future, in order to better focus risk analysis and prioritization of mitigation and resiliency investments. The Plan was submitted to the Federal Emergency Management Agency for final approval in August 2016.

### **b. Examples**

*Hazard Mitigation Plan:* The state could develop an "enhanced" all-hazards mitigation plan that considers how climate change will exacerbate the state's risk to natural hazards and other factors related to improving how the state allocates hazard mitigation funding. Enhanced plans qualify states for additional disaster recovery dollars in the event of a presidentially declared disaster. Hazard Mitigation Plans are an important tool for facilitating adaptation because they govern how billions of dollars in disaster recovery dollars are spent in the aftermath of a Presidentially declared disaster to reduce future risk. California incorporated consideration of climate change in its [2013 State Multi-Hazard Mitigation Plan](#),<sup>41</sup> and the plan was recognized by the Federal Emergency Management Agency as an "enhanced" plan, which will make California eligible for extra aid in the event of a presidentially declared disaster. The state's Flood Avoidance Framework is an important first step in this direction. States will also be required to mainstream climate considerations in hazard mitigation plans pursuant to new guidance issued by the Federal Emergency Management Agency (FEMA) in March 2015.<sup>42</sup> New FEMA mitigation assistance program guidance requires states to consider future climate change in Hazard Mitigation Plans, which states and communities must develop in order to be eligible for some types of federal disaster recovery assistance.

*Transportation Plans:* Maryland should use the information gleaned through the FHWA pilot to incorporate climate change into the state's next Long-Range Transportation Plan. The [2035 Maryland Transportation Plan](#)<sup>43</sup> recommends assessing vulnerabilities to climate change and sea-level rise, and institutionalizing consideration of sea-level rise and coastal hazards in prioritization of investments in coastal areas. Having conducted detailed vulnerability assessments for nearly all of the state's tidally influenced counties, Maryland is better positioned to account for climate change resilience in planning and programming to help prioritize state investments. The state should also consider how it can begin to develop risk-based asset management plans, which will be required in the

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<sup>40</sup> State of Maryland 2016 Hazard Mitigation Plan (August 2016), available at <http://mema.maryland.gov/community/Documents/2016%20Maryland%20Hazard%20Mitigation%20Plan%20final%202.pdf>

<sup>41</sup> For a summary of California's "enhanced" plan, see Georgetown Climate Center, Adaptation Clearinghouse, California 2013 State Multi-Hazard Mitigation Plan, <http://www.adaptationclearinghouse.org/resources/california-2013-state-multi-hazard-mitigation-plan.html>.

<sup>42</sup> Beginning in 2016, FEMA will require states to consider climate change in their Hazard Mitigation Plans, which are required as a condition of receiving disaster recovery assistance under the Hazard Mitigation Grant Program (HMGP) authorized by Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act.

<sup>43</sup> Maryland Department of Transportation, 2035 Maryland Transportation Plan: Moving Maryland Forward, available at [http://www.mdot.maryland.gov/Office\\_of\\_Planning\\_and\\_Capital\\_Programming/CTP/CTP\\_14\\_19/1\\_Final\\_CTP\\_Documents/2035\\_M\\_TP.pdf](http://www.mdot.maryland.gov/Office_of_Planning_and_Capital_Programming/CTP/CTP_14_19/1_Final_CTP_Documents/2035_M_TP.pdf).

future. In October 2016, the Federal Highway Administration (FHWA) finalized a rulemaking that will require states to consider future climate change in risk-based asset management plans for transportation infrastructure.<sup>44</sup> Risk-based asset management requirements were included in the 2012 transportation authorization and funding bill, Moving Ahead for Progress in the 21<sup>st</sup> Century (MAP-21). FHWA's rule will require state departments of transportation to develop planning processes that consider risks from future conditions including climate change and extreme weather, and identify strategies for minimizing the lifecycle costs of managing assets within the highway system.

## 6. Track state progress and develop indicators to assess the efficacy of adaptation initiatives

Adaptation efforts are only useful if they work, but states and other actors often lack defined methods for evaluating responses and monitoring success. State leaders are much more likely to champion a policy where there are demonstrable outcomes and clear benefits to the state. Without easily measurable benefits (at least in the short-term) state leaders may face difficulty building political support for adaptation policies and investments. States should also work with academic and other partners to develop indicators that can be used to monitor assess the efficacy of adaptation measures that are being implemented on the ground.

States should require state agencies to report on the progress they are making in implementing adaptation plans and to periodically update and refine plans. In Maryland, For progress reports to be a useful tool, state agencies should be required to not only report on, but also explain, their progress implementing each recommendation in the plan. Agencies should explain why they have not made progress on certain recommendations, and the initiatives they have undertaken to make progress or complete implementation of each specific goal laid out in the plan. However, policymakers should be careful not to require too much reporting or too frequent plan updates because paperwork can take away staff time needed to pursue implementation.

### a. What Maryland is already doing

Maryland develops progress reports and is required to report on progress pursuant to legislation. HB 514 directs the working groups within the Maryland Commission on Climate Change to establish annual work plans that set goals and performance benchmarks, and to hold regular meetings to assess progress. Specific state agencies are also required to report annually to the Commission on their programs that address climate change, including identifying whether they have met milestones for program implementation and any challenges encountered. These provisions, along with the Commission's annual reporting requirement to the Governor and General Assembly, will help the state regularly track its progress and establish accountability among state agencies and the Commission for carrying out actions to achieve the state's climate change goals. To ensure that state agencies implement the recommendations identified in state plans, the Commission should continue to require periodic progress reports from the working groups and individual state agencies charged with implementing specific recommendations in the state's adaptation plans. While the legislation requires tracking of progress, it does not specifically require assessment of how effective the state's implementation of these goals is for increasing resilience across different sectors in Maryland.

### b. Examples

*State-level Indicators:* There are few published state-level sets of indicators for climate adaptation, but several states are working on indicators for specific sectors and impacts:

- *New York:* In 2013, New York State released a set of [indicators](#) to help guide regional sustainability

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<sup>44</sup> Asset management Plans and Periodic Evaluations of Facilities Repeatedly Requiring Repair and Reconstruction Due to Emergency Events, 81 Fed. Reg. 73196 (Oct. 24, 2016) (codified at 23 C.F.R. pts. 515, 667).

planning.<sup>45</sup> One section of this document focuses on adaptation and lists 16 indicators. These include: number of sanitary sewer overflows, number of CRS communities, and percentage of water samples from river estuaries that are deemed unacceptable.

- *California*: The California Department of Public Health is soon to release a set of indicators they have developed in relation to their California Building Resilience against Climate Effect (CalBRACE) program supported by the Centers for Disease Control and Prevention. Their indicators are divided into three domains: (1) environmental exposures; (2) population sensitivity; and (3) adaptive capacity. The first two domains describe risk factors and include metrics such as projected number of extreme heat days, ozone concentration exceedance, percent of population working outdoors, and percent of population with physical and mental disabilities. The third domain looks at preparedness measures and includes metrics like percent of household with air conditioning, percent of area covered by impervious surfaces, and percent of population with access to public transit. While these measures may be useful statistics to have, it is unclear if they will truly allow the state to assess if preparedness actions are making a difference--or if those metrics are the right ones to look at. For example, the state should probably not make an initiative to reduce the number of people with disabilities, and it may not want to rely solely on air conditioning for heat protection, making it unclear what the value of these indicators will be.

*Non-State Level Indicators*: Recently, the Urban Sustainability Directors Network (USDN) in partnership with the Institute for Sustainable Communities and the City of Washington, D.C. conducted a review of existing climate indicators and metrics to see if any provided a useful framework for city-level adaptation planners ([Indicators Study](#)).<sup>46</sup> While they determined that none of the existing frameworks served the needs of cities perfectly, they could be informative for cities and states alike. The following frameworks may be useful to review:

- [Climate Risk and Adaptation Framework and Taxonomy \(CRAFT\)](#)<sup>47</sup> is a framework built with support from Bloomberg Philanthropies, C40, and ARUP, which was designed to provide a shared terminology for discussing climate hazards and reporting risks. The CRAFT tool is still under development, but the [Taxonomy](#)<sup>48</sup> has been released for public comment. The Indicators Study determined that the CRAFT taxonomy is useful for helping places talk about climate hazards in a standardized way, but does not assist with measurement of risk.
- Boston released [Draft Climate Change Adaptation Indicators](#)<sup>49</sup> in 2015. In this document, the indicators could more accurately be described as categories, and the metrics under each as traditional indicators that can be measured and reported.
- [Notre Dame Global Adaptation Index \(ND-GAIN\)](#)<sup>50</sup> provides country-level analysis of vulnerability to climate change and readiness to respond. Each country receives a score based on 36 indicators that measure vulnerability and 9 that measure readiness. Each of the indicators is detailed in the [technical](#)

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<sup>45</sup> New York State Energy Research and Development Authority, Cleaner, Greener, Communities Program, Sustainability Indicator Guidance Document (June 7, 2013), available at <https://www.nyserda.ny.gov/-/media/Files/About/Statewide-Initiatives/CGC-Plans/Indicators/Sustainability-Indicator-Guidance-Docment.pdf>.

<sup>46</sup> For a summary, see Georgetown Climate Center, Adaptation Clearinghouse, Developing urban Climate Adaptation Indicators, <http://www.adaptationclearinghouse.org/resources/developing-urban-climate-adaptation-indicators.html>.

<sup>47</sup> CRAFT: Climate Risk and Adaptation Framework and Taxonomy, available at [http://c40-production-images.s3.amazonaws.com/other\\_uploads/images/445\\_C40\\_CRAFT\\_v11.original.pdf?1453129528](http://c40-production-images.s3.amazonaws.com/other_uploads/images/445_C40_CRAFT_v11.original.pdf?1453129528).

<sup>48</sup> C40 Cities, Bloomberg Philanthropies, ARUP, City Climate Hazard Taxonomy, available at [http://c40-production-images.s3.amazonaws.com/researches/images/33\\_C40\\_Arup\\_Climate\\_Hazard\\_Typology.original.pdf?1426352208](http://c40-production-images.s3.amazonaws.com/researches/images/33_C40_Arup_Climate_Hazard_Typology.original.pdf?1426352208).

<sup>49</sup> Lipsky, A. and Starbuck, K. SeaPlan. Climate Change Indicators Framework for the City of Boston, MA. January 2015. Boston: Doc#220.14.02. Available at <https://drive.google.com/file/d/0B9EPWX4ibBzTaWVKN2I3RXNjc2lkaU9kdDZ4OTN0S2xBTWlr/view>.

<sup>50</sup> ND-GAIN Country Index, <http://index.gain.org/>.

[report](#)<sup>51</sup> and include categories such as access to reliable drinking water and population living under 5m above sea level. ND-GAIN is currently working to build an urban-scale assessment tool.

- [Rockefeller’s City Resilience Framework and Index](#)<sup>52</sup> is used by members of the 100 Resilient Cities program to measure and monitor progress. The framework consists of a variety of nested components including four dimensions of resilience: (1) health & wellbeing; (2) economy & society; (3) infrastructure & environment; and (4) leadership & strategy. Underneath these are 12 “drivers,” such as “promotes cohesive and engaged communities” and “meets basic needs,” that support each of the four categories. Rockefeller is working on defining more measurable indicators, but has not released these.

Defining climate adaptation indicators is not easy given that impacts cannot be predicted with certainty. It is challenging to determine how a city would have fared with or without some intervention years down the road and the efficacy of many interventions are not easily measurable. Despite this, the USDN *Indicator Studies* identified some recommendations for developing good indicators: (1) focus on purpose - indicators should be matched to the vision and goals of an adaptation plan, assign responsibility to specific agencies, and be decision-relevant; (2) indicators should reflect a “systems” perspective drawing on bundles of individual indicators that tell a larger story. For example, an indicator around flood risk would need to include metrics such as the amount of impervious surface, projected rainfall, and capacity of stormwater systems; (3) indicators should be evidence based and directly connected to a climate goal. Compared to an indicator measuring the number of trees planted, a better indicator would be the temperature reduced from tree canopy during a heat event.

## SUPPORT FOR LOCAL GOVERNMENTS AND PRIVATE ADAPTATION

Local governments and private actors will play a key role in successful adaptation. Many adaptation interventions necessary for increasing resilience are often squarely in the purview of local governments, including zoning codes, floodplain management, and building codes.<sup>53</sup> Local governments, however, often lack the resources and technical expertise to be able to effectively determine what changes should be made to those local codes and standard, but state governments can help build local capacity to undertake these changes. Private adaptation, such as actions taken by homeowners and businesses, will also be necessary to best prepare for climate change impacts; but private actors similarly may lack technical or financial capacity to incorporate resilience into their decisions.

Maryland should continue to explore how it can provide data and tools, technical assistance, and funding to help its many local governments plan for future risks and mainstream adaptation into local plans, laws, policies, and regulations, and to help homeowners and others similarly make proactive climate-smart decisions. Although Maryland has a lot of tools focused on coastal impacts and sea-level rise, the state provides fewer resources on other sectors and impacts. This section provides recommendations on how state agencies could improve or enhance support for local governments and private adaptation, what state agencies are already doing to provide this support, and examples of best practices being implemented in other states.

### 7. Provide technical assistance and build local capacity

Local governments need resources and direct assistance to help them understand their climate risks, and incorporate this information into local decisionmaking. As described above, one way the state could help local governments is to establish recommended risk-based climate change projections that local governments can use without having to

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<sup>51</sup> Chen, C; Noble, I; Hellmann, J; Coffee, J.; Murillo, M.; Chawla, N., University of Notre Dame Global Adaptation Index, Country Index Technical Report. November 2015. Available at [http://index.nd-gain.org:8080/documents/nd-gain\\_technical\\_document\\_2015.pdf](http://index.nd-gain.org:8080/documents/nd-gain_technical_document_2015.pdf).

<sup>52</sup> 100 Resilient Cities, Rockefeller Foundation, City Resilience Framework (November 2015), available at [http://lghhttp.60358.nexcesscdn.net/8046264/images/page/-/100rc/Blue%20City%20Resilience%20Framework%20Full%20Context%20v1\\_5.pdf](http://lghhttp.60358.nexcesscdn.net/8046264/images/page/-/100rc/Blue%20City%20Resilience%20Framework%20Full%20Context%20v1_5.pdf).

<sup>53</sup> The level of authority over each of these areas can vary by state – for example, some states give broad discretion over building codes to local governments, while others retain most control at the state level.



duplicate this effort at the local level. State tools, projections, and models, however, need to cover the full range of climate change threats that the state faces including changes in precipitation and changes in temperature.

Some states are also building local capacity by supporting peer-learning and collaboration among local governments at the regional scale. In California, Minnesota, and New York, networks are being used to help local governments share ideas, best practices, and model ordinances and to support one another in their adaptation efforts.

The state could also provide sector-specific guidance documents to help local governments address specific impacts of climate change, such as guidance to help communities address extreme heat or urban heat islands or guidance to help communities address impacts to specific sectors (such as agriculture or fisheries). For example, the Maryland Department of Health and Mental Hygiene (DHMH) could develop its climate and health county-level profiles into a toolkit similar to Oregon's, to enable local public health departments to more easily use those profiles to take action. It could also develop public health specific guidance documents similar to California's efforts to assist local governments in incorporating health elements into local planning and decision-making, even outside of the public health sector.

### **a. What Maryland is already doing**

*Multi-Sector Tools and Resources:* The state has developed mapping tools to identify “Climate Change Impact Areas” to help local governments identify areas vulnerable to climate change impacts that warrant special attention when city officials are making planning and investment decisions.<sup>54</sup> The mapping tool identifies sea-level rise inundation areas (projected in 50 and 100 years), areas vulnerable to erosion and storm surge, marsh transition zones, areas with temperature sensitive streams, and drought hazard and wildfire risk areas. Maryland agencies have also developed a variety of fact sheets that summarize climate change impacts in particular sectors (e.g. water resources, farming, land conservation and habitat restoration) and identify planning and management practices that local governments and landowners can implement to increase resilience.<sup>55</sup> The Department of Planning also hosts the Reinvest Maryland Toolbox, an online tool to easily identify state and federal programs and financial or regulatory incentives that support infill, redevelopment, and community revitalization, including environmental protection programs.<sup>56</sup>

*Coastal Hazards and Sea-level Rise Tools and Resources:* The Coastal Atlas is an online mapping and planning tool that allows state local decisionmakers to explore coastal risks such as erosion, storm inundation, and sea-level rise. Users can understand critical information about the state's coastal areas so that they can identify potential vulnerabilities and appropriate locations for conservation, development, or other uses early on in planning processes.<sup>57</sup> The Maryland Chesapeake and Coastal Service's Coastal Training Program provides skill-based trainings and technical assistance to decisionmakers in Maryland's sixteen coastal counties and Baltimore City.<sup>58</sup> Finally, Maryland's Resiliency Partnership, made up of five state agencies, has hosted a series of workshops to

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<sup>54</sup> Maryland Department of Natural Resources, Climate Change Impact Area Mapper, <http://dnr2.maryland.gov/climateresilience/Pages/mapper.aspx>. These areas are incorporated as well into mapping tools to help inform state and local capital investments, and state agencies have conducted outreach to local governments to help them understand how to use the mapping tools in these planning processes.

<sup>55</sup> See, e.g., Land Management: Farming in a Changing Climate, [https://climatechange.maryland.gov/wp-content/uploads/sites/16/2014/12/ian\\_newsletter\\_4061.pdf](https://climatechange.maryland.gov/wp-content/uploads/sites/16/2014/12/ian_newsletter_4061.pdf).

<sup>56</sup> Maryland Department of Planning, Reinvest Maryland Toolbox, <http://planning.maryland.gov/OurWork/toolbox/rmdtoolbox.shtml>.

<sup>57</sup> Maryland Department of Natural Resources, Maryland's Coastal Atlas, <http://www.dnr.state.md.us/ccs/Pages/coastalatlus.aspx>.

<sup>58</sup> National Estuarine Research Service, Coastal Training Program, <http://www.coastaltraining-md.org/>. Training is offered on managing the effects of shoreline development; watershed management and sustainability; coastal flooding, sea level rise and climate change; professional development and skills training; and restoration and conservation training. It is administered by the Chesapeake Bay National Estuarine Research Reserve, which is part of the MDN, Chesapeake and Coastal Service and funded through NOAA (Federal-State-Local Partnership).

reach out to residents on flood risk and mitigation, including home elevation and grant programs available.<sup>59</sup> And the Maryland Department of the Environment has hosted workshops in Crisfield and Smith Island so far, with additional workshops taking place in 2016.

*Floodplain maps:* Maryland worked with FEMA to develop a [Flood Risk Application](#)<sup>60</sup> to digitize the state's Flood Insurance Rate Maps (FIRMs). The online geographic information system (GIS) provides maps delineating the current 100-year and 500-year floodplains and flood elevations (based upon current regulatory conditions), including updated flood risk information for areas of the state that were recently remapped by FEMA. These maps can be used by local governments and landowners for determining compliance with the National Flood Insurance Program. Additional data layers can also be accessed through the Application to determine areas at risk of storm surge and future sea-level rise. Parcel information can be accessed to determine the value of structures in the floodplain. Users can also access data layers showing the locations of historic properties, critical infrastructure, and different natural resource areas. The state is also planning to update many of the riverine (non-coastal) depth grids in the coastal counties in the near term to help communities address flooding from changing precipitation patterns.

*Public Health:* In 2012, DHMH developed a “Maryland Public Health Strategy for Climate Change.”<sup>61</sup> The strategy identifies data needs relating to injuries and disasters, and vector-borne disease; climate modeling needs; and training needed for conducting health impact assessments (HIA), among other needs. In April 2016, DHMH also released a report with climate and health profiles for each Maryland county that calculate the future health burdens of climate impacts and extreme weather events, as well as providing actions communities can take to minimize those burdens.<sup>62</sup> These profiles are intended to support local public health agency action on climate change.

*Water Resources:* The Maryland Department of the Environment produced the *Climate Change Adaptation for Maryland Water Utilities Brochure* as part of its Water Supply Program to assist water utilities better plan for impacts from climate change.<sup>63</sup> The brochure recommends a variety of adaptation measures to help water systems prepare for and/or avoid these impacts and has been distributed to all community water systems in the state.

## **b. Examples**

*California* provides unique examples of how state agencies can develop tools and resources to help local governments prepare for the full range of climate change impacts across different sectors. The state developed and maintains [Cal-Adapt](#),<sup>64</sup> the state's web-based climate adaptation planning tool, which provides climate data at usable scales for local and regional climate change adaptation planning.<sup>65</sup> The website provides interactive visualization

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<sup>59</sup> The five agencies are the Department of Natural Resources, the Department of the Environment, the Maryland Emergency Management Agency, the Maryland Historical Trust, and the Maryland Environmental Service.  
<http://www.mde.state.md.us/programs/Marylander/Documents/MCCC/Publications/WorkPlans/2016AWRGWorkPlan.pdf>

<sup>60</sup> <http://www.mdfloodmaps.net/dfirmimap/index.html>

<sup>61</sup> Maryland Department of Health and Mental Hygiene, Maryland Public Health Strategy for Climate Change, [http://phpa.dhmm.maryland.gov/OEHFP/EH/Pages/Climate\\_Change.aspx](http://phpa.dhmm.maryland.gov/OEHFP/EH/Pages/Climate_Change.aspx). (DHMH) was awarded a capacity building cooperative agreement from the US Centers for Disease Control and Prevention's (CDC) Climate Ready Cities and States Initiative to develop the strategy. The award allowed DHMH to use CDC's Building Resilience Against Climate Effects (BRACE) framework and the Maryland Climate Change Action Plan to develop the public health climate strategy.

<sup>62</sup> Maryland Department of Health and Mental Hygiene, Maryland Climate and Health Profile Report, April 2016, [http://phpa.dhmm.maryland.gov/OEHFP/EH/Shared%20Documents/Reports/MD\\_climate\\_and\\_health\\_FullReport\\_04182016%20Final.pdf](http://phpa.dhmm.maryland.gov/OEHFP/EH/Shared%20Documents/Reports/MD_climate_and_health_FullReport_04182016%20Final.pdf)

<sup>63</sup> Maryland Department of the Environment, Climate Change Adaptation for Maryland Water Utilities, [http://www.mde.state.md.us/programs/Water/Water\\_Supply/Documents/120516\\_CCbrochure\\_Web.pdf](http://www.mde.state.md.us/programs/Water/Water_Supply/Documents/120516_CCbrochure_Web.pdf)

<sup>64</sup> For a summary, see Georgetown Climate Center, Adaptation Clearinghouse, Cal-Adapt planning tool, <http://www.adaptationclearinghouse.org/resources/cal-adapt-planning-tool.html>.

<sup>65</sup> California Energy Commission, Cal-Adapt, <http://www.cal-adapt.org/>. The site is the product of a collaboration of the California Energy Commission, the CA Natural Resources Agency, and the California Energy Commission's Public Interest Energy Research Program. In 2011, California launched Cal-Adapt, a web-based tool that allows users to see how climate is projected to change in

tools that allow users to view potential future climate-related scenarios for any California location, and to view projected climate effects including temperature, sea level rise, wildfire, and snowpack.<sup>66</sup> The state also developed the [California Adaptation Planning Guide \(APG\)](#),<sup>67</sup> which provides local planners with a step-by-step process for assessing local climate vulnerabilities and developing adaptation strategies.<sup>68</sup> In addition to providing information on how climate change can affect a community and specific sectors,<sup>69</sup> the APG presents example adaptation strategies that local planners can tailor depending on local or regional conditions.<sup>70</sup> Because climate conditions are localized and because local governments vary in terms of resources and capacity, this document is meant to allow for flexibility in the commitment of time, money, and effort to suit the needs of the community. California has also developed tools and resources to help local governments address impacts to specific sectors. For example, the Public Health Workgroup of the California Climate Action Team developed guidance for incorporating extreme heat projections into local planning and decisionmaking.<sup>71</sup> The document, [Preparing California for Extreme Heat](#), provides climate projections for increased temperature and extreme heat conditions for California, describes the health effects of extreme heat, and presents recommendations for state and local planners, local governments, emergency response, and public health and health care professionals and institutions.<sup>72</sup> The California Department of Public Health also developed the [Climate Action for Health: Integrating Public Health in Climate Action Planning](#), a guide to assist local planners and public health agencies incorporate targeted health elements into climate action plans.<sup>73</sup> The document addresses both mitigation and adaptation measures, and offers recommended priority actions and case studies to serve as model action plans. These tools and resources were necessary first steps before the state imposed mandatory climate adaptation planning requirements on local governments. California passed SB 379 in October 2015, requiring local governments to review the safety elements of their general plans and update them as necessary to include adaptation and resilience strategies appropriate in the

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local areas in California. The Cal-Adapt tool was developed by UC Berkeley's Geospatial Innovation Facility (GIF) with funding and advisory oversight by the CEC's Public Interest Energy Research (PIER) program, and advisory support from Google.org. The tool helps translate climate research from the scientific community into a format that is usable for local planning purposes. With continued funding support, the state hopes to continue to maintain and enhance Cal-Adapt so that it continues to serve as a central resource for those working on preparing for climate risks in California.

<sup>66</sup> California Natural Resources Agency, Safeguarding California, <http://resources.ca.gov/climate/safeguarding/>.

<sup>67</sup> For a summary see Georgetown Climate Center, Adaptation Clearinghouse, California Climate Adaptation Planning Guide, <http://www.adaptationclearinghouse.org/resources/california-climate-adaptation-planning-guide.html>.

<sup>68</sup> California Natural Resources Agency, California Climate Adaptation Planning Guide, [http://resources.ca.gov/climate/safeguarding/adaptation\\_policy\\_guide/](http://resources.ca.gov/climate/safeguarding/adaptation_policy_guide/); including Planning for Adaptive Communities, [http://resources.ca.gov/docs/climate/01APG\\_Planning\\_for\\_Adaptive\\_Communities.pdf](http://resources.ca.gov/docs/climate/01APG_Planning_for_Adaptive_Communities.pdf), and Identifying Adaptation Strategies, [http://resources.ca.gov/docs/climate/APG\\_Identifying\\_Adaptation\\_Strategies.pdf](http://resources.ca.gov/docs/climate/APG_Identifying_Adaptation_Strategies.pdf).

<sup>69</sup> Public Health, Socioeconomic, and Equity; Oceans and Coastal Resources; Water Management; Forest and Rangeland; Biodiversity and Habitat; Agriculture; and Infrastructure

<sup>70</sup> California Natural Resources Agency, Identifying Adaptation Strategies, [http://resources.ca.gov/docs/climate/APG\\_Identifying\\_Adaptation\\_Strategies.pdf](http://resources.ca.gov/docs/climate/APG_Identifying_Adaptation_Strategies.pdf). The document was developed by the California Natural Resources Agency and the California Emergency Management Agency with funding through the Federal Emergency Management Agency and the California Energy Commission.

<sup>71</sup> California Department of Public Health, Preparing California for Extreme Heat: Guidance and Recommendations, October 2013, [http://www.climatechange.ca.gov/climate\\_action\\_team/reports/Preparing\\_California\\_for\\_Extreme\\_Heat.pdf](http://www.climatechange.ca.gov/climate_action_team/reports/Preparing_California_for_Extreme_Heat.pdf). For a summary, see Georgetown Climate Center, Adaptation Clearinghouse, California Extreme Heat Adaptation Final Guidance, <http://www.adaptationclearinghouse.org/resources/california-extreme-heat-adaptation-final-guidance.html>.

<sup>72</sup> Id.

<sup>73</sup> California Department of Public Health, Climate Action for Health: Integrating Public Health into Climate Action Planning, February 2012, [http://www.cdph.ca.gov/programs/CCDPHP/Documents/CAPS\\_and\\_Health\\_Published3-22-12.pdf](http://www.cdph.ca.gov/programs/CCDPHP/Documents/CAPS_and_Health_Published3-22-12.pdf). For a summary, see Georgetown Climate Center, Adaptation Clearinghouse, Climate Action for Health: Integrating Public Health into Climate Action Planning, <http://www.adaptationclearinghouse.org/resources/climate-action-for-health-integrating-public-health-into-climate-action-planning.html>.

jurisdiction. In reviewing their general plan's safety element, jurisdictions are directed to assess climate change risks in their jurisdiction, and identify adaptation and resilience goals, policies, objectives, and implementation measures based on the vulnerability assessment.<sup>74</sup>

*Connecticut* developed the Connecticut Adaptation Resource Toolkit (CART). CART was developed by the Connecticut Department of Energy and Environmental Protection (DEEP) after DEEP worked with Groton, CT on a model adaptation planning process. CART provides local governments with instant access to climate change adaptation resources, including sector-specific resources for agriculture, built environment and infrastructure, education, natural resources and ecological habitats, public health and safety, and adaptation planning.<sup>75</sup> Connecticut has also supported local governments in reviewing their local ordinances and regulations to identify and remove barriers to using low-impact development (or green infrastructure) techniques in their watersheds.<sup>76</sup> By providing this technical assistance, the state enables the locals to make the necessary zoning and other changes needed to encourage the use of nature-based approaches for managing stormwater.

*Oregon's* Department of Energy hosts interactive maps of local government action on climate change in the *Oregon: Meeting the Challenge of Climate Change* web portal.<sup>77</sup> The Oregon Climate Assessment Report for the first time also provides regionally specific climate data about the state, and information about specific impacts of climate change.<sup>78</sup> The report was designed to help inform adaptation planning and strategy for all levels of government. The state provides up-to-date information on the state of beaches and shorelines along the Pacific Northwest coast and projected changes through its Oregon Beach and Shoreline Mapping and Analysis Program.<sup>79</sup> Oregon's Climate and Health Program has created several tools and data sources for the state's local public health departments to use in adaptation planning and implementation. The climate and health team created a state Climate and Health Profile Report in 2014 to (1) detail the health impacts Oregon expects from climate change, (2) identify who will be most affected by those impacts, and (3) set the stage for adaptation action.<sup>80</sup> In 2015 Oregon released a statewide Vulnerability Assessment to provide county-level assessments of populations most vulnerable to specific climate impacts.<sup>81</sup> Last, the Oregon Resilience Planning Toolkit provides specific planning and implementation resources for local public health departments to take action using the county-level data.<sup>82</sup>

In *North Carolina*, the state imposed a real estate recordation fee to raise money to support one of the most comprehensive and sophisticated floodplain map information systems in the country. Floodplain maps are important

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<sup>74</sup> Cal. Govt. Code sec. 65301(g)(4). The requirement to review and update the safety element of a local general plan takes effect upon the next time that a local jurisdiction updates its Local Hazard Mitigation Plan on or after January 1, 2017; for jurisdictions with no LHMP, the first review of the safety element must begin on or before January 1, 2022. If a city or county has adopted a LHMP or climate adaptation plan or other document that fulfills the law's requirements relating to vulnerability assessment and adaptation goals, policies, objectives, and implementation measures, then the jurisdiction may use that information (by summarizing and incorporating by reference) in its review and update of the safety element.

<sup>75</sup> Connecticut Department of Energy and Environmental Protection, Adaptation Toolkit, <http://www.ct.gov/deep/cwp/view.asp?a=4423&q=531864>.

<sup>76</sup> Connecticut Department of Energy and Environmental Protection, Municipal Outreach for Green Infrastructure and Low Impact Development, [http://www.ct.gov/deep/cwp/view.asp?a=2719&q=464958&deepNav\\_GID=1654](http://www.ct.gov/deep/cwp/view.asp?a=2719&q=464958&deepNav_GID=1654).

<sup>77</sup> Oregon Department of Energy, Climate Change in Oregon, <http://www.oregon.gov/energy/GBLWRM/pages/portal.aspx>.

<sup>78</sup> <http://library.state.or.us/repository/2010/201012011104133/summaries.pdf>

<sup>79</sup> Oregon Department of Geology and Mineral Industries, Oregon Beach and Shoreline Mapping and Analysis Program, <http://www.oregongeology.org/sub/Nanoos1/index.htm>.

<sup>80</sup> Oregon Health Authority, Public Health Division, Climate and Health Program, Oregon Climate and Health Profile Report, <http://public.health.oregon.gov/HealthyEnvironments/climatechange/Documents/oregon-climate-and-health-profile-report.pdf>.

<sup>81</sup> Oregon Health Authority, Public Health Division, Climate and Health Program, Climate Change Vulnerability Assessment, <https://public.health.oregon.gov/HealthyEnvironments/climatechange/Documents/Social-Vulnerability-Assessment.pdf>.

<sup>82</sup> Oregon Health Authority, Public Health Division, Climate and Health Program, Resilience Planning Toolkit, <https://public.health.oregon.gov/HealthyEnvironments/climatechange/Toolkit/Pages/index.aspx>.

because they are used by local governments to determine how to regulate development and how to spend flood mitigation funding. The maps produced by FEMA under the NFIP are often outdated and under-predict flood risk. To address this problem, North Carolina combined its own state resources with FEMA mapping resources to develop a Flood Risk Information System to improve the accuracy and functionality of the maps for local governments and state agencies. The system digitized the floodplain maps using high-resolution LiDAR data for the entire state, which makes the maps more accurate and easier to use. The System also includes additional data layers – including flood depth damage information. The System allows North Carolina communities to make better decisions about where to direct new development and how to invest hazard mitigation funds. However, unlike Maryland’s work, North Carolina’s current system does not include information about sea-level rise. Although the state received \$5 million from FEMA to study how sea-level rise will change the state’s flood risks in 2009, the maps have been somewhat politically controversial, however, and have not yet been made public. The sea-level rise study evaluated the state’s risk of flooding under various scenarios of potential sea-level rise (up to 1 meter) over four “time slices” through 2100, and included consideration of how flood risks would change based upon storm intensity and frequency.

*New York* is working to create a network of local governments to facilitate peer learning. The New York State Department of Environmental Conservation runs the New York Climate Smart Communities Program, a network of local governments in New York State addressing both greenhouse gas reduction and climate resilience.<sup>83</sup> The program provides tools, case studies and technical assistance to the local governments, including a Land-Use Toolkit and a Climate Smart Resilience Planning Tool. The network also provides an opportunity for those local governments to share ideas and learn from one another through both monthly webinars<sup>84</sup> and through highlighting of accomplishments among the local governments.<sup>85</sup>

The *Minnesota* GreenStep Cities program, led by the Minnesota Pollution Control Agency (MPCA) in a public-private partnership, convenes 110 Minnesota cities to share sustainability best practices, including climate adaptation.<sup>86</sup> The best practices are further broken down into specific actions the cities can take in areas such as clean air, stormwater management, and comprehensive planning.<sup>87</sup> The program provides model ordinances for a variety of topics<sup>88</sup> and convenes the cities regularly for workshops and webinars on a variety of topics.

## **8. Use funding as a “carrot” to support and encourage local adaptation planning and implementation**

To address capacity and funding challenges, some states are also encouraging local action by providing financial assistance to communities to help them assess their risks and plan for future impacts. For example, states can help local governments update floodplain ordinances and coastal regulations, apply for the Community Rating System, or redesignate growth areas.

Although Maryland is providing significant funding to support planning, the state could enhance its efforts to provide funding to leading communities to help them implement resilience projects on the ground. Concrete projects can help communities demonstrate the benefits of resilience approaches and develop models that can be replicated through the community or in other jurisdictions. Massachusetts, Connecticut, California, and others are providing grant funding for local governments to undertake studies or implementation projects in the coastal or

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<sup>83</sup> New York Department of Environmental Conservation, Climate Smart Communities, <http://www.dec.ny.gov/energy/50845.html>.

<sup>84</sup> New York Department of Environmental Conservation, Climate Smart Webinar Presentations, <http://www.dec.ny.gov/energy/84359.html>.

<sup>85</sup> New York Department of Environmental Conservation, Climate Smart Communities in the News, <http://www.dec.ny.gov/energy/89765.html>.

<sup>86</sup> Minnesota GreenStep Cities, <http://greenstep.pca.state.mn.us/index.cfm>.

<sup>87</sup> Minnesota GreenStep Cities Best Practices, <http://greenstep.pca.state.mn.us/bestPractices.cfm>.

<sup>88</sup> Minnesota GreenStep Cities, From Policy to Reality, <http://greenstep.pca.state.mn.us/modelOrdinances.cfm>.

other sectors. Maryland currently provides some coastal and green infrastructure funding, but could expand the scope to other sectors such as public health or agriculture.

**a. What Maryland is already doing**

*Maryland's CoastSmart Communities Resilience grants* provide financial and technical assistance to local governments to encourage them to incorporate coastal hazards and sea-level rise into long term strategic planning, new or modified codes and ordinances, permitting processes, education and outreach campaigns, and other programs.<sup>89</sup> The grant program also provides technical assistance in the form of guidance documents, vulnerability assessments and adaptation strategy recommendations to help local governments incorporate climate change into local planning.<sup>90</sup> For example, DNR helped Baltimore City develop a joint hazard mitigation/climate adaptation plan and associated outreach program. For the 2016 and 2017 grant years, DNR added a new "Green Infrastructure Resiliency" track to its [CoastSmart Community Resilience Grants program](#),<sup>91</sup> which awards grants for projects that use green infrastructure to address localized flooding from more frequent and intense rain events in addition to grants for coastal resilience projects. To do so, DNR combining funding sources from NOAA and EPA.

**b. Examples**

*California:* The California State Coastal Conservancy funds projects to promote adaptation efforts through their Climate Ready Program, which launched in 2013.<sup>92</sup> The programs allows local governments or private organizations interested in preparing for sea-level rise, extreme weather, rising temperatures, and other climate impacts the opportunity to apply for between \$200,000 and \$1.5 million in funding. Funding has been used for a wide range of projects including: the City of Imperial Beach's assessment and plan to address sea-level rise risks<sup>93</sup>, Los Angeles County's efforts to prepare an adaptive management plan for the 17 beaches they manage and to transform a county park into a model "green park" complete with drought-tolerant plants and nature-based stormwater management systems,<sup>94</sup> and Santa Cruz County's work to assist farmers as they respond to climate change by reducing their irrigation needs, limiting erosion, and improving soil health and resiliency to storm damage.<sup>95</sup>

*Massachusetts:* The state provides funding to coastal municipalities through its Coastal Resilience Grant Program.<sup>96</sup> This grant encourages communities to pursue nature-based flood and erosion management techniques such as living shorelines. It is open to the 78 municipalities within Massachusetts along the coastal zones. Of note, the program provides both technical and financial assistance. Over the past three years, Massachusetts analyzed the projects of grantees to better understand which tools, techniques, and on the ground actions successfully addressed

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<sup>89</sup> Maryland Department of Natural Resources, Community Resiliency Grants, <http://dnr2.maryland.gov/ccs/coastsmart/Pages/grants.aspx>. The grants are administered through Maryland's annual Coastal Zone Management Grant Fund, awarded by NOAA's Office of Ocean and Coastal Resource Management.

<sup>90</sup> Maryland Department of Natural Resources, Community Resiliency Grants, <http://dnr2.maryland.gov/ccs/coastsmart/Pages/grants.aspx>

<sup>91</sup> See Maryland's Community Resiliency Grants: 2017 Request for Proposals, available at [http://dnr2.maryland.gov/ccs/coastsmart/Documents/cs\\_RFP.pdf](http://dnr2.maryland.gov/ccs/coastsmart/Documents/cs_RFP.pdf).

<sup>92</sup> State of California Coastal Conservancy, Climate Ready Program, <http://scc.ca.gov/2013/04/24/climate-ready-program/>.

<sup>93</sup> City of Imperial Beach, Imperial Beach Sea Level Rise Study, [http://www.imperialbeachca.gov/index.asp?Type=B\\_BASIC&SEC=%7B29511BB9-06F9-4547-BA2C-DEE671BB6DAD%7D&DE=%7B5C50D03B-8511-420B-96A0-130839E3E2CA%7D](http://www.imperialbeachca.gov/index.asp?Type=B_BASIC&SEC=%7B29511BB9-06F9-4547-BA2C-DEE671BB6DAD%7D&DE=%7B5C50D03B-8511-420B-96A0-130839E3E2CA%7D).

<sup>94</sup> County of Los Angeles, Final Report: Los Angeles County Public Beach Facilities Sea Level Rise Vulnerability Assessment, [http://file.lacounty.gov/dbh/docs/cms1\\_247261.pdf](http://file.lacounty.gov/dbh/docs/cms1_247261.pdf).

<sup>95</sup> State of California Coastal Conservancy, Climate Ready Grants, <http://scc.ca.gov/climate-change/climate-ready-program/>.

<sup>96</sup> Massachusetts Executive Office of Energy and Environment, Coastal Resilience Grant Program, <http://www.mass.gov/eea/agencies/czm/program-areas/stormsmart-coasts/grants/>.

coastal storm risks. They then use those lessons to provide technical assistance to new grantees. In August 2015, Massachusetts awarded \$2.2 million in grants to 14 municipalities for their 2016 program.

## 9. Provide funding or financing to support private adaptation

Private homeowners and businesses will also need assistance increasing their resilience to the impacts of climate change. States can provide grants or create revolving loan funds to fund and finance resilience investments for private development.

### a. What Maryland is already doing

*Living Shorelines:* Maryland has also implemented an array of outreach programs to support regulatory mandates under the state's Living Shoreline Protection Act. DNR has designed and distributed a wide array of informational resources for local communities and landowners, ranging from small pamphlets to full-scale professional workshops.<sup>97</sup> DNR educates multiple stakeholder groups about living shorelines, including local government officials, contractors, and landowners. DNR also connects landowners with an array of options to finance living-shoreline projects, such as grants or low- or no-interest loans. Also, DNR oversees a number of ongoing scientific studies regarding the suitability and success of living shorelines in different regions.<sup>98</sup>

### b. Examples

*Connecticut:* In 2013, Connecticut launched Shore Up Connecticut, a low-interest loan program aimed at helping homeowners and business owners that were not eligible for federal disaster aid following Sandy retrofit buildings to be more resilient to flood impacts.<sup>99</sup> Homeowners can borrow up to \$300,000 and must agree to elevate their homes one-foot above the 500-year flood elevation. Commercial structures can either be flood-proofed or elevated. Loan recipients must also maintain flood insurance.

*Property Assessed Clean Energy (PACE):* Maryland may wish to consider expanding its existing Property Assessed Clean Energy (PACE) program to include flood-resilience retrofits. Under PACE programs, owners obtain loans to cover the upfront cost of installing energy upgrades, such as solar panels, which can make retrofits more affordable. The loans are generally secured by a lien on the property and are repaid as line items on regular property tax bills, lowering risk for public and private lenders. To create a PACE for flood resilience program, Maryland would need to revise its existing legislation. Under current law, counties are authorized to create PACE loan programs for only energy-related upgrades. Moreover, eligibility is limited to commercial properties and to residential properties with more than four dwelling units. (Md. Code Ann., Local Gov't § 1-1101, *et seq.*)

- *Florida:* Florida statutes allow localities to establish property-assessed financing programs for windstorm resilience in addition to clean energy and energy-efficiency improvements. Eligible projects include “wind-resistance improvements,” such as strengthening roof attachments; installing wind-resistant shingles, bracing, or storm shutters; and reinforcing roof-to-wall connections, among other things.<sup>100</sup> Under the Florida PACE statute, localities can finance qualifying improvements by imposing a voluntary assessment on the property.<sup>101</sup> Local governments are permitted to issue debt to fund the program and can also partner with one another to provide financing.<sup>102</sup> For-profit and non-profit organizations may administer financing

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<sup>97</sup> Bhaskar Subramanian, Maryland Department of Natural Resources, Address at the Georgetown Climate Center Webinar: Preparing for Climate Changes with Living Shorelines (March 21, 2013), available at <http://www.georgetownclimate.org/preparing-for-climate-changes-with-living-shorelines>.

<sup>98</sup> See, e.g., MARCIA BERMAN & TAMIA RUDNICKY, VIRGINIA INSTITUTE OF MARINE SCIENCE, LIVING SHORELINE SUITABILITY MODEL FOR WORCESTER COUNTY, MARYLAND (2008), available at [http://ccrm.vims.edu/publications/projreps/worcester\\_living%20shoreline\\_v2.pdf](http://ccrm.vims.edu/publications/projreps/worcester_living%20shoreline_v2.pdf).

<sup>99</sup> Shore Up Connecticut, <http://shoreupct.org/>.

<sup>100</sup> Fla. Stat. §163.08(2)(b)(3)(a)-(g).

<sup>101</sup> Fla. Stat. § 163.08(1)(b).

<sup>102</sup> Fla. Stat. § 163.08(5) and (7).

programs on localities' behalf.<sup>103</sup>

- *Virginia:* In Virginia, a commission charged with updating the state's climate-adaptation plan has recommended developing a program to allow property owners to finance flood-resilience retrofits through property tax bills. Virginia's recommended "PACE for Resilience" program would allow both commercial and residential property owners to finance resilience upgrades, such as building elevation, removable flood barriers, and utility relocation, which can help reduce flood damages and insurance premiums. The Virginia Climate Commission modeled its recommendation on San Francisco's Seismic Retrofit Program, which applies a PACE-style framework to earthquake upgrades.
- *Federal policy:* The federal government also recently moved to eliminate one of the principal barriers to widespread use of PACE for single-family residential homes by revising rules governing mortgages backed by the Federal Housing Authority (FHA), but other barriers remain. Under new guidance, properties with qualifying PACE liens are now eligible for FHA-insured purchase mortgages and refinancing. To qualify, liens must be subordinate to mortgage liens. Nevertheless, the Federal Housing Finance Agency (FHFA) remains opposed to PACE financing and continues to prohibit federal housing-support entities Fannie Mae and Freddie Mac from purchasing and securitizing mortgage secured by properties encumbered by PACE liens. This can make it more difficult to obtain financing for these properties because private lenders are often reluctant to make loans when they cannot sell the mortgages to Fannie Mae and Freddie Mac.

## 10. Require or encourage local governments to consider climate change in local plans

In addition to providing incentives, states can also promote local adaptation activity by requiring local governments include adaptation in core planning documents, such as comprehensive plans. This may require state legislation, but by doing so the state can encourage action in localities where political pressure keeps change from happening. The state could require localities to consider climate change in comprehensive plans that govern land-use decisions at the local level (as they do in California). The state could also require or encourage localities to consider climate change in other plans that drive local decisionmaking like hazard mitigation plans or local critical areas.

### a. What Maryland is already doing

*Local Hazard Mitigation Plan Guidance:* In May 2015, The Maryland Emergency Management Agency (MEMA) published a guidebook that advises local jurisdictions on core elements that should be included within their local hazard mitigation plan updates and resources they can use to meet these standards. The guide advises local governments on how to meet FEMA standards for considering risks related to sea-level rise and incorporating the concept of resilience and sustainability. It suggests local governments review DNR's CoastSmart resources, which includes the [Climate Change and Coast Smart Construction Infrastructure Siting and Design Guidelines](#) that provides criteria for what, where, and how state infrastructure decisions are made in vulnerable areas.<sup>104</sup>

*Maryland CoastSmart Community Scorecard:* Maryland also provides local governments a method for self-assessing their preparedness for coastal hazards and climate change impacts through the [CoastSmart Communities Scorecard](#).<sup>105</sup> The scorecard asks communities to consider their vulnerability to shoreline change, sea-level rise, flooding, and storm change along with their capacity to adapt to impacts and changes. The scorecard is organized into five sections: risk and vulnerability; people and property; infrastructure and critical facilities; natural resources; and societal and economic impacts. To utilize the scorecard, local governments answer questions for each section,

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<sup>103</sup> Fla. Stat. § 163.08(6).

<sup>104</sup> State of Maryland, Climate Change and *Coast Smart* Construction Infrastructure Siting and Design Guidelines (January 2014), [http://dnr2.maryland.gov/climateresilience/Documents/ClimateChange\\_CoastSmartReport013114.pdf](http://dnr2.maryland.gov/climateresilience/Documents/ClimateChange_CoastSmartReport013114.pdf).

<sup>105</sup> Maryland Department of Natural Resources, *CoastSmart* Scorecard, [http://dnr2.maryland.gov/ccs/coastsmart/Pages/cs\\_Scorecard.aspx](http://dnr2.maryland.gov/ccs/coastsmart/Pages/cs_Scorecard.aspx).



and total responses provide CoastSmart ratings. The ratings indicate how well existing planning efforts are addressing current and future weather and climate hazards.

### ***b. Examples***

*California:* In October 2015, California passed SB 379 requiring cities and counties to include climate adaptation and resilience in their local land-use plans, which local governments use to ensure that development patterns reflect larger goals such as safety or protecting natural resources.<sup>106</sup> This is an important step in mainstreaming climate adaptation into planning efforts that are already accounted for in staff time and budgets. Additionally, by mandating the consideration of climate change, California can encourage places not already active in climate adaptation to make progress. Legislation like this is easier in a state such as California that has spent years investing in technical support and resources for local governments. For example, California offers its local government's detailed planning guidance and regional risk assessments through their Adaptation Planning Guide (as described above), minimizing the work local governments must take on themselves.

*Oregon:* In Oregon, the state requires that local land use plans identify natural hazards that are subject to climate change as a way to reduce risk to people and property.<sup>107</sup>

*Virginia:* State legislation (SB 1443) in Virginia requires localities in the Hampton Roads region to consider risks from sea-level rise and recurrent flooding.<sup>108</sup> This is not statewide, but does focus mandates in an area of the state particularly prone to flooding. The state supports this mandate by stipulating that various state agencies, such as the Department of Conservation and Recreation and the Department of Emergency Management along with academic institutions provide technical assistance.

*Florida:* In March 2015, Florida passed SB1094, officially recognizing sea-level rise as a cause of flood risk in the state and requiring local governments to reduce flood risks when drafting comprehensive coastal management plans.<sup>109</sup> Florida is an example of how less restrictive legislation can eventually pave the way for more aggressive action. SB1094 was preceded by the 2011 Community Planning Act, which gave local governments the option of designating Adaptation Action Areas for areas vulnerable to climate impacts including sea-level rise and storm surge.<sup>110</sup> A number of counties, including Broward County and the City of Fort Lauderdale took advantage of this opportunity to test adaptation policies such overlay zones, land acquisition programs, and hazard mitigation program improvements.

*New York:* The New York Community Risk and Resilience Act requires local governments to update their Local Waterfront Plans to consider sea-level rise, and amends state smart growth policies to direct state investments out of vulnerable areas.<sup>111</sup>

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<sup>106</sup> California S.B. 379, <http://www.adaptationclearinghouse.org/resources/california-sb-379-land-use-general-plan-safety-element-climate>.

<sup>107</sup> Oregon Statewide Planning Goals and Guidelines, Goal 7: Areas Subject to Natural Hazards, <https://www.oregon.gov/LCD/docs/goals/goal7.pdf>.

<sup>108</sup> Virginia S.B. 1443, <http://www.adaptationclearinghouse.org/resources/virginia-sb-1443-comprehensive-plan-sea-level-rise-strategies.html>.

<sup>109</sup> Florida S.B. 1094, <http://www.adaptationclearinghouse.org/resources/florida-sb-1094-e-an-act-relating-to-the-peril-of-flood-e.html>.

<sup>110</sup> Creation of Adaptation Action Areas, <http://www.adaptationclearinghouse.org/resources/creation-of-e-adaptation-action-areas-e-in-florida-s-community>.

<sup>111</sup> <http://www.dec.ny.gov/energy/104113.html>. Community Risk and Resiliency Act, section 10.

## CROSS-CUTTING TOPICS

### 11. Ensure equity in adaptation efforts at all levels of government

Climate change will disproportionately affect populations that have less adaptive capacity (e.g., low-income, communities of color, elderly, sick). While the research community has identified this climate-equity challenge, state plans often lack specific policy recommendations for protecting vulnerable populations or ensuring that climate actions benefit those most in need. Maryland can encourage state agencies to consider addressing social vulnerability as a core element of any adaptation study, plan, investment, or program. Maryland can also encourage local governments to involve the most vulnerable community members in the process of identifying and choosing resilience solutions.

#### **a. What Maryland is already doing**

*Priorities for the Maryland Commission on Climate Change:* HB 514 identifies actions that the Commission should prioritize and delegate to working groups established under the law. One of the priorities identified in HB 514 involves addressing disproportionate impacts of climate change on low-income and vulnerable communities.

*Climate and health profile:* In April 2016, Maryland released its climate and health profile report. While this report does outline some of the health concerns that will impact low-income, minority, and other vulnerable communities, it does not explicitly look at social vulnerability as a lens for understanding climate risks, nor does it identify how public health can encourage more equitable outcomes.

*Natural Solutions for Coastal Resilience:* The state is also partnering with TNC and others to develop a tool to help prioritize investments in acquisition, restoration, and enhancement of coastal habitats for flood risk reduction benefits in the most vulnerable communities. The tool couples habitat information with data on demographic and social vulnerability (age, income, and language proficiency) to help policymakers identify priority shorelines.

*Deal Island:* The state is also working in one of its regions, on the Deal Island Peninsula, that is most physically and socioeconomically vulnerable to the impacts of sea-level rise and flooding. This region of the state is rural, includes many unincorporated communities that lack the technical capacity to do adaptation planning, and includes many socially vulnerable groups including low-income and retired residents. The peninsula houses many degraded marshes. Through the project, the state is conducting an ecological assessment of the marsh system and is creating a stakeholder network to support community engagement and collaborative learning.

*Baltimore:* The City of Baltimore is integrating adaptation and equity through a number of programs. Baltimore's *Make a Plan, Build a Kit, Help Each Other* program organizes community meetings in which residents share the risks their communities face and ways that climate change is likely to influence these risks. At these meetings, residents also make an emergency plan and build an emergency preparedness kit that they can take home with them. Baltimore's "climate ambassadors" program fosters local leadership by identifying, training, and working with residents from within communities to lead planning initiatives and to educate the public about climate change and resilience. Baltimore is also considering building "resilience hubs" in neighborhoods throughout the city in partnership with community-based organizations. These community hubs will be staging areas to distribute disaster materials and information, and will serve as meeting spaces for affected residents. Baltimore is also looking at finding ways that the centers can be used to supply meals to children who are not being fed during disasters because they typically eat lunch at school.

Additionally, Baltimore has a "Vacant to Value" program, in which the city is streamlining the process to put a property into receivership so that non-profits, developers, and homebuyers can use a suite of incentives to rehabilitate and reuse the property for community gardens and neighborhood green space, among other uses.

#### **b. Examples**

*Federal Initiatives – CDC:* The Centers for Disease Control and Prevention's (CDC) Climate Ready States and Cities Initiative (CRSCI) is supporting climate-health vulnerability assessments and programs in Oregon, Arizona, Florida, Illinois, Massachusetts, Michigan, Minnesota, New Hampshire, New York, North Carolina, Rhode Island,

Maine, Vermont, Wisconsin, and Maryland. Most of these programs are not as focused on health equity, but do address equity in some fashion. For example, Oregon integrates social vulnerability in their statewide assessment of climate and health vulnerability. Likewise, Wisconsin included data layers on poverty, educational attainment, and social isolation in their heat vulnerability index.

*California:* The California Department of Public Health has an Office of Health Equity that aims to promote the social and economic conditions that improve public health. This office has developed a Climate Change and Healthy Equity Program (CCHEP) to work on policy, adaptation planning, land use, epidemiology, environmental health, health education, and risk communication, among other topics, to ensure that California's climate programs are geared towards equitable public health outcomes. California understands that climate change will disproportionately affect certain communities, including low-income residents, people of color, and culturally/linguistically isolated communities. To address these disproportionate impacts, CCHEP provides guidance, trainings, and technical assistance to local public health departments and other state agencies to increase capacity and ensure that they understand potential disproportionate impacts. CCHEP has also supported studies on active transport and health to help justify programs and policies that encourage walking and biking. This program is supported by the Centers for Disease Control and Prevention's (CDC) Climate Ready States and Cities Initiative (CRSCI). In 2016, California also passed S.B. 1000, which will require the addition of an environmental justice element (or environmental justice goals integrated into other elements) in local general plans.<sup>112</sup> Local jurisdictions will be required to identify policies and objectives that will help reduce unique or compounded health risks in disadvantaged communities, improve civil engagement in public decisionmaking, and prioritize programs that address unique needs of disadvantaged communities.

*Washington:* [Washington's 2012 plan](#) identifies protecting vulnerable populations as one of their primary goals, but the plan focuses only on process-oriented recommendations for involving different stakeholders in the decisionmaking process and calling for further study. For example, within the section on infrastructure and the built environment, the plan calls for more reliable funding mechanisms to ensure that local governments can safeguard vulnerable populations. Similarly, within the section on public health, the plan calls for the state to work with local health organization to better understand climate risks and provide vulnerable populations with information. The Washington Department of Health has made health equity a priority in the state, and created a cross-agency Health Equity Workgroup in January 2014 to identify appropriate policy options.<sup>113</sup> The group is implementing five strategies as part of a three-year work plan. As part of this work, Washington has developed a Health Disparity Tool<sup>114</sup> to improve data collection and analysis relating to health outcomes and disparities, in order to better advance health equity.

*New York:* New York has required local governments to consider equity as they develop reconstruction plans for rebuilding after Hurricane Sandy. New York's [Guidance for Rising Community Reconstruction Plans](#)<sup>115</sup> specifically explains how vulnerable populations should be factored into risk assessments, and the state is prioritizing projects that address risks to frontline communities. Each asset is assigned a vulnerability score, which is partially determined by how difficult it would be to relocate or evacuate vulnerable populations in a hazard event. The Guidance also asks the community to analyze if current laws, regulations, and plans integrate socioeconomic and demographic risk assessments and it challenges them to specifically describe how their strategy will help vulnerable populations.

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<sup>112</sup> S.B. 1000, 2015-2016 Sess. (Cal. 2016). [https://leginfo.ca.gov/faces/billTextClient.xhtml?bill\\_id=201520160SB1000](https://leginfo.ca.gov/faces/billTextClient.xhtml?bill_id=201520160SB1000).

<sup>113</sup> Washington State Department of Health, Current Efforts to Promote Health Equity, <http://www.doh.wa.gov/CommunityandEnvironment/HealthEquity/CurrentEfforts>.

<sup>114</sup> Washington State Department of Health, Washington Tracking Network, Topic: Health Disparities, <https://fortress.wa.gov/doh/wtn/WTNIBL/>.

<sup>115</sup> For a summary, see Georgetown Climate Center, Adaptation Clearinghouse, Guidance for New York Rising Community Reconstruction Plans, <http://www.adaptationclearinghouse.org/resources/guidance-for-new-york-rising-community-reconstruction-plans.html>.

*Connecticut:* The Connecticut Department of Public Health (DPH) provides many roles to help local health departments grapple with the impacts of climate change. It created a composite index assessing unmet health needs that pulls together socioeconomic data and health outcomes indices. The resulting index shows that areas with lower socioeconomic status are disproportionately affected by negative health outcomes. These data can be used to inform local adaptation plans by identifying areas where climate change may add to existing health challenges. It also developed a [Heat Wave Guidance Document](#)<sup>116</sup> to help local health departments answer heat related questions from the public, outdoor workers, school districts, and office employees. DPH counsels local health departments on how they can play a role in key decisions on school closures or protecting workers from heat risks, without state statutes or public health codes that grant local health department regulatory authority.

*Equity initiatives at the city-level:* Cities are also making progress on climate adaptation and states can take steps to encourage local social justice focused adaptation activities. One strategy that cities have found to be especially productive is to partner with community-based organizations and to involve residents directly in planning leadership roles. For example, Cleveland is using Kresge Foundation funding to offer sub-grants to four community-based organizations to lead neighborhood-planning efforts. Additionally, they are electing 16 climate ambassadors who will receive a stipend and training to support neighborhood engagement and adaptation projects. These strategies allow cities to better reach community members who may not trust or know to reach out to public officials. The ability to pay residents and organizations for services is important for fulfilling equity goals, since it brings in people who otherwise would likely not have the resources to participate. State governments could support these kinds of activities by addressing hurdles that make it difficult for cities to issue these types of grants without private foundation support.

- *Adaptive reuse of vacant lands:* A number of cities, including Pittsburgh and Baltimore are exploring ways to reuse vacant land for parks and green infrastructure, which addresses both urban blight and increases preparedness. Technical assistance from state agencies on how to efficiently and legally acquire vacant properties and use these lots for resilience purposes could help expand these programs.
- *Local hiring policies:* Cities like New Orleans and New York City are also exploring local hire and workforce development programs that could ensure that resilience investments benefit residents and reach low-income/minority people. Maryland could explore statewide workforce development programs to train Maryland residents to better fill jobs related to growing climate-related industries, such as installing green infrastructure techniques.
- *Affordable resilient housing:* New Orleans also recognizes that they need to find ways to ensure that low-income communities have access to safe and resilient housing. Currently New Orleans is exploring using Property Assessed Clean Energy (PACE) financing to support flood mitigation retrofits, and are looking at ways to distribute resources to lower- and moderate-income homeowners that may have lower credit ratings. They are facing opposition from state leaders in implementing this program. Maryland may want to explore housing policies that would improve access to resilient housing among low-income residents.

## 12. Protect Cultural and Historic Resources

Climate change poses both physical and economic threats to historic structures and districts in Maryland. Many historic structures in Maryland were damaged or destroyed during Hurricane Isabel. Louisiana and Mississippi also faced devastating losses of historic properties during Hurricane Katrina. The challenge the state faces is how to preserve these historic resources – which provide cultural and economic benefits to communities – in the face of rising seas, increasing flood risks, and more intense storms. The challenge is both legal and economic.

Federal and state laws encourage preservation of historic structures. Federal law encourages historic preservation through Section 106 of the National Historic Preservation Act. Under the National Environmental Policy Act

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<sup>116</sup> Connecticut Department of Public Health, Fact Sheet: Providing Assistance During Heat Waves – Information for Local Health Departments (rev. Jul. 2015), available at [http://www.ct.gov/dph/lib/dph/environmental\\_health/eoha/pdf/072915\\_extreme\\_heat\\_fs\\_2010\\_final2.pdf](http://www.ct.gov/dph/lib/dph/environmental_health/eoha/pdf/072915_extreme_heat_fs_2010_final2.pdf).

(NEPA), federal agencies have to review the effect their activities will have on historic properties and mitigate impacts to the historic character of those properties. Section 106 does not prohibit modifications to structures, it just requires an assessment of impacts and that impacts be minimized. Section 106 is often triggered in the post-disaster context where federal disaster recovery dollars are being used to rebuild damaged structures.

Maryland state laws also encourage historic preservation and these requirements are primarily administered at a local level. Maryland local governments may appoint a Historic Preservation Commission, and they may establish regulations to designate, review, and approve changes to historic properties through creation of a Historic Area Overlay Zone. Historic preservation rules generally limit a property owner's ability to make "publicly visible exterior changes" to historic structures (such as elevating a structure) and these changes require approval from the local Historic Preservation Commission. The Commission may deny an application based on a list of subjective factors regarding the structure's relationship to the surrounding area, its architectural significance, the alteration's compatibility with the surrounding area, and other aesthetic factors.

To prepare for climate change, Local Historic Preservation Commissions may need help reconciling historic preservation criteria that disfavor exterior changes to historic structures with flood resilience retrofits, which often require exterior changes to enhance the structure's ability to withstand flooding. Commissions and landowners may also need guidance on how retrofits can be made in a manner that complies with historic preservation goals and is cost effective.

These physical threats posed by climate change will also be exacerbated by the economic threats posed by rising flood insurance rates. Recent reforms to the National Flood Insurance Program (NFIP) require insurance rate increases of up to 18 percent (or 25 percent for severe repetitive loss properties) on "grandfathered" properties that previously enjoyed subsidies because they were built before the NFIP requirements were in place. These reforms did not include any protections for historic properties that cannot be elevated because of local historic preservation rules and that have traditionally been exempted from local floodplain ordinances. As a result, many grandfathered properties may see substantial increases in their flood insurance rates. This may make flood insurance premiums unaffordable for owners of historic structures who may not be able to elevate their structures because of historic preservation rules. And these rate increases could threaten the economic ability of private residents to preserve and maintain these structures.

#### **a. What Maryland is already doing**

*Cultural Resources Hazard Mitigation Plan Program:* The Maryland Historic Trust is working with local communities to help them consider risks to historical sites and cultural landmarks in hazard mitigation plans. The Program assists local governments in creating hazard mitigation plans for their cultural resources.<sup>117</sup> Assistance includes trainings, model guidance, and educational materials. MHT also offers one-on-one technical assistance to aid local governments in plan development and mitigation projects.

*Annapolis and Baltimore:* Maryland could build upon the activities being pursued by local governments in the state. Both Annapolis and Baltimore are undertaking their own analyses of the risks climate change poses to historic structures and developing strategies to protect cultural resources. The City of Annapolis (with a grant from the National Trust for Preservation) is working to integrate consideration of historic resources and risks posed by sea-level rise into its local hazard mitigation plan. To do so, they are following FEMA guidelines by: (1) developing GIS maps to identify historic properties in the floodplain; (2) developing a cultural resources inventory to establish priorities based upon risk and historical significance; (3) analyzing options to reduce risks to both public and private historic resources; and (4) developing design guidelines for retrofitting structures in ways that will not compromise the historic character of the structure or district. The City of Baltimore is also working with the US Army Corps of Engineers to develop design guidelines for retrofitting historic structures to increase their resilience and the Corps

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<sup>117</sup> Department of Planning, Maryland Historical Trust, Cultural Resources Hazard Mitigation Planning Program, [https://mht.maryland.gov/grants\\_hazardmitigation.shtml](https://mht.maryland.gov/grants_hazardmitigation.shtml).

is looking at strategies that can be applied for the historic rowhouses and other building typologies that are typical to the city.

*State-level elevation guidelines:* The state is also working on state-level guidelines, similar to those developed by Mississippi after Hurricane Katrina (detailed below). This will allow the state to learn from the work that is being pursued in Annapolis and Baltimore and provide guidance to other jurisdictions throughout the state.

*Historic preservation tax credit:* The state also allows owners of historic properties to use historic preservation tax credits to rehabilitate and flood proof historic properties.

### **b. Examples**

*Mississippi:* Maryland could proactively replicate the examples of states that reformed their historic preservation rules to facilitate rebuilding after disasters. After Katrina, Mississippi used its disaster recovery funding to establish a program to elevate and rebuild residential structures. Because of the amount of historic properties in the state, the Mississippi Development Authority (MDA) set up a framework for streamlining review of applications for funding for historic properties. First, the state convened all of the relevant parties: the MDA, the State Historic Preservation Officer (SHPO), local historic preservation commissions, and the Indian tribes. Through a Programmatic Agreement these entities all agreed to a process for streamlining historic review (required under Section 106 and NEPA) and providing applicants clear and consistent criteria for ensuring that projects met historic preservation requirements. Second, the state developed [Elevation Design Guidelines](#) for the different types of historic structures in Mississippi coastal communities. Applicants that designed their projects to conform with the design guidelines could be assured that they would receive a “no adverse affects” determination from the SHPO. Third, the state provided historic preservation experts and architects to provide technical assistance and guidance to applicants. Maryland could consider developing a similar program to facilitate retrofits to historic structures that need to be addressed because of flood risks and rising flood insurance premiums.

*New York City:* After Sandy, New York City also developed strategies for retrofitting historic structures to reduce a range of climate impacts, not just sea-level rise and flooding, but also urban heat islands, stormwater flooding, and even energy efficiency improvements. NYC developed guidelines for retrofitting different typologies of building stock common to the region. The guidelines look at different methods for mitigating risks – like temporary flood protections, elevating utilities, and using different landscaping methods. They are also working with FEMA to ensure that these types of measures can qualify as partial-mitigation for purposes of setting insurance rates for these properties – even if the property cannot be elevated above the base flood elevation.

*Insurance study:* The state could also work to develop a flood insurance affordability study to examine the economic impacts of rising flood insurance rates on low- and moderate- income homeowners, as well as owners of historic properties. New York City conducted a flood insurance affordability study after Hurricane Sandy and this report is expected to be published later this year. The City of Virginia Beach has also commissioned a similar report as it develops a sea-level rise adaptation plan.

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