

Maryland's *CoastSmart* Communities Scorecard



A community self-assessment tool

This tool has been prepared by the Chesapeake & Coastal Service to provide Maryland's coastal communities with a practical method to assess their preparedness for the impacts of coastal hazards and increased future impacts due to a changing climate.





Coastal hazards in Maryland

Extending over 3,000 miles along the diverse landscapes of the Chesapeake Bay, the Coastal Bays, and the Atlantic Ocean, Maryland's shoreline is highly susceptible to coastal hazards. In Maryland, these hazards are both episodic and chronic in nature, resulting from weather events (hurricanes, nor'easters, floods, and storm surge) and long-term processes (sea-level rise, land subsidence, and erosion). Almost 70% of Maryland's shoreline experiences chronic erosion and up to 60% of some counties lie within the 100-year floodplain. The damages and impacts resulting from coastal hazards present a substantial threat to communities, infrastructure, and natural resources throughout Maryland and will only be exacerbated by climate change.

The effects of sea-level rise and the risks associated with coastal hazards are often observed at the local level, and therefore require local action. Through programs such as *CoastSmart* Communities, the State of Maryland is helping build the capacity to develop plans within communities that not only reduce future threats to our communities' safety, health, and welfare, but are typically more effective and less costly than responding reactively to coastal hazard impacts as they happen.

How vulnerable is your community to coastal hazards?

Vulnerability refers to how susceptible a natural or human system is to coastal hazards, such as shoreline change, sea-level rise, flooding, and storm surge. Vulnerability is a function of a system's **sensitivity** and its capacity to **adapt** to impacts and changes. Systems that are **sensitive** to coastal hazards are easily affected or have a disproportionately large area affected by a small change. **Adaptation** consists of actions taken to reduce the vulnerability of natural and human systems to the effects of climate change in the coastal zone.

Why a Scorecard?

With varying technical capacity and the demands placed on local planning staff, providing resources to identify and implement adaptation strategies is essential. Our goal is to help local governments determine how well they are currently positioned to plan for coastal hazard impacts through a simple, practical self-assessment. The Scorecard also provides a mechanism for planners, natural resource managers, emergency management professionals and other local officials to identify specific, realistic ways that they can prepare for these impacts by integrating coastal hazards into existing planning, management, and regulatory programs. Because each Maryland community is unique, the Scorecard is intended to identify areas that need improvement, not serve as a basis for ranking or comparing among communities.

How to use the Scorecard

The scorecard is organized into five major sections: 1) Risk and Vulnerability Assessment, 2) People and Property, 3) Infrastructure and Critical Facilities, 4) Natural Resources, and 5) Societal and Economic Impacts. Go through each section and answer the questions to the best of your ability. After each section, total up your 'yes' responses and check the *CoastSmart* ratings to see how well existing planning efforts are addressing current and future weather and climate hazards. To help determine your responses, each section has a "Where to Start" box with a list of relevant planning documents, resources, and other tools to help assess your preparedness.

What your scores can tell you

When assessing your community, it is important to look at the individual section scores to see which areas need the most improvement and where you are doing the best things. As a general guide, we've included a three-tiered scoring system for each section:

- **CoastSmart:** Scores in this rating indicate that your community is positioned to be ready, adaptive, and resilient to coastal hazards and climate change. There is, however, always room for improvement. Examine the recommendations and helpful resources provided at the end of each section to see where you may be able to do more work to make your community even more resilient.
- **On The Right Track:** To continue moving in the *CoastSmart* direction, look at your lower section scores. Study your results to identify strategies that have been successful and determine how they can be adapted to generate more "yes" answers and make your community better prepared to face coastal hazards and climate change.
- **Getting Started:** While you may only be in the beginning steps of making your community *CoastSmart*, it is important to analyze your results carefully. Focus on identifying some key actions that you can feasibly take to protect your community in the short term, while continuing to work on long-term planning and positive changes that will reduce vulnerability, minimize the cost of implementation, and make your community *CoastSmart*.

After determining your individual section scores, try to identify any strategies that have allowed your community to be more prepared in your higher scoring sections and think about how these strategies could be adapted and applied to sections with lower scores to move your community closer to *CoastSmart*.

What next? Where to go for help

For any "no" answers you provided, explore the resources listed at the end of the section for additional information and ideas. The tools, publications, and trainings described here can help your community continue moving toward being *CoastSmart*. Also, look at the **Other Resources** section at the end of the Scorecard for a list of services that the Chesapeake & Coastal Service can provide.

If you had a lot of **Getting Started** or **On the Right Track** section scores, you may want to consult with the **Chesapeake & Coastal Service (410-260-8743)** to discuss financial and technical assistance that might be available from various state and federal agencies to help your community become *CoastSmart*.



Connection with FEMA's Community Rating System (CRS)

The National Flood Insurance Program's (NFIP) Community Rating System (CRS) is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements.

Participating communities receive points based on 19 creditable activities, organized under four categories: Public Information, Flood Preparedness, Mapping and Regulations, and Flood Damage Reduction. Flood insurance premium rates are discounted to reflect the reduced flood risk resulting from the community actions meeting the goals of the CRS.

The Chesapeake & Coastal Service has developed the *CoastSmart* Communities Scorecard with CRS in mind - making connections between the elements of the Scorecard and creditable CRS activities.

The "CRS Points" boxes in each section offer a few samples of the creditable activities and point values that correspond with our Scorecard elements. The activity number and title correspond directly to those found in the 2013 CRS Coordinator's Manual. crsresources.org/manual



Assessing Risk and Vulnerability

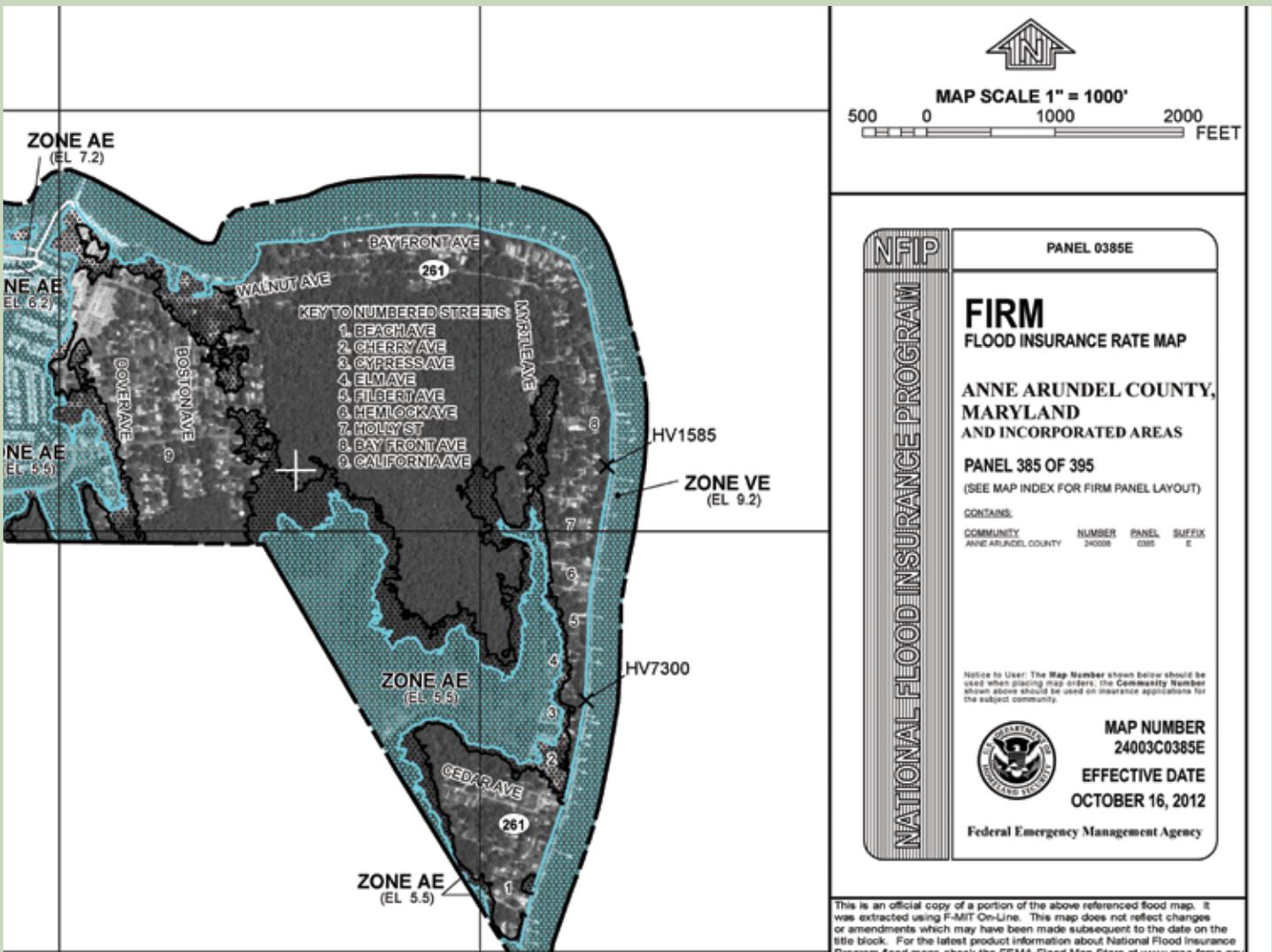
A **risk and vulnerability assessment** helps to identify people, property and resources that are at risk of injury, damage or loss from coastal hazards. This information serves as the foundation to help communities develop strategic plans and determine and prioritize the adaptation strategies that can make a community more resilient to coastal hazards in the long run. Therefore, assessing your risk and vulnerability is a crucial first step towards becoming CoastSmart.

Where to start

Consult the following resources, if available, to help complete this section:

- Map of your community
- Hurricane evacuation studies
- Digital flood insurance rate maps
- SLOSH model outputs (storm surge)
- FEMA HAZUS-MH tool
- Sea-level rise inundation maps
- Maryland Coastal Atlas Shorelines Tool
- Census data
- National Register of Historical Places
- Photos, news articles, or other data

An excerpt from an example Flood Insurance Rate Map for Anne Arundel County.



Assessing Risk and Vulnerability

Yes No

	Yes	No
1. Has your community considered the following?		
• Coastal erosion and/or shoreline change	<input type="checkbox"/>	<input type="checkbox"/>
• Sea-level rise	<input type="checkbox"/>	<input type="checkbox"/>
• Coastal flooding	<input type="checkbox"/>	<input type="checkbox"/>
• Storm surge	<input type="checkbox"/>	<input type="checkbox"/>
2. Has the past extent of the following coastal hazards been identified and mapped based on historical information, existing plans and reports, or scientific and local knowledge?		
• Coastal erosion and/or shoreline change	<input type="checkbox"/>	<input type="checkbox"/>
• Sea-level rise	<input type="checkbox"/>	<input type="checkbox"/>
• Coastal flooding	<input type="checkbox"/>	<input type="checkbox"/>
• Storm surge	<input type="checkbox"/>	<input type="checkbox"/>
3. Do any plans describe the damage and cost of previous storms, floods, or erosion?	<input type="checkbox"/>	<input type="checkbox"/>
4. Does the community track repetitive loss properties within the National Flood Insurance Program (NFIP)?	<input type="checkbox"/>	<input type="checkbox"/>
5. Have historic rates of local sea-level rise been defined through tide-gauges or research?	<input type="checkbox"/>	<input type="checkbox"/>
6. Does the community have staff trained in mapping or monitoring the following?		
• Coastal erosion and/or shoreline change	<input type="checkbox"/>	<input type="checkbox"/>
• Sea-level rise	<input type="checkbox"/>	<input type="checkbox"/>
• Coastal flooding	<input type="checkbox"/>	<input type="checkbox"/>
• Storm surge	<input type="checkbox"/>	<input type="checkbox"/>
7. Are maps or spatial data used to define the future extent of the following coastal hazards?		
• Coastal erosion and/or shoreline change	<input type="checkbox"/>	<input type="checkbox"/>
• Sea-level rise	<input type="checkbox"/>	<input type="checkbox"/>
• Coastal flooding	<input type="checkbox"/>	<input type="checkbox"/>
• Storm surge	<input type="checkbox"/>	<input type="checkbox"/>
8. Do any plans estimate future financial losses that may result from sea-level rise?	<input type="checkbox"/>	<input type="checkbox"/>
9. Have the values of properties at risk from sea-level rise been evaluated?	<input type="checkbox"/>	<input type="checkbox"/>
10. Has the community assessed the vulnerability of the following to coastal hazards through mapping or GIS?		
• Critical facilities (hospitals, fire stations, etc.)	<input type="checkbox"/>	<input type="checkbox"/>
• At-Risk Populations (elderly, low-income, disabled)	<input type="checkbox"/>	<input type="checkbox"/>
• Buildings (number and type of structures)	<input type="checkbox"/>	<input type="checkbox"/>
• Infrastructure (roads, schools, hospitals, public works, etc.)	<input type="checkbox"/>	<input type="checkbox"/>
• Natural resources (Critical Areas, unique ecosystems and habitats, etc.)	<input type="checkbox"/>	<input type="checkbox"/>
• Historical resources (historic districts, properties, landmarks)	<input type="checkbox"/>	<input type="checkbox"/>
• Cultural resources (libraries, museums, archeological)	<input type="checkbox"/>	<input type="checkbox"/>
• Economic resources (business districts, factories, tourism areas)	<input type="checkbox"/>	<input type="checkbox"/>
11. Does the community have staff trained in the use of FEMA's HAZUS-MH?	<input type="checkbox"/>	<input type="checkbox"/>
12. Have risk and vulnerability assessments been shared with these people and agencies?		
• Planning staff	<input type="checkbox"/>	<input type="checkbox"/>
• Public Works officials	<input type="checkbox"/>	<input type="checkbox"/>
• Transportation planners	<input type="checkbox"/>	<input type="checkbox"/>
• Emergency Management	<input type="checkbox"/>	<input type="checkbox"/>
• Elected officials	<input type="checkbox"/>	<input type="checkbox"/>
• General public	<input type="checkbox"/>	<input type="checkbox"/>

Total number of yes and no answers

Community Rating System (CRS) points

► **Activity 410 - Floodplain Mapping** The objective of this activity is to improve the quality of the mapping that is used to identify and regulate floodplain development (e.g. Higher study standards (HSS), using future-conditions hydrology, including sea level rise), **160 points.**

► **Activity 510 - Floodplain Management Planning** The objective of this activity is to credit the production of an overall strategy of programs, projects, and measures that will reduce the adverse impact of the hazard on the community and help meet other community needs (e.g. Repetitive loss area analysis (RLAA)), **140 points**

ASSESSING RISK AND VULNERABILITY

CoastSmart rating:

of 36

Number of Yes answers:

CoastSmart..... >25
On The Right Track..... 12-25
Getting Started..... <12



Identifying at-risk and vulnerable properties is key to helping communities become more resilient to coastal hazards.

Recommendations & resources

As much as possible, communities should take advantage of available resources and data to assess their risk and vulnerability. Often, this includes compiling a catalog of spatial data, available either at the local level or from State agencies, which then gets overlaid with hazard layers to determine vulnerable areas. A thorough inventory could include:

- Emergency response facilities and shelters.
- The locations of repetitive loss structures.
- Mapped geographic areas at risk to coastal erosion, storm surge, coastal flooding, and sea-level rise.
- The age, condition, and base flood elevations of public facilities and infrastructure such as fire departments, police and sheriff departments, communication facilities, electric utilities, and sewage and water treatment plants.
- The age, condition, and base floor elevations of private structures.
- The location and condition of residential wells and septic tanks.
- Major transportation facilities including airports, marinas, ports, bridges, traffic control facilities, mass transit facilities, evacuation routes, and maintenance facilities.
- Locations of residents in hazard-prone areas who may be vulnerable because of age, income, or disability.
- Facilities such as schools, churches, nursing/convalescent homes, correctional facilities, and mobile home parks.
- Facilities for hazardous materials storage and disposal, fuel storage, active and inactive landfills, and animal feeding and agricultural operations.
- Health-related facilities such as hospitals, clinics, emergency medical services, and Red Cross.
- The location and condition of historic districts and structures.
- Cultural and archaeological resources.

Other helpful resources

► **CoastSmart Communities Resource Center**

The Maryland Chesapeake & Coastal Service has compiled various resources for communities. Here you will find examples of vulnerability assessments that have been completed in Maryland; the Coastal Atlas, and various other publications.

dnr.maryland.gov/coastsmart/

► **Coastal Atlas**

The Coastal Atlas is an interactive mapping application with data including shoreline change, erosion rates, erosion projections, sea-level rise vulnerability based on topographic elevation (LiDAR) and storm surge from the Corps of Engineers Hurricane Evacuation Studies. The Shorelines mapping application allows state and local decision-makers to visually analyze and explore data for coastal and ocean planning activities.

dnr.maryland.gov/ccs/coastalatlasc/shorelines.asp

► **Federal Emergency Management Agency (FEMA) resources**

Among the various resources that are provided by FEMA, their second volume of How-to Guides, entitled Understanding Your Risks: Identifying Hazards and Estimating Losses, provides a series of worksheets to help communities identify what information is needed and how to use it in the analysis of natural hazards such as flooding and coastal storms. fema.gov/media-library/assets/documents/4241

Also developed by FEMA, Digital Flood Insurance Rate Maps (DFIRMs) depict the likely extent of coastal flooding associated with storms that have a 1% and 0.2% chance of occurring within any given year. Maps are accessible from either the FEMA website at msc.fema.gov or the Maryland DFIRM Outreach Program website at mdfloodmaps.com

► **National Oceanic Atmospheric Administration’s (NOAA) Roadmap for Adapting to Coastal Risk** The Roadmap for Adapting to Coastal Risk provides a participatory approach for assessing a community’s vulnerability to hazards and for incorporating relevant data and information about hazards and climate into ongoing local planning and decision-making. csc.noaa.gov/digitalcoast/training/roadmap

To learn how the Roadmap Approach may be applied to coastal inundation, visit the Inundation Toolkit for resources dedicated to coastal flooding and storm surge. csc.noaa.gov/digitalcoast/inundation/understand/

► **HAZUS-MH**

HAZUS-MH combines science, engineering, and mathematical modeling with GIS technology to estimate losses of life and property—and shows those losses on a map. This public domain software product, developed by the National Institute of Building Sciences for FEMA, estimates impacts to the physical, social, and economic vitality of a community from earthquakes, hurricane winds, and floods.

fema.gov/hazus/index.shtml

Based on the Sea, Lake, and Overland Surges from Hurricanes (SLOSH) model, hurricane evacuation studies show the potential impact of storms on populated areas and can help identify areas where precautionary measures can be taken to reduce the risks an area faces. It is important to work with people in vulnerable areas to identify potential coastal hazards and determine adaptation plans that can minimize or avoid many of the negative effects associated with climate change and severe weather.





People & Property: Land-Use Planning

Land-use planning is one of the most effective ways to reduce coastal hazard vulnerability and to build resilience within a community. How and where we decide to develop translates into who and what is, or will become, vulnerable to coastal hazards. Local decisions about allowable uses, and the support of public services and infrastructure for those uses, can have major impacts on a community's exposure. Where development has already occurred, local governments can take steps to reduce existing and future vulnerability by altering current land uses.

Where to start

Consult the following resources, if available, to help complete this section:

- Comprehensive Plan
- Water and Sewer Plan
- Floodplain Management Ordinance
- Subdivision regulations
- Records of high water marks for past floods



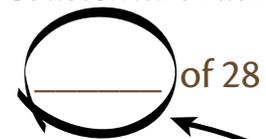
Parts of Dorchester County flood regularly during high tides.

Community Rating System (CRS) points

- ▶ **Activity 430 - Higher Regulatory Standard**
The objective of this activity is to credit regulations to protect existing and future development and natural floodplain functions that exceed the minimum criteria of the National Flood Insurance Program (NFIP) (e.g. development limitations (DL), 1,330 points, Coastal A Zones (CAZ), 650 points, protection of critical facilities (PCF), 80 points, Freeboard (FRB), 500 points).

PEOPLE & PROPERTY: LAND USE PLANNING

CoastSmart rating:



Number of Yes answers:

- CoastSmart..... >20
- On The Right Track..... 10-20
- Getting Started..... <10



Land-Use Planning		Yes	No
1.	Does your community participate in the FEMA Community Rating System?	<input type="checkbox"/>	<input type="checkbox"/>
2.	Does your community's comprehensive plan have a coastal hazard planning element or does the land use plan make recommendations to reduce coastal hazard vulnerability through planning?	<input type="checkbox"/>	<input type="checkbox"/>
	<i>If yes, does the comprehensive plan discourage development in vulnerable areas or identify specific land use tools that will be used to respond to coastal hazard threats?</i>	<input type="checkbox"/>	<input type="checkbox"/>
3.	Are frequently flooded areas zoned or planned for open space or recreation and targeted for conservation easements and acquisitions?	<input type="checkbox"/>	<input type="checkbox"/>
4.	Does the comprehensive plan recommend subdivision regulations that limit development within areas vulnerable to coastal hazards?	<input type="checkbox"/>	<input type="checkbox"/>
5.	Does the comprehensive plan recommend subdivision regulations that limit development within the floodplain?	<input type="checkbox"/>	<input type="checkbox"/>
6.	Does the comprehensive plan promote infill outside vulnerable areas?	<input type="checkbox"/>	<input type="checkbox"/>
7.	Does the Sensitive Areas Element of the comprehensive plan consider coastal hazards in its policy recommendations?	<input type="checkbox"/>	<input type="checkbox"/>
8.	Does the Water Resources Element of the comprehensive plan consider the impacts of climate change on drinking water availability?	<input type="checkbox"/>	<input type="checkbox"/>
9.	Does the community have an adopted floodplain management plan?	<input type="checkbox"/>	<input type="checkbox"/>
10.	Are planning horizons extended to incorporate potential long-term coastal hazards such as:		
	<i>Sea-level rise?</i>	<input type="checkbox"/>	<input type="checkbox"/>
	<i>Coastal erosion?</i>	<input type="checkbox"/>	<input type="checkbox"/>
	<i>Increased storm activity and severity?</i>	<input type="checkbox"/>	<input type="checkbox"/>
11.	Does the water and sewer plan include recommendations for relocation, abandonment or protection of infrastructure at risk to coastal flooding or other coastal hazards?	<input type="checkbox"/>	<input type="checkbox"/>
12.	Does the community have a certified floodplain manager (CFM®) on staff?	<input type="checkbox"/>	<input type="checkbox"/>
13.	Does your community have a floodplain manager or planner who participates in one of more of the following organizations?	<input type="checkbox"/>	<input type="checkbox"/>
	<i>Association of State Floodplain Managers (ASFPM) or Maryland Association of Floodplain and Stormwater Managers (MAFSM)?</i>		
	<i>American Planning Association (APA) or Maryland APA chapter?</i>		
	<i>American Society of Civil Engineers (ASCE) or state or local section of ASCE?</i>		
	<i>American Public Works Association?</i>		
14.	Does the community have technical or computer mapping capabilities?	<input type="checkbox"/>	<input type="checkbox"/>
15.	Has the community adopted the 2010 Maryland Building Performance Standards (MBPS)?	<input type="checkbox"/>	<input type="checkbox"/>
16.	Has the community conducted a build-out analysis using existing zoning?	<input type="checkbox"/>	<input type="checkbox"/>
	<i>Has the community evaluated the build-out analysis for vulnerability to coastal hazards?</i>	<input type="checkbox"/>	<input type="checkbox"/>
17.	Does the community require disclosure statements for vulnerable coastal properties?	<input type="checkbox"/>	<input type="checkbox"/>
18.	Does the community have a timeline or strategic plan for the relocation, abandonment or protection of buildings in areas at risk to coastal flooding or other coastal hazards?	<input type="checkbox"/>	<input type="checkbox"/>
19.	Does the community require the elevation of residential, nonresidential, and public buildings or infrastructure to be above base flood elevations, also known as freeboard, within the 100-year floodplain?	<input type="checkbox"/>	<input type="checkbox"/>
20.	Does your community require flood-proofing of residential, nonresidential, and public buildings or infrastructure within the 100-year floodplain?	<input type="checkbox"/>	<input type="checkbox"/>
21.	Does your community restrict rebuilding of structures destroyed by coastal hazards?	<input type="checkbox"/>	<input type="checkbox"/>
	<i>If rebuilding is allowed, is it required to be more resilient to coastal hazard impacts (e.g., elevated, smaller footprint, or set back from the coast)?</i>	<input type="checkbox"/>	<input type="checkbox"/>
22.	Does your community use an early flood warning system?	<input type="checkbox"/>	<input type="checkbox"/>
	<i>Do local communities have citizen action groups that alert at-risk property owners during an event; educate residents about evacuation routes and help residents get out during an event?</i>	<input type="checkbox"/>	<input type="checkbox"/>
Total number of yes and no answers			



Recommendations & resources

In Maryland, growth and development are outlined in the Local Government Comprehensive Plan, a document officially adopted by the local governing body and reviewed every six years for possible update. The comprehensive plan establishes goals and objectives that serve to tell the world how the community wants to function and look in the future. The plan has legal significance in that zoning, the provision of water and sewer resources, and other local land-use actions must be consistent with the overall comprehensive plan. For this reason, incorporating coastal hazards into local comprehensive plans is recommended and longer planning horizons that incorporate climate change should be considered.

Ways in which a community can incorporate coastal hazards into comprehensive planning include:

- Add resilience to coastal hazards in the goals and objectives section of the comprehensive plan.
- Incorporate coastal hazard data and analyses into the existing elements of a comprehensive plan, or incorporate them into a new element such as a coastal management element or a sea-level rise planning element.
- Educate and inform community leaders and the public of the community's vulnerability to coastal hazards.
- Integrate hazard mitigation policies into the comprehensive plan.
- Include maps of coastal hazards in the land use plan element and plan for and zone vulnerable areas for open space conservation or limited development.
- Incorporate a post-disaster rebuilding policy into the comprehensive plan to limit rebuilding in high-hazard areas.



Annapolis City Dock under water during a king tide.

The comprehensive plan could also include policies and recommendations for regulatory or management tools to reduce a community's vulnerability. Examples of specific land use tools to consider:

- Building code standards can be adopted that are more stringent than the minimum required.
- Zoning regulations can reduce or restrict development in vulnerable areas.
- Overlay districts can establish hazardous area overlay zones within which land use types and/or intensities can be regulated through zoning, purchase-and-sellback or leaseback strategies, and managed through capital facilities expenditure policies to avoid subsidizing development in hazardous areas.
- Subdivision Regulations can require cluster development to avoid hazards through subdivision and planned unit development regulations and/or encouraged through incentive zoning.
- Setbacks and buffers can require development to be out of hazard zones to reduce vulnerability.
- Development can be reduced through purchase or transfer of development rights.
- Land acquisition and easements can reduce the amount of development in hazardous areas through fee-simple

acquisition, purchase of development rights and easement, or transfer of development rights.

- Site design regulations and performance standards can be used to minimize a structure's vulnerability as well as avoid off-site flooding and the generation of landscape debris.
- Capital expenditure policies that prioritize funding for projects that incorporate coastal hazards.

Other helpful resources

► **Maryland Comprehensive Plans online**

The Maryland Department of Planning created a website to help the citizens of Maryland better understand the comprehensive planning process. Information on comprehensive plan requirements, procedural requirements for getting the plan adopted, and resources for citizen participation is available on the following website:

www.mdp.state.md.us/OurWork/CompPlans/Welcome.shtml

► **Adaptation Clearinghouse**

The Georgetown Climate Center has put together a website compiling resources to help communities adapt to a changing climate. One of these, the Adaptation Tool Kit, is a publication evaluating 18 different land-use tools and explains how local governments can utilize them to avoid or lessen the impacts of sea-level rise. Additionally, it provides a framework by which decision makers can begin to compare their options and decide which tools to consider given their particular local needs.

Additionally, the Georgetown Climate Center has been developing model sea-level rise overlay zone language, which could be used to designate areas with a high risk and call for additional regulatory requirements to protect areas that serve as important flooding buffers, or to designate areas appropriate for protection or retreat strategies.

georgetownclimate.org/adaptation/clearinghouse

► **EPA Rolling Easements primer**

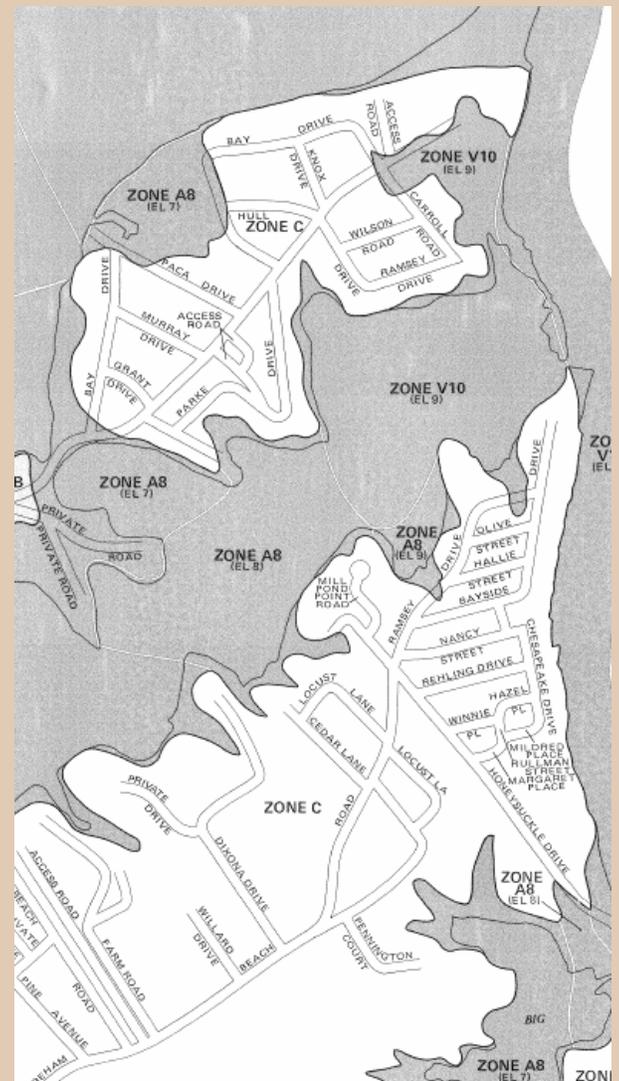
Recently published by the EPA, this primer examines rolling easements, a collection of approaches that allow beaches and wetlands to migrate inland as sea levels rise in cases where traditional protective measures, such as the construction of dikes, seawalls, and other structures, may prove economically or environmentally unsustainable.

epa.gov/cre/downloads/rollingeasementsprimer.pdf

► **Maryland State Model Floodplain Ordinance**

The State Model Floodplain Management Ordinance, developed through a coordinated effort with local communities, integrates NFIP and the State permit requirements. After the devastation of Hurricane Isabel in 2003, additional provisions to enhance floodplain management have been recommended such as coastal communities must implement a minimum two-foot freeboard (additional elevation requirement), all new and replaced HVAC units must be elevated, and all fuel storage tanks must be anchored or elevated.

mdfloodmaps.com/pdfs/MD_FPM_Model_Ordinance.pdf



The 100-year floodplain, the shaded sections in this Flood Insurance Rate Map, often has additional zoning regulations that limit how and where development can be located. These types of regulations could be used as a model for creating additional sea-level rise regulations to protect coastal development.



People & Property: All-Hazard Mitigation Planning

All-hazard mitigation planning is a process by which actions are taken to reduce or eliminate long-term risk to life and property from future hazard events. All-Hazard Mitigation Plans provide a platform for a comprehensive evaluation of the hazards a community faces, an integrated view of all the local government policies and programs that can be created to reduce those risks, and a planning process through which local officials can collaborate to identify and prioritize the most important initiatives that the community can take to reduce the risks they face.

Where to start

Consult the following resources, if available, to help complete this section:

- Local All-Hazard Mitigation Plan
- FEMA Community Rating System, in particular, Activity 510

All-Hazard Mitigation Planning		Yes	No
1.	Does your community have a current FEMA-approved All-Hazard Mitigation Plan?	<input type="checkbox"/>	<input type="checkbox"/>
2.	Does the All-Hazard Mitigation Plan describe past mitigation efforts (i.e., shoreline stabilization, land acquisition, etc.), along with their costs and effectiveness?	<input type="checkbox"/>	<input type="checkbox"/>
3.	Does the hazard mitigation plan provide a general explanation of the environmental, social, and economic consequences of failing to address coastal hazards?	<input type="checkbox"/>	<input type="checkbox"/>
4.	Has the community ever acquired repetitive loss structures? • Does the community currently work to acquire them?	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
5.	Does the plan include maps that indicate local coastal hazard risks?	<input type="checkbox"/>	<input type="checkbox"/>
6.	Does the plan identify strategies to manage the following coastal hazards as potential threats? • Coastal erosion and/or shoreline change? • Sea-level rise? • Coastal flooding? • Storm surge?	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
7.	Does the plan identify opportunities to incorporate hazard mitigation into existing planning mechanisms (e.g., land use planning, capital investments, shoreline restoration projects)?	<input type="checkbox"/>	<input type="checkbox"/>
8.	Does the plan identify the federally required update frequency (five years)?	<input type="checkbox"/>	<input type="checkbox"/>
Total number of yes and no answers			

Community Rating System (CRS) points

► **Activity 520 - Acquisition and Relocation** The objective of this activity is to encourage communities to acquire, relocate, or otherwise clear existing buildings out of the flood hazard area (e.g. acquisition and relocation of buildings; Buildings on the repetitive loss list (bRL), Severe Repetitive Loss properties (bSRL), For all elements = **2,250 points**

PEOPLE & PROPERTY: ALL-HAZARD MITIGATION PLANNING

CoastSmart rating:

of 12

Number of Yes answers:

CoastSmart >8
On The Right Track 4-8
Getting Started <4

Recommendations & resources

Hazard mitigation planning generally involves going through a process to systematically identify policies, activities, and tools that can be used to implement actions that reduces a community's vulnerability. This process has four major steps: organizing resources, assessing risks, developing a mitigation plan, and implementing the plan and monitoring progress. To better reduce a community's vulnerability to hazards, including sea-level rise, consider the following suggestions in future All-Hazard Mitigation Plan updates:

- Incorporate the full suite of coastal hazards into All-Hazard Mitigation Plans and include the potential for those hazards to worsen over time due to climate change.
- Explore opportunities to incorporate the findings of the hazard mitigation planning process into local comprehensive plans.
- Prioritize projects that use hazard mitigation funding for the acquisition and demolition of structures instead of elevating structures, except in certain limited circumstances, such as when protecting cultural or historic resources. Acquisition and demolition has the greatest mitigation and environmental protection benefits as it removes citizens from the hazard area permanently and restores the floodplain to its natural state.
- Improve the information available to citizens and planners about the dangerous reaches of high hazard dams, including estimated flood depths, velocities and times to peak flow, and investigate the potential intensification of these impacts that sea-level rise and climate change could cause.

Other helpful resources

► Maryland Emergency Management Agency (MEMA) Hazard Mitigation Program website

Numerous resources are available from MEMA's Hazard Mitigation Program website, including the State's Hazard Mitigation Plan, information on Maryland's Flood Hazard Mitigation Program, local jurisdiction support such as guidance for Local Multi-Hazard Mitigation Planning and a sample of a Local Mitigation Plan scope of work, and information on applying for multi-hazard mitigation project assistance.

memamaryland.gov/memacommunity/pages/mitigation.aspx

Hazard mitigation planning can reduce the risk to life and property from future hazard events.



BEN LONGSTAFF



People & Property: Emergency Response & Disaster Preparedness

Emergency response and disaster preparedness can ensure that people are evacuated or adequately sheltered and out of harm's way during storm events. This section assesses if and how your community has considered the effects of coastal hazards on this type of planning.

Where to start

Consult the following resources, if available, to help complete this section:

- Emergency Operations Plan

Emergency Response & Disaster Preparedness		Yes	No
1.	Does your community have first-hand experience with disaster recovery within the last 10 years?	<input type="checkbox"/>	<input type="checkbox"/>
2.	Does your community have a communication system to use before, during, and after a disaster?	<input type="checkbox"/>	<input type="checkbox"/>
3.	Has the community assessed the vulnerability of major evacuation routes to the following coastal hazards:		
	• Coastal erosion and/or shoreline change?	<input type="checkbox"/>	<input type="checkbox"/>
	• Sea-level rise?	<input type="checkbox"/>	<input type="checkbox"/>
	• Coastal flooding?	<input type="checkbox"/>	<input type="checkbox"/>
	• Storm surge?	<input type="checkbox"/>	<input type="checkbox"/>
4.	Has the community assessed the location of shelters in relation to coastal hazards, including access considerations:		
	• Coastal erosion and/or shoreline change?	<input type="checkbox"/>	<input type="checkbox"/>
	• Sea-level rise?	<input type="checkbox"/>	<input type="checkbox"/>
	• Coastal flooding?	<input type="checkbox"/>	<input type="checkbox"/>
	• Storm surge?	<input type="checkbox"/>	<input type="checkbox"/>
5.	Has the community evaluated their critical facilities, such as hospitals, fire stations, and police stations, for vulnerability to the following coastal hazards including access considerations:		
	• Coastal erosion and/or shoreline change?	<input type="checkbox"/>	<input type="checkbox"/>
	• Sea-level rise?	<input type="checkbox"/>	<input type="checkbox"/>
	• Coastal flooding?	<input type="checkbox"/>	<input type="checkbox"/>
	• Storm surge?	<input type="checkbox"/>	<input type="checkbox"/>
6.	Does the community emergency management staff participate in the community's comprehensive planning process?	<input type="checkbox"/>	<input type="checkbox"/>
Total number of yes and no answers			

Community Rating System (CRS) points

► Activity 610 - Flood Warning and Response

The objective of this activity is to encourage communities to ensure timely identification of impending flood threats, disseminate warnings to appropriate floodplain occupants, and coordinate flood response activities to reduce the threat to life and property (e.g. flood threat recognition system (FTR), 75 points; emergency warning dissemination (EWD), 75 points; flood response operations plan (FRO), 115 points; critical facilities planning (CFP), 75 points).

PEOPLE & PROPERTY: EMERGENCY RESPONSE & DISASTER PREPAREDNESS

CoastSmart rating:

of 15

Number of Yes answers:

CoastSmart..... >11
 On The Right Track..... 5-11
 Getting Started..... <5

Recommendations & resources

Evacuation and sheltering temporarily removes people from harm's way during storm events. Still, communities cannot rely only on these measures to minimize their vulnerability to coastal storms, sea-level rise and associated flooding, and should consider the following:

- Incorporate sea-level rise into the planning process for evacuation routes, shelters, and critical facilities.
- Apply for funding from the Maryland Emergency Management Agency to update critical facilities to withstand extreme weather and flooding, provide adequate shelter, and demolish vulnerable structures.
- Analyze the effects of future land use and development rates on evacuation and sheltering capacity and incorporate these findings into the comprehensive plan process.
- Integrate emergency response into comprehensive land use planning.

Other helpful resources

► Federal Emergency Management Agency (FEMA) Government Resource Center website

A variety of resources are available from FEMA to help local governments plan and prepare for disasters and emergencies including available grants, advice on conducting risk analysis and reduction, and Disaster Response and Recovery. A collection of ideas for activities, projects, and potential funding sources that can help reduce or prevent the impacts of disasters is available in the Mitigation Best Practices Portfolio.

fema.gov/plan/index.shtm



AUBREY BODINE



PETER C. MCGOWAN

Evidence of sea level inundation is visually apparent throughout low-lying coastal areas in Dorchester and Somerset Counties and is additionally documented by the loss of 13 chartered Chesapeake Bay islands that have disappeared beneath the water's surface. Pictured left is a house (circa 1888) on the Chesapeake Bay's Holland Island photographed in 1953 and 2010. The 1953 shot was taken by renowned Chesapeake Bay photographer Aubrey Bodine, and the recent photograph was taken by Peter C McGowan with U.S. Fish & Wildlife in June 2010. The house finally began to fall into the Bay after Tropical Storm Earl brushed the east coast in September 2010 and another unnamed storm took place in October 2010.



Infrastructure & Critical Facilities

Emergency response and disaster preparedness can ensure that people are evacuated or adequately sheltered and out of harm's way during storm events. This section assesses if and how your community has considered the effects of coastal hazards on this type of planning.

Where to start

Consult the following resources, if available, to help complete this section:

- Map of road network
- Comprehensive Plan (transportation & community facilities elements)
- List of critical or essential facilities





Infrastructure & Critical Facilities	Yes	No
1. Does the community have a capital improvements plan or an equivalent budgetary process?	<input type="checkbox"/>	<input type="checkbox"/>
2. Are professional planners, engineers, and/or certified floodplain managers involved in the capital improvements planning process?	<input type="checkbox"/>	<input type="checkbox"/>
3. Does the capital improvements plan identify the frequency necessary to update the plan?	<input type="checkbox"/>	<input type="checkbox"/>
4. Does your community have a detailed inventory, including elevations, of the structural components of emergency access routes (e.g., roads, bridges, and culverts)?	<input type="checkbox"/>	<input type="checkbox"/>
5. Does your community have procedures for regularly examining structural components of emergency access routes for damage?	<input type="checkbox"/>	<input type="checkbox"/>
6. Does your community have a plan for upgrading/repairing critical transportation infrastructure?	<input type="checkbox"/>	<input type="checkbox"/>
7. When critical transportation infrastructure is repaired, are the following considered to reduce future flood damages?		
• Elevating roads above predicted flood levels?	<input type="checkbox"/>	<input type="checkbox"/>
• Moving roads landward as erosion occurs?	<input type="checkbox"/>	<input type="checkbox"/>
• Incorporating future flooding and sea-level rise into culvert size and placement?	<input type="checkbox"/>	<input type="checkbox"/>
8. When upgrading existing community infrastructure, does the capital improvements plan or the community consider the impact of the following coastal hazards?		
• Coastal erosion and/or shoreline change?	<input type="checkbox"/>	<input type="checkbox"/>
• Sea-level rise?	<input type="checkbox"/>	<input type="checkbox"/>
• Coastal flooding?	<input type="checkbox"/>	<input type="checkbox"/>
• Storm surge?	<input type="checkbox"/>	<input type="checkbox"/>
9. When planning new community infrastructure, does the capital improvements plan or the community consider the impact of the following coastal hazards?		
• Coastal erosion and/or shoreline change?	<input type="checkbox"/>	<input type="checkbox"/>
• Sea-level rise?	<input type="checkbox"/>	<input type="checkbox"/>
• Coastal flooding?	<input type="checkbox"/>	<input type="checkbox"/>
• Storm surge?	<input type="checkbox"/>	<input type="checkbox"/>
10. Has the community discussed at what point it will stop upgrading existing community infrastructure to withstand increased coastal hazards and sea-level rise?	<input type="checkbox"/>	<input type="checkbox"/>
11. Are maps (or other spatial tools like GIS) used to spatially define the vulnerability of the following to coastal hazards?		
11.1 Roads		
• Coastal erosion and/or shoreline change?	<input type="checkbox"/>	<input type="checkbox"/>
• Sea-level rise?	<input type="checkbox"/>	<input type="checkbox"/>
• Coastal flooding?	<input type="checkbox"/>	<input type="checkbox"/>
• Storm surge?	<input type="checkbox"/>	<input type="checkbox"/>
11.2 Public buildings (schools, hospitals, fire stations, etc.)		
• Coastal erosion and/or shoreline change?	<input type="checkbox"/>	<input type="checkbox"/>
• Sea-level rise?	<input type="checkbox"/>	<input type="checkbox"/>
• Coastal flooding?	<input type="checkbox"/>	<input type="checkbox"/>
• Storm surge?	<input type="checkbox"/>	<input type="checkbox"/>
11.3 Public services (wastewater treatment, water distribution, power transmission, etc.)		
• Coastal erosion and/or shoreline change?	<input type="checkbox"/>	<input type="checkbox"/>
• Sea-level rise?	<input type="checkbox"/>	<input type="checkbox"/>
• Coastal flooding?	<input type="checkbox"/>	<input type="checkbox"/>
• Storm surge?	<input type="checkbox"/>	<input type="checkbox"/>

Total number of yes and no answers

Community Rating System (CRS) points

▶ **Activity 540 - Drainage System Maintenance**
 The objective of this activity is to ensure that the community keeps its channels and storage basins clear of debris so that their flood carrying and storage capacity are maintained (e.g. channel debris removal (CDR), **200 points**; Problem site maintenance (PSM), **50 points**; Capital improvements program (CIP), **70 points**; Stream dumping regulations (SDR), **30 points**; Storage basin maintenance (SBM), **120 points**; Coastal erosion protection maintenance (EPM), **100 points**).

INFRASTRUCTURE & CRITICAL FACILITIES

CoastSmart rating:

_____ of 30

Number of Yes answers:
 CoastSmart..... >21
 On The Right Track..... 10-21
 Getting Started..... <10



It is important to determine the elevations of roads and other infrastructure as they may become inaccessible and prevent access to emergency services during severe weather.

Recommendations & resources

In cases where a comprehensive plan contains a capital improvements element or a community facilities element, local governments can identify the elimination of public hazards as a criterion for evaluating capital improvement projects. Climate change and coastal hazards should be included in this evaluation to eliminate the risk of making large, risky investments in hazardous areas.

Opportunities to reduce future risk to infrastructure during capital improvements may include:

- Incorporate coastal hazards and climate change into capital improvements planning regulations.
- Evaluate current transportation networks for vulnerability to coastal hazards.
- Incorporate climate change and sea-level rise into design and engineering standards for all retrofitted or new public infrastructure including roads, power transmission, and water and wastewater networks.
- Site future public infrastructure (such as water treatment facilities) outside of vulnerable areas.
- Identify critical structures that are currently in the 100-year flood plain such as:
 - Police stations
 - Fire stations
 - Hospitals
 - Schools
 - Water-treatment plants
 - Electric transfer stations
 - Bridges

Other helpful resources

► **Model bylaw for effectively managing coastal floodplain development**

This document, written by Woods Hole Sea Grant, Cape Cod Commission, and University of Hawaii Sea Grant, contains examples of bylaw language that can be used to regulate development in coastal hazard areas and provides advice on the types of regulations that can reduce the vulnerability of a community's infrastructure.

nsgl.gso.uri.edu/hawau/hawauto9001.pdf

► **Sea-level Rise: Technical Guidance for Dorchester County**

With funding awarded through the *CoastSmart* Communities Grant, Dorchester County created this document to guide the development of the county's sea-level rise response. The document addresses recommendations for the county when planning for the long-term implications of sea level rise in four areas: Vulnerability and Impact Assessment; Long-Range and Comprehensive Planning; Codes, Regulations and Development Standards; and Public Education and Outreach. The guidance is presented in a manner intended to allow readers to understand how sea-level rise may affect the daily functioning of the county,



Natural Resources

Maryland's natural resources provide protection and buffering from the impacts of coastal hazards in the form of natural drainage ways, floodplains, wetlands, beaches, and dunes. In the past, development has altered or destroyed many of these natural protective features and significantly reduced the ability of the land to absorb coastal hazard impacts. Furthermore, as sea level rises, critical ecosystems and habitats, such as wetlands, may migrate into upland areas and potentially affect current or proposed development.

Where to start

Consult the following resources, if available, to help complete this section:

- Comprehensive Plan (sensitive areas element)
- Local Critical Area program

Tidal salt marshes such as these are at risk of erosion from sea-level rise.



JANE THOMAS



Natural Resources		Yes	No
1.	Are potential conservation land acquisitions or easements assessed for their vulnerability to coastal hazards?	<input type="checkbox"/>	<input type="checkbox"/>
2.	Are potential conservation land acquisitions or easements assessed for their natural protective properties, such as storm surge buffer, flood water management, and erosion control?	<input type="checkbox"/>	<input type="checkbox"/>
3.	Are potential conservation land acquisitions or easements assessed for their ability to provide long-term suitable habitat?	<input type="checkbox"/>	<input type="checkbox"/>
4.	Do conservation land acquisition or easement programs within your community direct funding to areas designated as the most ecologically valuable land, such as those identified in Maryland GreenPrint?	<input type="checkbox"/>	<input type="checkbox"/>
4.1	Has any assessment been conducted to determine the future extent of these ecologically valuable areas within the community, such as the Sea Level Affecting Marshes Model (SLAMM)?	<input type="checkbox"/>	<input type="checkbox"/>
5.	Does the County Land Preservation, Parks, and Recreation Plan:		
5.1	Address open space conservation as a way to minimize the effect of coastal hazards?	<input type="checkbox"/>	<input type="checkbox"/>
5.2	Get updated in coordination with the comprehensive plan or on a regular schedule?	<input type="checkbox"/>	<input type="checkbox"/>
6.	Is public open space maintained in a manner that provides protection from coastal hazards?	<input type="checkbox"/>	<input type="checkbox"/>
7.	Does the community comprehensive plan designate areas requiring special protection (such as wetlands, beaches, and floodplains)?	<input type="checkbox"/>	<input type="checkbox"/>
8.	Does the sensitive areas element of the comprehensive plan include coastal hazards and climate change or does the comprehensive plan have a sea-level rise planning element that addresses potential changes in sensitive areas?	<input type="checkbox"/>	<input type="checkbox"/>
9.	Does the community consider the following threats in their Critical Area, Sensitive Area or open space planning processes?		
	• Coastal storms on shorelines?	<input type="checkbox"/>	<input type="checkbox"/>
	• Erosion on shorelines?	<input type="checkbox"/>	<input type="checkbox"/>
	• Sea-level rise on shorelines and wetlands?	<input type="checkbox"/>	<input type="checkbox"/>
	• Coastal hazards on wildlife and habitat?	<input type="checkbox"/>	<input type="checkbox"/>
10.	Does the community have local ordinances to protect any of the following from development or disturbance?	<input type="checkbox"/>	<input type="checkbox"/>
	• Dunes?		
	• Bluffs?		
	• Eroding cliffs?		
	• Wetlands?		
	• Beaches?		
11.	Does the Water Resources Element in the comprehensive plan consider the impacts of coastal hazards (e.g., salt water intrusion) on the availability of freshwater for drinking water and living resources?	<input type="checkbox"/>	<input type="checkbox"/>
12.	Does the community have protective measures in place for aquifer recharge areas, including wells, springs, seeps, lakes, and headwaters?	<input type="checkbox"/>	<input type="checkbox"/>
Total number of yes and no answers			

Community Rating System (CRS) points

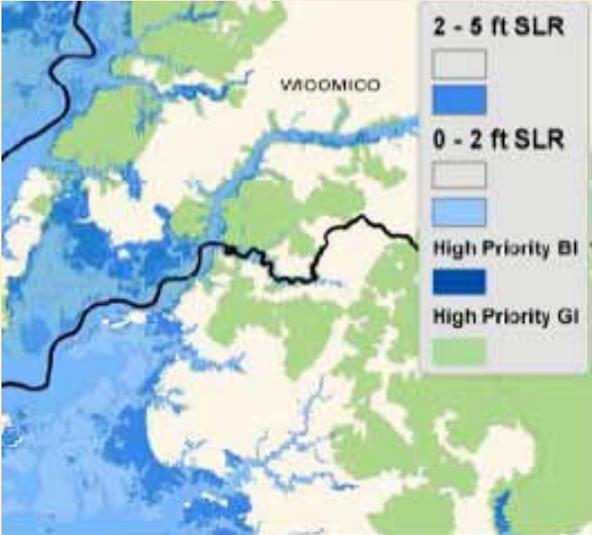
► **Activity 420 - Open Space Preservation**
 The objectives of this activity are to: (1) Prevent flood damage by keeping flood-prone lands free of development, and (2) Protect and enhance the natural functions of floodplains (e.g. special flood-related hazards open space (SHOS), **50 points**; deed restrictions (DR), **50 points**; natural functions open space (NFOS), **170 points**; open space incentives (OSI), **250 points**).

NATURAL RESOURCES

CoastSmart rating:

 of 17

Number of Yes answers:
 CoastSmart..... >12
 On The Right Track..... 6-12
 Getting Started..... <6



Incorporating coastal hazards into land conservation planning can help ensure that protected land will provide vital ecosystem services, including buffering extreme weather, well into the future.

Recommendations & resources

Natural buffers may provide the best and most resilient solutions to rising sea levels and coastal hazards. Leaving natural systems in place and allowing them the opportunity to migrate, when possible, will offer much better results than attempting to recreate or restore them after a disturbance or in another location. To better plan for how natural resources will transform and be allowed to adapt to climate change, consider the following actions:

- Adopt policies and land development regulations designed to protect natural features such as dunes, bluffs, wetlands, beaches, etc.
- Identify opportunities to restore, enhance, or supplement natural protective features.
- Adopt land use regulations that require expanded setbacks to protect buffer areas around the margins of natural protective features, such as extending the Critical Area buffers around waterways and wetlands beyond the 100-foot minimum.
- Utilize acquisitions and easements to protect the integrity of natural protective features and support open space conservation to reduce the vulnerability of adjacent infrastructure.
- Identify areas with a high conservation potential and strategically and cost-effectively direct protection and restoration activities and funding towards them.
- Prioritize and target protection and restoration activities that enhance the ability of coastal ecosystems to provide natural buffers, flood control, storm surge protection, and reduce the vulnerability of coastal communities.

Other helpful resources

► Climate Change Impact Area Mapper

An online tool provided by the Maryland Department of Natural Resources for management decision-making, planning and education purposes. The Climate Change Impact Area Mapper brings together multiple data layers from different sources to illustrate land areas in Maryland that are projected to be the most sensitive to anticipated changes in climate. The layers include areas vulnerable to sea-level rise, storm surge, flooding, drought, and rising temperatures. Climate Change Impact Areas are one of Plan Maryland's five Preservation/Conservation overlays. Communities should include an analysis of the CCIA mapping layers in the process of designating Plan Maryland Place Designations.

dnr.maryland.gov/climatechange/mapper.asp

An analysis of applicable CCIA overlays should also be included in Sustainable Communities designation applications submitted to the Maryland Department of Housing and Community Development. For more information, see the Summary for Planning Area Guidelines available at:

plan.maryland.gov/PDF/implementPlan/ClimateChangeImpactAreas.pdf

► **Maryland GreenPrint**

Developed by the State of Maryland, GreenPrint is a web-based tool showing the relative ecological importance of every parcel of land in the State. This map, updated periodically with new information, shows areas already protected in the state and areas in which Maryland will focus future conservation efforts. These new areas, called Targeted Ecological Areas (TEAs), include large blocks of forests and wetlands, rare species habitats, aquatic biodiversity hotspots, and areas important for protecting water quality. They are identified by Maryland Department of Natural Resources as the most ecologically valuable areas in the State and are preferred for conservation funding through Program Open Space. Soon, GreenPrint will begin to include coastal blue infrastructure priorities and areas important for wetland sea level rise adaptation to help inform management decisions. To find out more about the GreenPrint Map and to view its data, visit: greenprint.maryland.gov.

► **Synthesis of adaptation options for coastal areas**

The Climate Ready Estuaries Program within the EPA has developed this document to provide a brief introduction to key physical impacts of climate change on estuaries and a review of on-the-ground adaptation options available to coastal managers to reduce their systems' vulnerability to climate change impacts. The majority of management goals discussed in this report pertain to the maintenance and restoration of natural systems and each section provides specific examples of measures undertaken by states or localities.

epa.gov/climatechange/impacts-adaptation/northeast.html

► **Coastal Habitats and Sea-level Rise webpage**

The Chesapeake & Coastal Service has been working on a project to help the state target high priority coastal habitats that provide adaptation benefits to the projected impacts of climate change. Through this project new criteria are being developed to target lands that have a high likelihood of providing exceptional buffers, habitat or other environmental benefits to help Maryland adaptively and proactively respond to sea-level rise, increased storm events, temperature and precipitation changes from climate change. These data layers, as well as other natural resources data, are available through the Coastal Atlas. To find out more about the Chesapeake & Coastal Service's efforts to determine the future extent of coastal habitats, visit:

dnr.maryland.gov/ccs/habitats_slr.asp.



Restoring natural buffers and allowing them to migrate into upland areas will provide valuable ecosystem services such as filtering runoff and providing habitat for a number of species. In addition, they will also reduce the impact of many coastal hazards on the land behind them.



BHASKARAN SUBRAMANIAN



Economy & Society

Coastal hazards and climate change will affect local communities, businesses, and culturally important areas. This section will help identify social and economic resources in a community that may be vulnerable to coastal hazards and identify any social groups that may provide support in identifying at-risk populations or implementing solutions in areas that will need increased attention.

Where to start

Consult the following resources, if available, to help complete this section:

- Comprehensive Plan
- FEMA's HAZUS-MH tool

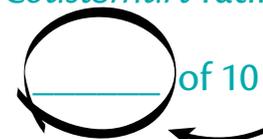
Economy & society		Yes	No
1. Has the community mapped the vulnerability to coastal hazards of the following?		<input type="checkbox"/>	<input type="checkbox"/>
• At-risk populations (elderly, low-income, disabilities, etc.)?		<input type="checkbox"/>	<input type="checkbox"/>
• Historical resources (historic district, properties, landmarks)?		<input type="checkbox"/>	<input type="checkbox"/>
• Cultural resources (libraries, museums, archeological sites)?		<input type="checkbox"/>	<input type="checkbox"/>
• Economic resources (business districts, factories, tourism, working waterfronts)?		<input type="checkbox"/>	<input type="checkbox"/>
2. Does the county or municipality have an economic development plan or strategy?		<input type="checkbox"/>	<input type="checkbox"/>
2.1 Does the plan identify economic vulnerabilities due to coastal hazards?		<input type="checkbox"/>	<input type="checkbox"/>
3. Is the community's economic base diversified?		<input type="checkbox"/>	<input type="checkbox"/>
4. Do any plans or studies describe the cost of damages from previous storms, floods, erosion, or the economic loss due to closures during events and the recovery process?		<input type="checkbox"/>	<input type="checkbox"/>
5. Do any plans or studies estimate future financial losses that may result from sea-level rise?		<input type="checkbox"/>	<input type="checkbox"/>
6. Do any of these social systems strongly define your community's identity?		<input type="checkbox"/>	<input type="checkbox"/>
• Faith-based networks?			
• Cultural heritage/historic districts?			
• Neighborhood associations?			
• Business-related networks?			
• Civic organizations (Kiwanis Club, Rotary Club, etc.)?			
• Universities or colleges?			
Total number of yes and no answers			

Community Rating System (CRS) points

- ▶ **Activity 320 - Map Information Service**
The objective of this activity is to provide inquirers with information about the local flood hazard and about flood-prone areas that need special protection because of their natural functions (e.g. problems not shown on the FIRM, **20 points**; special flood-related hazards, **20 points**; historical flood information, **20 points**).

ECONOMY & SOCIETY

CoastSmart rating:



Number of Yes answers:

CoastSmart.....>7
On The Right Track..... 4-7
Getting Started.....<4

Recommendations & resources

In many cases the economic and societal consequences of coastal hazards will last long after the physical effects have subsided or been remedied. Decreased revenue and difficulties attracting visitors back to an area can last for years after an area is affected while cultural and historical resources may never be recovered. To reduce the long-term cost of climate change and coastal hazards, the following can be considered during the planning process:

- Identify areas that will be affected by sea-level rise and other coastal hazards that have a high socio-economic vulnerability including:
 - Low income populations.
 - Concentrations of the elderly or individuals who have disabilities, such as an assisted care facility.
 - Businesses that provide a majority of the jobs or disproportionately support a community's economy.
 - Working waterfronts that support the local economy.
 - Historic districts and other cultural resources that help to define a community.
 - Tourism destinations that draw people to a community.
- Identify social groups that can help build support within the community and engage their leaders to identify and help address the concerns and needs of community members.

Other helpful resources

► **A Social Vulnerability Index for Disaster Management**

This paper describes the development of a Social Vulnerability Index (svi), from 15 census variables at the census tract level, for use in emergency management. It also examines the potential value of the svi by exploring the impact of Hurricane Katrina on local populations. The methodology used in this study could be used at a finer scale with local data to help identify socially vulnerable populations. For information, visit: webra.cas.sc.edu/hvri/products/sovi.aspx.

► **Sea Level Rise Strategic Plan Anne Arundel County, Phase I Report: Vulnerability Assessment and Final Plan**

This *CoastSmart* Communities Grant project identified areas of Anne Arundel County that are susceptible to sea-level rise and developed an inventory of community resources at risk. The county is using this inventory to help inform decisions on how to incorporate climate change into all aspects of the county's management. Visit: dnr.maryland.gov/CoastSmart/pdfs/AASLRStrategicPlan.pdf. The county's Sea Level Rise Strategic Plan discusses the key findings from the vulnerability assessment and other planning analysis; identifies the major planning issues for Anne Arundel County as related to sea level rise; and recommends future actions to protect resources and minimize impacts. Visit: dnr.maryland.gov/CoastSmart/pdfs/AASLRStrategicPlan_final.pdf.

► **Integrating Historic Property & Cultural Resource Considerations into Hazard Mitigation Planning**

This publication developed by FEMA shows communities, step by step, how to develop and then implement a pre-disaster planning strategy for their historic properties and cultural resources. Too often communities recognize the importance of their historic properties and cultural resources only after disaster strikes and these assets have been damaged or even destroyed. This guide should provide community planners with the tools and resources they need to consider historic properties in mitigation planning activities. Visit: fema.gov/environmental-planning-and-historic-preservation-program/integrating-historic-property-cultural.

► **Coastal County Snapshots**

Developed by the NOAA Coastal Services Center, Coastal County Snapshots turn complex data into easy-to-understand stories, complete with charts and graphs. Local officials can use snapshot information to learn about their communities and handouts generated by the website can be a helpful educational tool when working with governing bodies and citizen groups. csc.noaa.gov/snapshots



Flooding during storms can have a disproportionate effect on some populations, economic centers, and cultural resources. Many business districts and historic areas around the Chesapeake Bay are only a few feet above sea level, making them particularly susceptible to coastal flooding. Proactively adapting these vulnerable areas to higher water levels can avoid lengthy and costly recovery efforts, reducing the long-term impact to a community's economy and cultural identity.



Results

Look at how your different section scores compare to each other and recognize specific sections that get a high score and ones that may need more work. Try to identify any strategies that have allowed your community to be more prepared in your better sections and think about how those strategies could be adapted and applied to sections with weaker scores to move your community closer to becoming *CoastSmart*.

ASSESSING RISK AND VULNERABILITY

CoastSmart rating: _____ of 36

Number of Yes answers:

CoastSmart >25
On The Right Track 12-25
Getting Started <12

PEOPLE & PROPERTY: LAND USE PLANNING

CoastSmart rating: _____ of 28

Number of Yes answers:

CoastSmart >20
On The Right Track 10-20
Getting Started <10

PEOPLE & PROPERTY: ALL-HAZARD MITIGATION PLANNING

CoastSmart rating: _____ of 12

Number of Yes answers:

CoastSmart >8
On The Right Track 4-8
Getting Started <4

PEOPLE & PROPERTY: EMERGENCY RESPONSE AND DISASTER PREPAREDNESS

CoastSmart rating: _____ of 15

Number of Yes answers:

CoastSmart >11
On The Right Track 5-11
Getting Started <5



INFRASTRUCTURE & CRITICAL FACILITIES

CoastSmart rating: _____ of 30

Number of Yes answers:

- CoastSmart.....>21
- On The Right Track..... 10–21
- Getting Started.....<10

NATURAL RESOURCES

CoastSmart rating: _____ of 17

Number of Yes answers:

- CoastSmart.....>12
- On The Right Track..... 6–12
- Getting Started..... <6

ECONOMY & SOCIETY

CoastSmart rating: _____ of 10

Number of Yes answers:

- CoastSmart..... >7
- On The Right Track.....4–7
- Getting Started..... <4

Count the number of sections with each rating to determine your overall preparedness:

CoastSmart _____

On The Right Track _____

Getting Started _____



Additional resources

When adopting programs or updating regulations to incorporate climate change and coastal hazards into local planning, consider consulting with the Chesapeake & Coastal Service, Maryland Department of Planning, Maryland Department of the Environment, and the Maryland Emergency Management Agency to identify funding opportunities and technical assistance that may be available to your community. There are also a number of online resources and services discussed in each section of the scorecard that can help your community plan for a changing climate that are available free of charge from the Chesapeake & Coastal Service, other Maryland State Agencies, the Federal Emergency Management Agency, and NOAA's Coastal Services Center. The following resources can also provide your community with valuable information related to all of the sections discussed in the Scorecard.

Chesapeake & Coastal Service

► **CoastSmart Communities Resource Center:**

The *CoastSmart* Communities Resource Center has been developed by the Chesapeake & Coastal Service to help businesses, communities and local governments access available products and services to address the risks associated with coastal hazards and sea-level rise such as shoreline erosion, the economic cost of sea-level rise, county-level technical and response guidance, and state-level strategies for adapting to climate change. Here you will find existing project documents, web-based planning tools, storm surge inundation and sea-level rise maps, training programs, and staff resources. These documents and tools are intended to provide communities with successful examples of incorporating climate change into local planning to serve as guidance when addressing the long-term impacts of sea-level rise and climate change in the coastal zone. dnr.maryland.gov/coastsmart

► **Maryland's Coastal Atlas**

The Coastal Atlas is an online mapping and planning tool that allows state and local decision-makers to visually analyze and explore data for coastal and ocean planning activities. The Shorelines application allows users to access state shoreline erosion data, visualize coastal inundation from storms and identify areas at risk to sea-level rise, making it extremely useful in conducting risk and vulnerability assessments. For more information on how to use the Coastal Atlas, view the Introduction Video and complete the exercises in the Training Manual on the Coastal Atlas website: dnr.maryland.gov/ccs/coastalatlantis/index.asp

► **CoastSmart Communities Grants**

This competitive grant program provides financial and technical assistance to local governments to incorporate natural resource and/or coastal management issues into local planning and permitting activities. The program seeks proposals for projects that are aligned with the strategic objectives of Maryland's Chesapeake & Coastal Service and foster innovative coastal management through scientifically sound initiatives that:

- Ensure that coastal communities are protected from coastal hazards and the impacts of climate change.
- Work to ensure coastal and ocean waters meet living resource and human needs.
- Serve to enhance the protection and management of Maryland's coastal resources.

Funding will be provided on an annual basis.

dnr.maryland.gov/coastsmart

► **Trainings and Technical Assistance**

Offered through the Coastal Training Program and the Chesapeake & Coastal Service, these trainings can provide community leaders and decision makers with the knowledge and skills needed to incorporate coastal hazards, sea-level rise, and climate change into local policies and planning.

coastaltraining-md.org

Other resources



► **Comprehensive Strategy for Reducing Maryland's Vulnerability to Climate Change. Phase I: Sea-level rise and Coastal Storms**

This report was created by the Maryland Commission on Climate Change Adaptation and Response Working Group and outlines specific policy recommendations for reducing the vulnerability of the state's natural and cultural resources and communities to the impacts of climate change. Within this document there are a number of suggestions of how to incorporate climate change into local planning that range from economic policies to building regulations to land-use planning. Many of the other resources and plans developed through the Chesapeake & Coastal Service are based on this report. dnr.maryland.gov/CoastSmart/pdfs/Comprehensive_Strategy.pdf

► **Maryland's Greenhouse Gas Reduction Plan, Chapter 8: Adaptation**

Maryland's Climate Action Plan includes two climate change adaptation strategies that are currently being used to guide state-level adaptation planning efforts. Phase I and the second strategy (Phase II), released in 2011 as a compendium to the Climate Action Plan, addresses changes in precipitation patterns and increased temperature and the likely impacts to human health, agriculture, forest and terrestrial ecosystems, bay and aquatic environments, water resources, and population growth and infrastructure. The strategies provide the basis for guiding and prioritizing state-level activities with respect to both climate science and adaptation policy over the near and longer terms. This chapter provides summaries of Maryland's Phase I and II adaptation strategies, including current and planned near-term implementation efforts. climatechange.maryland.gov/site/assets/files/1454/chap8_adaptation_final_lowres.pdf

► **FEMA Community Rating System**

The National Flood Insurance Program's (NFIP) Community Rating System (CRS) is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. Participating communities receive points based on 19 creditable activities, organized under four categories: Public Information, Flood Preparedness, Mapping and Regulations, and Flood Damage Reduction. Flood insurance premium rates are discounted to reflect the reduced flood risk resulting from the community actions meeting the goals of the CRS. The 2013 CRS Coordinator's Manual can be found at: crsresources.org/

► **Updating Maryland's Sea-Level Rise Projections**

"The Free State" is one of the most vulnerable to sea-level rise. Historically, Marylanders have long had to contend with rising water levels along the Chesapeake Bay, Atlantic Ocean, and Coastal Bay shores. Shorelines have eroded and low-relief lands and islands (some previously inhabited) have been inundated. Prior to the 20th century, this was largely due to the slow sinking of the land since the Earth's crust is still adjusting to the melting of large masses of ice following the last glacial period. Over the 20th century, however, relative sea-level rise (how much the average level of tidal waters has risen with respect to land) has increased, at least partially as a result of global warming. Written by the Scientific and Technical Working Group of the Maryland Climate Change Commission, this report interprets recent scientific results to produce projections useful for sea-level rise adaptation in Maryland. climatechange.maryland.gov/publications/updating-marylands-sea-level-rise-projections/

► **A Framework for Considering Climate Change in Transportation and Land Use Scenario Planning**

This report details a project conducted in Cape Cod and provides a framework for agencies at all levels to use scenario planning to assess, mitigate, and adapt to sea-level rise and other potential climate change effects and impacts in transportation and land use planning. volpe.dot.gov/coi/ppoa/publiclands/projects/interagencyproject.html



Definitions used in this document

Adaptation – Adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities.

All-Hazard Mitigation Plan – Mitigation plans identify the natural hazards that impact communities, identify actions to reduce losses from those hazards, and establish a coordinated process to implement the plan. (44 CFR §201.1(b)).

Base flood – The flood having a one-percent chance of being equaled or exceeded in any given year; the base flood also is referred to as the 1-percent annual chance (100-year) flood. The 100-year flood is used by the National Flood Insurance Program (NFIP) as the standard for floodplain management and to determine the need for flood insurance.

Base Flood Elevation (BFE) – The water surface elevation of the base flood in relation to the datum specified on the community's Flood Insurance Rate Map. In areas of shallow flooding, the base flood elevation is the highest adjacent natural grade elevation plus the depth number specified in feet on the Flood Insurance Rate Map, or at least four (4) feet if the depth number is not specified.

Critical Area – The Critical Area law (1984) identifies the "Critical Area" as all land within 1,000 feet of the Mean High Water Line of tidal waters or the landward edge of tidal wetlands and all waters of and lands under the Maryland Chesapeake Bay and its tributaries and coastal bays.

Coastal hazard risk – The level of threat to people or what people value that is associated with the occurrence of a natural hazard. This risk can be escalated or reduced by human activity.

Coastal flooding – Prolonged strong onshore flow of wind and/or high astronomical tides causing a rise in sea level that floods coastal areas.

Comprehensive plan – A planning document, officially adopted by the local governing body, which spells out the manner in which a municipality, county or sub-area of a county must develop.

Easements – A right of use over the property of another.

Erosion – The process of wearing away of land by the action of water, ice, or wind.

Floodplain – The area on the sides of a stream, river, or watercourse that is subject to periodic flooding. The extent of the floodplain is dependent on soil type, topography, and water flow characteristics. Often synonymous with 100-year floodplain and is the land area susceptible to being inundated by coastal or riverine waters with a 1 percent chance of being equaled or exceeded in any given year.

Floodplain management – The operation of an overall program of corrective and preventative measures for reducing flood damage, including but not limited to emergency preparedness plans, flood control works and flood plain management regulations.

Floodplain Management Plan – State or local regulation which provides standards for the purpose of flood damage prevention and reduction.

Freeboard – A factor of safety in the National Flood Insurance Program (NFIP), usually expressed in feet above a flood level, for the purposes of floodplain management.

HAZUS – A software program, created by FEMA, that estimates loss using information about building stock, local geology and bathymetry/topography, economic data, and other information to estimate losses from potential hazards.

Hurricane Evacuation Study – These studies look at the vulnerability of a population to hurricane threats and give guidance to local emergency managers planning an evacuation of the community.

Hazard mitigation – Any sustained action taken to reduce or eliminate the long-term risk to human life and property from hazards (44 CFR 201.2). Hazard mitigation activities may be implemented prior to, during, or after an event. However, it has been demonstrated that hazard mitigation is most effective when based on an inclusive, comprehensive, long-term plan that is developed before a disaster occurs.

Inundation – The act of covering with water, either permanently or temporarily.

Land use – The manner land is developed and used in terms of the types of activities allowed (agriculture, residences, industries, etc.) and the size of buildings and structures permitted.

LIDAR – Light Detection And Ranging (LIDAR) is a new technology that uses lasers to measure the elevation of the ground and provides the greatest possible detail of elevations. LIDAR determines distance to an object or surface using laser pulses.

Definitions used in this document



Living shorelines – A shoreline restoration and protection concept that emphasizes the use of natural materials including marsh plantings, shrubs and trees, low profile breakwaters/sills, strategically placed organic material, and other techniques that recreate the natural functions of a shoreline ecosystem.

Mitigate – The act of removing threats to life or property or impacts.

Overlay districts – An overlay zone is a zoning district which is applied over one or more previously established zoning districts, establishing additional or stricter standards and criteria for covered properties in addition to those of the underlying zoning district.

Repetitive loss – Properties/structures/businesses that have had received two or more claim payments of more than \$1,000 from the National Flood Insurance Program within any rolling 10-year period for the home or business, or property.

Restoration – The act of repairing damage to a site caused by human activity, industry or natural disasters. The ideal environmental restoration, though rarely achieved, is to restore the site as closely as possible to its natural condition before it was disturbed.

Resilience – The ability of a system to respond and recover from disasters.

Riverine flooding – Flooding that is the result of creeks and rivers leaving their banks as a result of a heavy rainfall. This is the flooding that is mapped on the Flood Insurance Rate Maps.

Sea-level rise – Increase in the volume of the world's oceans due to expansion as the oceans warm and to the melting of land-based ice (i.e., glaciers, ice sheets).

Sensitive Areas Element – An element of a local Comprehensive Land Use Plan “that contains goals, objectives, principles, policies, and standards designed to protect, from adverse effects of development, sensitive areas, including the following: 1) streams and their buffers; 2) 100-year floodplains; 3) habitats of threatened and endangered species, and 4) steep slopes.” (Codified at Section 3.05(a)(1)(viii), Article 66B, Annotated Code of Maryland).

Setbacks – The minimum allowable horizontal distance from a given point or line of reference, such as a street right-of-way or property line, to the nearest point of a foundation or supporting post or pillar of any applicable structure.

Shoreline stabilization – A stabilization method used as part of a project or as a separate action to minimize the destructive effects of wind and water on surface soil or soil banks. Structural shore erosion control methods are best defined as those applicable to higher rates of erosion, employing principally traditional methods of shoreline stabilization.

Special Flood Hazard Area (SFHA) – An area of land, recognized by the NFIP, which would be inundated by a flood having a 1% chance of occurring in any given year. Development may take place within the SFHA, provided that development complies with local floodplain management ordinances, which must meet the minimum Federal requirements.

Storm surge – An increase (or decrease) in water level associated with some significant meteorological event, e.g. persistent strong winds and change in atmospheric pressure, or tropical cyclone. Its typical effect is to raise the level of the tide above the predicted level.

Storm water – Consists of runoff from rain, irrigation and other urban and rural sources.

Vulnerability – The level of exposure of human life, property, and resources to damage from natural hazards. A condition wherein human settlements or buildings are threatened by virtue of their proximity to a hazard, the quality of their construction, or both.

Vulnerability Assessment – Analysis of the potential for loss of or harm/damage to exposed assets largely due to complex interactions among natural processes, land use decisions, and community resilience.

Water Resources Element (WRE) – An element within local Comprehensive Land Use Plans for Maryland communities. The purpose of the WRE is to ensure that future county and municipal comprehensive plans reflect the opportunities and limitations presented by local and regional water resources.

Water and Sewer Plan – Each county and Baltimore City is required to prepare, adopt and annually maintain a 10-year forecasted Water and Sewage Plan to demonstrate how safe and adequate water and sewerage facilities will be provided to support planned redevelopment and new growth, outlined in their adopted Comprehensive Land Use Plan.

Wetland – A natural area that is regularly saturated by surface water or groundwater and is characterized by a prevalence of vegetation that is adapted for life in saturated soil conditions (eg, swamps, bogs, fens, marshes, and estuaries).

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Financial assistance provided by the Coastal Zone Management Act of 1972, as amended, administered by the Office of Ocean and Coastal Resource Management, National Oceanic and Atmospheric Administration (NOAA).
A publication of the Maryland Coastal Zone Management Program, Department of Natural Resources pursuant to NOAA Award No. NA12NOS4190169.

Cover photo credits (top to bottom): Mark E. Brady, Jane Thomas, Wanda Cole, MD DNR, Jane Thomas

Science communication, design, and layout by the Integration & Application Network, University of Maryland Center for Environmental Science



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Printed on recycled paper

9/2013 14-5222013-647