

Building Coast-Smart Communities: How Will Maryland Adapt to Climate Change?

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Web Version | Includes Scorecard | 4/22/09

Building Coast-Smart Communities: How Will Maryland Adapt to Climate Change?

This is a nine-party negotiation assisted by a professional mediator. A group of local officials and stakeholder representatives faces a challenge: they must reach agreement on a set of strategies for managing the climate change risks facing their coastal community or sacrifice substantial financial assistance that the Governor is making available to a few model communities ready to proceed. The group must use the “scorecard” provided to demonstrate that its plan responds effectively to their particular challenges and stays within cost guidelines.

While this negotiation does not intend to exactly replicate how decisions in Maryland are made at the local level, it does highlight the value of mediated, multi-stakeholder conversations in reaching more sustainable outcomes. It also introduces participants to critical issues coastal communities face around climate risks. It is hoped that the coastal leaders attending this event can take the lessons learned from this negotiation and the resulting conversations back to their own towns and counties, with the ultimate goal of helping Maryland’s coastal communities become ‘coast-smart’ by better managing risks from climate change.

Scenario

Cheshire is a small county on the eastern shore of Maryland’s Chesapeake Bay. Fishing, farming, and more recently tourism have been the mainstays of the local economy. Historic Springtown is the political, economic and cultural hub of the county. With a population of 30,000, it has a distinctly urban feel, which contrasts sharply with the rest of the largely rural county. The town is home to a relatively large marina, local museum, regional hospital, municipal offices, the county courthouse, a new theatre and a historic waterfront.

For the past 15 years, Cheshire County has seen an influx of retirees and commuters from Washington, D.C., attracted by the rural lifestyle. Farmers under pressure from rising costs have been subdividing their land to make ends meet or to cover their retirements. More wealthy newcomers have purchased much of the county’s waterfront property. Meanwhile, county revenue has been decreasing, due to the shrinking agriculture and fishing industries. To pay for state-mandated upgrades to the county’s aging infrastructure, the county has had to relax its zoning requirement to attract new business and increase its revenues. Consequently, low-density strip malls have begun appearing along the outskirts of Cheshire County’s few towns. Ironically, these commercial centers erode the character of what originally attracted many newcomers in the first place. If the county adopts more restrictive regulations, however, local officials fear tax revenues would decrease.

Residents of Cheshire County are hearing more and more about the risks that climate change may pose to Maryland’s low-lying coastal communities. The Maryland Department of Natural Resources recently presented a model to town planners (see Appendix F) of what Cheshire County might look like if sea level rises significantly. The state believes that climate change could also cause an increase in the intensity and severity of storms, as well as reduce the availability of fresh water. Considering the damage caused by Tropical Storm Isabel to Cheshire County’s historic waterfront in 2003, many are concerned. After Isabel, a new seawall was built along the town’s waterfront, with money from the U.S. Army Corp of Engineers. Many other

waterfront businesses, however, including facilities used by local watermen, have been left unprotected.

The Maryland Department of Natural Resources has started preparing sea-level rise projections for areas throughout the state, including Chesire County, to better assess how sea-level rise will affect their communities. Based upon these maps (attached), in more rural areas of the county, property owners stand to lose substantial portions of their land due to sea level rise inundation, changes in floodplain boundaries over time, and projected changes in shoreline position due to shore erosion. Of particular concern is the potential submersion of key infrastructure like the water treatment plant, the local hospital and school. Climate projections are extremely complex, so there is uncertainty around these sea-level rise projections. In the face of this uncertainty, the State of Maryland prefers to take a proactive and precautionary stance on managing any potential risks associated with climate change. The state has been recognized for its leadership on this issue.

Planners working for Chesire County have successfully nominated the County as one of a handful of pilot communities to participate in a Coast-Smart Communities program created by the state legislature. This program creates a number of incentives encouraging communities to take "Coast Smart" steps to protect themselves from the risks of climate change. As a pilot community, Chesire County will be eligible for reduced premiums for coastal flood insurance and a variety of grants. To qualify for these benefits, the community must agree to undertake a package of coast-smart activities that exceed a minimum score established by a new Coast Smart Risk Management Scorecard. Given the current financial state of the county, this is an important financial opportunity.

A diverse group of local stakeholders has been asked by county officials to serve on the newly created Chesire County Coast-Smart Advisory Committee. The Committee has been asked to recommend a set of actions that will qualify the town for state incentives. Each action has a score that reflects its effectiveness to reduce climate-related risks for homeowners, businesses and the municipality. On the other hand, the actions involved all have costs associated with them for the county government. It will be up to the Committee to evaluate each item on the list of possible actions (provided in Appendix A) to determine how to proceed. To qualify for the Coast-Smart Communities program, the committee must develop a package that meets the minimum score on the scorecard, without exceeding a cost limit set by the county. Given the diverse interests represented around the table, this won't be easy.

Logistics

In addition to these general instructions, players will receive confidential instructions that provide critical information on their character, specific negotiating strategies, negotiable and non-negotiable points, along with a scorecard with their priority choices highlighted. All players are asked to remain true to the role they have been assigned (even if it is not their everyday role) and are reminded that they represent an organization, not simply their own interests. Each role has an underlying strategy that is outlined in the confidential instructions. Use this strategy to guide your negotiations. Non-negotiable (i.e. unacceptable) points are exactly that—however they may be rendered acceptable if the group reaches unanimous wording on an amended policy option. Any amended policy options cannot vary too far from the intended original purpose and scope. Confidential instructions should NOT be shown to any other characters.

Players will have 30 minutes to meet with other players in the room assigned with the same character. These **'same-role' meetings** should be used to think strategically about the best way of accomplishing the objectives spelled out in each person's **confidential instructions**.

Once the **full table negotiations** begin, groups will have an hour and 45 minutes (with the help of a professional mediator) to reach agreement. It is important that there be no contact between tables. Also, mediators might ask sub-groups at their tables to meet separately for a few minutes (caucus).

In order for an **agreement** to be official and eligible for state-based incentives, consensus must be reached by **eight out of nine** parties. This is not eight out of nine agreeing per individual policy but rather eight out of nine agreeing on the entire package. Also the Agreement must include at least 25 points from Category 1, and 15 points from Categories 2, 3, 4, and 5. The entire list of actions must total at least "100 points" and not cost more than "25 \$'s."

There is no other information available besides what is contained in the hand outs distributed at the beginning of the role-play. Parties are free to contribute any other information they choose, but the rest of the group may or may not accept it as accurate.

At the conclusion of the role-play, mediators will be asked to summarize the outcome at their table and get participants to sign a negotiated agreement. Everyone will have a chance to discuss their reactions to the game afterwards, during a debrief.

Please visit <http://maryland.coastsmart.org/> for more information on the April 27th event and other activities the State of Maryland is doing to address climate change.

Chesire County Coast-Smart Advisory Committee Members

Chesire County Commissioner: Born and raised locally, the Chesire County Commissioner is also the former mayor of Springtown, the largest city in Chesire County. He/She doesn't see climate change as an issue. His/her skepticism grows out of a lifetime of dealing with fads and scare tactics. He/She wants to see Chesire County restored to what it was 50 years ago.

Chesire County Planner: A key player in helping to qualify the town as a pilot community, and an expert on climate adaptation regulation, the county planner is eager to help the Committee formulate the most effective local response possible. He/She has been continually frustrated by the town's unwillingness to take the issue of climate change seriously. Historically, the planning office has received very little support from state and local politicians, forcing them to compromise on many important land use decisions.

Chesire Real Estate Development Association, President: Also a successful owner of a real estate development firm on the Eastern Shore, President of Chesire's Real Estate Development Association is concerned that alarmist reports about the possible effects of climate change (and the burden of increased government regulation) is going to depress real estate values even further. Because of the recent influx of retirees and D.C. commuters, he/she has purchased large swaths of expensive shoreline property. Recent engineering advances in coastal protection appear to him/her to offer the best of both worlds: a way to proceed with the development of valuable waterfront land while at the same time reducing shoreline erosion.

Maryland Department of Natural Resources Biologist: Extremely knowledgeable about local ecological assets (coastal wetlands), the ecological impacts and implications of various policy options, and the dangers posed by low-lying contaminated sites, he/she is in an excellent position to provide scientific information to the group. A graduate of the University of Maryland, the State of Maryland biologist brings to the discussion a new generation's commitment to sustainable development and a desire to minimize impacts on future generations.

Chamber of Commerce, President: A second-generation business owner, the Chesire County Chamber of Commerce President is very concerned about the claims being raised by environmental groups that his/her dockside seafood restaurant is in grave danger from projected sea level rise and the likely increased intensity of storms. He/She represents the business interests of the county and winces at the thought of more restrictive regulations being imposed on local businesses that are already being pinched by competition from the numerous strip malls that have popped up in the area.

Chesire County Environmental Coalition, Executive Director: He/She is very vocal about the need for much broader public awareness of the risks associated with climate change and a strong advocate for conservation, wetland preservation and protection of biodiversity. Wanting the group to focus on climate change mitigation not just adaptation, the executive director is a strong champion of more restrictive regulations including substantial penalties for anyone developing in the floodplains.

Chesire County Residents Association, President: Recently retired from a stressful career in D.C., the Residents Association President has just purchased a small house on the waterfront in Chesire County after vacationing as a renter in the area for more than a decade. Last month,

he/she engineered the merger of the Chesire County Creekwatchers and the long-standing Residents Association to make sure someone is keeping an eye on the health of the Bay and increasing insurance costs. Living on a fixed income makes life even more difficult as any increase in insurance premiums increased may force her/him and her family to leave. He/She is not afraid to speak up on behalf of the “little guy.”

Chesire County Farmers Association, Head: The Head of the Farmers Association is a local farmer concerned that rising fuel prices and the recent crash in commodity prices will put him/her out of business. Increasing competition from large industrial farms in the Midwest and imported grain from Latin America are only adding to the stress that almost all local farmers are feeling. He/She volunteered to be on the Committee to see if there is any way that farmers in the area can find some economic benefit in these new efforts to fight the risks of climate change. Recent incentives to produce biofuels, for example, have helped to increase the bottom line of many farmers. Perhaps the Coast-Smart Program could do the same.

Chesire County Emergency Management Director: The local emergency management director is concerned about the risks the county’s residents face from future storm events. Previous storms have been devastating and, luckily, evacuation procedures have been sufficient to prevent any loss of life. However, part of his/her responsibility is to not only prepare for disasters, but also to help organize mitigation efforts to reduce the threat of them. While he/she has created a county hazard mitigation plan, it is not required to be enforced.

Mediator: The mediator for the committee is a professional mediator who has worked in Maryland for his/her entire life. The mediator will facilitate the discussion in an effort to help participants build consensus on the package of policies and actions to select from the scorecard. He/She is being paid by a grant from a local foundation, but can only continue to work in this role if the full Committee supports him/her. The mediator has already met with each of the Committee members in private and, thus, has a pretty good idea about what each person is thinking.

Appendix A: Scorecard

SCORING SYSTEM:

- 25 points from Category 1
- 15 from each of Categories 2, 3, 4 & 5
- Your score should equal 100 or more
- Your costs cannot exceed 25 \$'s in cost

The “Cost” category is an approximation of how expensive it will be for the local government to implement and manage this policy.

“State Match” means that matching funds would be provided by the state to establish this program. The number of \$ signs denotes the cost the city would have to incur.

The “Score” is an assessment of how effectively this policy would reduce the impacts of climate change on the county. More effective policies receive a higher score.

COAST-SMART COMMUNITIES SCORECARD Minimum 100 points, Maximum 25 \$ to qualify	Cost to County	Score
CATEGORY 1: Reducing Vulnerability of the Built Environment (Minimum 25 points)		
Subcategory 1: Remove from harms way		
1. Ban the building of new primary dwellings and prohibit the expansion of footprints on existing developed lots within the 100-year tidal floodplain.	\$	10
2. Incorporate elements into the county's comprehensive plan that address and accommodate for sea level rise and an increased storm surge vulnerability zone. This could include provisions such as overlay zones, tiered zoning with increasingly strict regulations within areas of vulnerability, increased buffers in areas of vulnerability, etc.	\$	8
3. Establish a transferable development rights (TDR) system to encourage swapping of land in coastal areas vulnerable to sea level rise and storm surge for inland parcels (this is versus a zoning approach)	\$\$	8
4. Develop a timeline and strategic plan to move or abandon existing infrastructure in areas subject to more frequent storm surge and damage due to sea level rise inundation.	\$	9
5. Require mandatory disclosure statements about property's vulnerability to sea-level rise in all real estate transactions	\$	7
6. Establish and fund a buy-out program for the purchase of repetitive loss properties within the 100 year floodplain	\$\$\$ - State Match	9
Subcategory 2: Protect in place		
7. Require a 2-foot freeboard elevation above the FEMA requirements for all new and existing buildings in the 100-year tidal floodplain	\$\$\$	8
8. Develop an Infrastructure Improvement Plan that establishes timelines for raising roads and bridges, higher volume stormwater management, etc. based on vulnerability to sea level rise	\$\$	7
9. Provide tax rebates on investments in adaptation measures for homeowners and small business owners in at risk areas (e.g., elevating houses, upgrading well water and septic systems)	\$\$ - State Match	6
10. Create a comprehensive local adaptation plan	\$\$ - State Match	7
11. Enhance federal flood insurance by contributing to a state insurance pool for homeowners and small businesses located in areas vulnerable to sea level rise and storm surge.	\$\$\$\$ - State Match	8

CATEGORY 2: Water & Wastewater Infrastructure (Minimum 15 points)		
Subcategory 1: Increase supply		
12. Use water banks/pools and water markets to facilitate the reallocation of water resources	\$\$\$	8
13. Develop advanced wastewater treatment capacity for water reuse ("graywater")	\$\$\$	7
14. Build a desalinization plant to provide additional drinking water	\$\$\$\$	9
Subcategory 2: Decrease demand		
15. Increase billing rates for water from \$400/yr avg per household to \$800/yr avg per household; use additional revenue to fund water efficiency measures	\$\$	9
16. Provide financial incentives (e.g., tax breaks, rebates) for switching to more efficient water technologies (e.g. manufacturing processes and appliances)	\$\$\$	8
17. Include information on climate change impacts to water supplies and how residents can reduce water use in utility bill inserts, newsletters, websites, and local newspapers	\$	4
18. Update drought management plans and/or water resources elements in the comprehensive plans to recognize changing conditions	\$	4
19. Require farmers to install high efficiency water delivery systems for irrigated agriculture	\$\$	8
CATEGORY 3: Protecting Wetlands and Wildlife (Minimum 15 points)		
Subcategory 1: Protect existing assets		
20. Expand critical area buffers to include land with historically tidal-influenced soils (i.e., hydric soils)	\$	9
21. Create a county-level map showing areas, that if protected, would provide suitable habitat over the long term for the maximum number of the county's terrestrial and wetland plant and animal species and natural communities	\$\$	7
22. Increase monitoring of existing wetlands and conservation areas to track changes in water levels, species composition and abundance	\$\$ - State Match	6
Subcategory 2: Intervene to improve resiliency		
23. Purchase ecological buffers, at market rate, to allow for inland preservation and migration of wetlands, salt marshes, and other natural flood control systems	\$\$ - State Match	7
24. Target land preservation efforts for wetland and coastal systems that create wildlife corridors and artificial wetlands to enable species to move to higher elevation and latitudes	\$\$	6
CATEGORY 4: Farm and Forestland Preservation (Minimum 15 points)		
Subcategory 1: Protect existing farm and forest assets		
25. Modify agricultural practices to reflect increasing variability in historic weather patterns (e.g., change planting season, plant drought resistant crops)	\$	7
26. Commission a state-supported study to determine the net present value for ecosystem services (e.g., pollination, water filtration, erosion control, carbon capture) in the county to incorporate this value into future planning	\$\$ - State Match	6
27. Increase monitoring and assistance for existing conservation easement landowners to ensure effective conservation is taking place on these lands	\$\$	6
Subcategory 2: Intervene to improve farm and forest resiliency		
28. Provide tax rebates for farmers who use conservation and adaptation practices on land they own, rent, or lease	\$\$ - State Match	7
29. Cut public crop subsidies to farmers whose crops face repetitive loss damage from flooding	\$\$\$	8
30. Require forested buffers on agricultural lands to improve resilience of adjacent waterways and wetlands	\$\$ - State Match	8
31. Assess forested areas at risk of being lost and identify reforestation sites outside the sea level rise risk zone	\$	6
32. Develop a county tree canopy plan to increase tree coverage	\$ - State Match	5

CATEGORY 5: Public Education (Minimum 15 points)		
Subcategory 1: Community Education		
33. Publish an annual report highlighting local climate adaptation measures taken by local residents and businesses and measuring progress of locally-defined climate adaptation goals	\$ - State Match	5
34. Create a coast smart street or business program to recognize and promote local achievements in implementing adaptation strategies	\$	6
35. Create citizen emergency preparedness teams to encourage readiness for the next major storm (e.g. people who will help their neighbors identify evacuation routes, shelters, etc.)	\$	5
36. Create climate change information sessions for local governments to learn what they can do to promote climate adaptation planning	\$	6
37. Organize community workshops and forums to educate the general public about climate risks	\$ - State Match	8
Subcategory 2: Youth Education		
38. Create a new school curriculum to introduce and reinforce understanding of climate change risks	\$	4
39. Have schools adopt a section of shoreline at risk to climate change to study and work to protect (like an adopt-a-highway program)	\$	4

Appendix B: Glossary

2-foot freeboard: The minimum level (two feet) above the height of a once in a 100 year flood (i.e. 100-yr flood line or base flood elevation) to which buildings are required to build.

Buy back program: A government fund to purchase homes when they become available on the market. MD has a buy back program for homes in the 100-year floodplain, but this program has not been funded enough to buy back all homes that would qualify.

Climate adaptation: Activities which proactively help an individual, organization or community live alongside the climate change induced effects to their landscape. Examples include: raising the foundation of a house to prevent future flooding, and planting more trees to help stabilize the banks of rivers during future storms.

Climate change risk management zones: Areas that are highly vulnerable to climate-change-related events (e.g. low-elevation, flood prone areas, regions with poor access to groundwater or at risk to salt water intrusion into aquifers).

Climate mitigation: Activities which proactively reduce the amount of greenhouse gas emissions (e.g. carbon dioxide) directly or indirectly emitted by an individual, industry, organization or community thereby reducing the climate-altering impacts of their behavior. Examples include: Driving less, using a fuel-efficient furnace, and planting trees.

Coastal High Hazard Area: An area of special flood hazard at risk to strong wave action from storms or earthquakes. Special floodplain management requirements apply to coastal high hazard areas, including the requirement that all buildings be elevated on piles or columns.

Conservation agreements: In this case, a formal understanding between a landowner and a local, state or federal government that obliges the landowner to take or refrain from certain actions, or transfer certain rights and responsibilities in order to achieve agreed upon conservation goals.

County comprehensive plan: A guiding policy that outlines future land use and development regulations.

Drought management plan: A policy that outlines how water resources will be managed when supplies are scarce.

Drought resistant crops: Crops that are able to survive during times of very little rainfall.

Ecological buffers: A zone or area that serves not for any human uses but as a conserved natural habitat where plants and animals can thrive.

FEMA: The Federal Emergency Management Agency. FEMA is the federal agency responsible for advising governments on building codes and flood plain management, disaster preparedness education and capacity building, providing disaster assistance, training emergency managers, coordinating the federal response to disasters and administering the national flood and crime insurance programs.

Graywater: Wastewater generated from domestic processes such as dish washing, laundry and bathing. Graywater is distinct from blackwater, which contains feces or toxic chemicals.

Hazard mitigation plans: A policy that outlines how a local government is going to reduce the vulnerability of the community to natural and human-caused hazards.

High efficiency water delivery systems: Methods of irrigating agricultural fields that maximize the amount of water reaching the crop and minimizes the water lost to evaporation or absorbed by the soil. Drip irrigation is an example of an energy-efficient water delivery system.

Local adaptation plan: A plan by local government to increase a community's ability to manage the locally identified risks associated with climate change, integrating climate adaptation activities across their government's current services.

Natural flood control systems: These are natural areas that are especially adept at retaining and absorbing floodwater. Wetlands, bogs and mangroves are examples of natural flood control systems.

Riparian areas: Riparian areas usually have visible vegetative or physical characteristics reflecting the influence of water. Riversides, lake borders and marshes are typical riparian habitat.

Risk Management Projects: Projects developed to minimize impacts of current and future risks to the organization's sustainability. Risks include: natural hazards (e.g. fires, flooding, etc), crime (e.g. theft, accounting fraud, acts of terrorism), financial considerations (e.g. access to capital, credit rating), and an organization's social license to operate (good standing in local community, media, etc).

Tiered Zoning System: A system of increasingly more stringent zoning requirements as one approaches flood prone areas. This system is designed to encourage development of land that is less vulnerable to flood damage while discouraging developing areas vulnerable to flooding.

Transferable development rights (TDR): TDR programs allow landowners to sever development rights from properties in government-designated coastal high hazard areas, and sell them to purchasers who want to increase the density of development in areas that local governments have selected as higher density areas.

Water banks/pools: The technique of storing unallocated water in underground aquifers for the purpose of meeting future water needs. Water banking has been used in the Western United States as a method of conserving water.

Water Markets: A forum designed to efficiently allocate water licenses where water users sell unused portions of water licenses to those needing water permits. Conservation groups or governments can also purchase the water licenses in these markets and leave the water for in-stream ecological needs.

Wetland restoration: Rehabilitation of previously existing wetland functions, from a more impaired to a less impaired or unimpaired state of overall function.

Wildlife corridors: Passages of land or water either private or public, designed to link fragmented habitat and help wildlife move across the landscape.

Appendix C: Worksheet

GOAL: \geq100 POINTS; <\$25	Proposed package	Score	\$s	My Preferred Package	Score	\$s	Agreement Package	Score	\$s
Category 1 - 25 points required	#4	9	1						
	#8	7	2						
	#9	6	2						
	#10	7	2						
Category 2 - 15 points required	#12	8	3						
	#17	4	1						
	#18	4	1						
Category 3 - 15 points required	#20	9	1						
	#22	6	2						
	#23	7	2						
Category 4 - 15 points required	#26	6	2						
	#28	6	2						
	#31	6	1						
Category 5 - 15 points required	#33	5	1						
	#36	6	1						
	#37	8	1						
TOTAL		104	25						

Appendix D: Policy Background

CATEGORY 1: Reducing Vulnerability of the Built Environment

Subcategory 1: Remove from harms way

1. *Ban the building of new primary dwellings and prohibit the expansion of footprints on existing developed lots within the 100-year tidal floodplain.* Maryland already has some restrictions on development in the tidal floodplain through the state's Critical Area Act. This would expand on the regulations currently in place.
2. *Incorporate elements into the county's comprehensive plan and hazard mitigation plans that address and accommodate for sea level rise and an increased storm surge vulnerability zone.* This could include provisions such as changes in zoning, capital expenditures, site specific or tiered zoning regulations, overlay zones, increased buffers in areas of vulnerability, etc. Most county plans have not taken climate change into account. This is a directive to incorporate provisions that address risks, but gives the counties flexibility to implement those elements using a variety of tools and methods.
3. *Establish a transferable development rights (TDR) system to encourage swapping of land in coastal areas vulnerable to sea level rise and storm surge for inland parcels (this is versus a zoning approach).* Transferable development rights are a tool for managing growth used in many parts of the country for different reasons (e.g. to protect farmland, historic areas, or open space). The approach basically awards greater flexibility for development in certain pre-specified land areas linked to restrictions on development in other areas, thereby creating an incentive for developers to adopt the restrictions.
4. *Develop a timeline and strategic plan to move or abandon existing infrastructure in areas subject to more frequent storm surge and damage due to sea level rise inundation.* This would direct the county to implement a plan that identifies what infrastructure assets will be moved versus abandoned, as well as a timeline for carrying out those actions. The plans should take into account projected sea level rise inundation, intended lifespan of the infrastructure at risk, and a plan for continuation of public services provision to vulnerable communities.
5. *Require mandatory disclosure statements about property's vulnerability to sea level rise in all real estate transactions.* This is a consumer awareness measure, similar to other warnings homebuyers get about possible problems with homes they are thinking about buying.
6. *Establish and fund a buy-out program for the purchase of repetitive loss properties within the 100-year floodplain.* This program would purchase properties that have been repeatedly damaged due to storm surge and flooding in the 100-year floodplain.

Subcategory 2: Protect in place

7. *Require a 2-foot freeboard elevation above the FEMA base flood elevation requirements for all new and existing buildings in the 100-year tidal floodplain.* This would require new buildings

to be two feet higher off the ground than FEMA requires and existing buildings to be elevated by two feet to meet new standards. Some Maryland counties have already adopted an additional freeboard requirement for new buildings.

8. *Based on vulnerability to sea level rise, develop an Infrastructure Improvement Plan that establishes timelines for raising roads and bridges, higher volume stormwater management, etc.* This is supplementary to the strategic plan that addresses moving vs. abandoning infrastructure (see Policy #4). This policy lays out a plan to adapt and improve existing infrastructure given the vulnerability to sea level rise.

9. *Provide tax rebates on investments in adaptation measures for homeowners and small business owners in at risk areas (e.g. elevating houses, upgrading well water and septic systems).* This creates financial incentives for homeowners and small business owners to adopt adaptation measures.

10. *Create a comprehensive local adaptation plan.* This would create an overall adaptation plan for the county, addressing all relevant sectors and constituencies. Several counties in Maryland have begun doing this kind of planning.

11. *Enhance federal flood insurance by contributing to a state insurance pool for homeowners and small businesses located in areas vulnerable to sea level rise and storm surge.* This is based on the recovery fund efforts in Florida. The Florida Disaster Recovery Fund was established to help cover recovery costs not covered through flood insurance.

CATEGORY 2: Water & Wastewater Infrastructure

Subcategory 1: Increase supply

12. *Use water banks/pools, and water markets to facilitate the reallocation of water resources.* These are mechanisms to reallocate water from areas that are water rich to areas suffering from drought. These mechanisms would reallocate water supplies across regions.

13. *Develop advanced wastewater treatment capacity for water reuse (“gray water”).* This enables water with only moderate contamination (e.g. from dishwashing or bathing) to be used again for other purposes (e.g. agriculture), thereby extending the usefulness of the original water supply. These systems are used in some arid climates.

14. *Build a desalinization plant to provide additional drinking water.* Desalinization takes seawater, removes some of the water from it to create potable water, and discharges the remaining higher salinity water (i.e. brine) back into the environment. This technology is used in many arid climates around the world (and in California and Florida).

Subcategory 2: Decrease demand

15. *Increase billing rates for water from \$400/yr avg per household to \$800/yr avg per household, use additional revenue to fund water efficiency measures.* Public water utilities can

increase the cost of water to encourage conservation or generate additional revenue to pay for new programs, such as water efficiency or infrastructure improvements.

16. *Provide financial incentives (e.g., tax breaks, rebates) for switching to more efficient water technologies (e.g. manufacturing processes and appliances).* Many regions with scarce water supplies have encouraged the adoption of more efficient water use technologies (e.g. low-flow toilets) through rebate programs.

17. *Include information on climate change impacts to water supplies and how residents can reduce water use in utility bill inserts, newsletters, web sites, and local newspapers.* Using utility inserts to inform consumers about efficiency measures is a common practice in the electricity sector. This could be easily applied to water utilities.

18. *Update drought management plans and/or water resources elements in the comprehensive plans to recognize changing conditions.* Plans dealing with water resources should anticipate periodic droughts. The length, frequency, and intensity of droughts may increase in the future due to climate change.

19. *Require farmers to install high efficiency water delivery systems for irrigated agriculture.* Agricultural states with scarce water resources have encouraged more efficient irrigation systems through regulation, public education and incentive grants.

CATEGORY 3: Protecting Wetlands and Wildlife

Subcategory 1: Protect existing assets

20. *Expand critical area buffers to include land with historically tidal-influenced soils (i.e. hydric soils).* Going beyond the current definition of tidal areas, this expansion of critical area buffers would extend the boundary to include all contiguous land covered by hydric soils. This will create a more comprehensive and scientifically accurate critical areas buffer, helping to reduce the risks to landowner associated with sea level rise. According to the USDA, “The definition of a hydric soil is a soil that formed under conditions of saturation, flooding or ponding long enough during the growing season to develop anaerobic conditions in the upper part.”

21. *Create a county-level map showing areas, which if protected, would provide suitable habitat over the long term for the maximum number of the county's terrestrial and wetland plant and animal species and natural communities.* Piecemeal approaches to conservation may be easier in the short run, but comprehensive biodiversity mapping will help ensure a more strategic and ultimately less costly method of reducing community vulnerability to climate change.

22. *Increase monitoring of existing wetlands and conservation areas to track changes in water levels, species composition and abundance.* Monitoring existing wetlands and conservation areas can help provide baseline information and support the development of indicators to monitor the effects of climate change.

Subcategory 2: Intervene to improve resiliency

23. *Purchase ecological buffers, at market rate, to allow for inland preservation and migration of wetlands, salt marshes, and other natural flood control.* Wetlands, while unsuitable for farming, are extremely valuable for their biodiversity and ecosystem functions of flood control, erosion prevention and water filtration. Using market rate prices to purchase wetlands for conservation is a proven method to reduce the liabilities facing a community.

24. *Target land preservation efforts for wetland and coastal systems that create wildlife corridors and artificial wetlands to enable species to move to higher elevation and latitudes.* Flora and fauna can only survive under certain climatic conditions. As climate changes occurs, species will have to move elsewhere to find comfortable climatic conditions. Consequently, corridors of preserved land and artificial wetlands will be needed to assist their migration. Creating wildlife corridors is a common strategy around the world for preserving biodiversity.

CATEGORY 4: Farm and Forestland Preservation

Subcategory 1: Protect existing assets

25. *Modify agricultural practices to reflect increasing variability in historic weather patterns (e.g. change planting season, plant drought resistant crops, etc.* Integrating agricultural practices with climate change science can reduce a farm's exposure to climate change risks and increase long-term profitability. This is similar to Maryland's Cover Crop Program.

26. *Commission a state-supported study to determine the net present value for ecosystem services (e.g. pollination, water filtration, erosion control, carbon capture, etc) in the county to incorporate this value into future planning.* Determining a dollar value for a community's ecosystem services can help convince decision makers and potential funders of their real assets and liabilities and facilitate land-use planning. This area of research is increasing in prominence worldwide.

27. *Increase monitoring and assistance for existing conservation easement landowners to ensure effective conservation is taking place on these lands.* Existing conservation programs can benefit from additional resources, but this policy will also serve to improve climate resiliency on conservation easements.

Subcategory 2: Intervene to improve resiliency

28. *Provide tax rebates for farmers who use conservation and adaptation practices on land they own, rent, or lease.* Financial incentives are a proven method to encourage farmers to adopt conservation practices. This policy option expands the current program to include tax rebates for climate adaptation activities.

29. *Cut public crop subsidies to farmers whose crops face repetitive loss damage from flooding.* Repetitive loss properties are increasingly expensive to insure, and represent a significant public liability if taxpayer-funded subsidies continue. Other, more economically and/or ecologically sustainable uses for repetitive loss properties should be encouraged.

30. *Require forested buffers on agricultural lands to improve resilience of adjacent waterways and wetlands.* Besides reducing polluting agriculture run-off, forested buffers reduce erosion, retain soil moisture, provide valuable wildlife habitat, and ultimately increase the resilience of a community. This is a common method of protecting waterways worldwide.

31. *Assess forested areas at risk of being lost and identify reforestation sites outside the sea level rise risk zone.* Sea level rise and salt-water intrusion will potentially kill many coastal forests. Proactively reforesting habitat above the projected sea level rise zone can help protect coastal forests and minimize damage to shoreline infrastructure.

32. *Develop a county tree canopy plan to increase tree coverage.* Increasing tree canopy cover helps reduce erosion, cool air temperatures, retain soil moisture, reducing your community's vulnerability to climate change as well as beautifying the landscape. Maryland has a state program which encourages communities to increase their tree coverage. This policy sets specific targets and benchmarks by the county.

CATEGORY 5: Public Education

Subcategory 1: Community Education

33. *Publish an annual report highlighting local climate adaptation measures taken by local residents and businesses and measuring progress of locally-defined climate adaptation goals.* To measure progress on becoming Coast-Smart, it is essential to develop performance indicators. These reports can be made publicly available and used to highlight a community's efforts to adapt to climate change.

34. *Create a Coast-Smart street or business program to recognize and promote local achievements in implementing adaptation strategies.* These programs can boost local civic pride in being Coast-Smart and can help a community prepared for future storm events and sea level rise.

35. *Create citizen emergency preparedness teams to encourage readiness for the next major storm (e.g. people who will help their neighbors identify evacuation routes, shelters).* Involving the local community in how they reduce their risk during the next major storm can minimize future loss, empower community members and strengthen social bonds. Emergency First Responders are often citizen volunteers.

36. *Create climate change information sessions for local governments to learn what they can do to promote climate adaptation planning.* Persuading local leaders about the importance of planning ahead for climate change can help reduce a community's long-term vulnerability to future storms.

37. *Organize community workshops and forums to educate the general public about climate risks.* It is difficult for the average citizen to assess whether the science about climate change is accurate. These workshops are intended to help debunk climate change myths and ground the issue in local concerns.

Subcategory 2: Youth Education

38. *Create a new school curriculum to introduce and reinforce understanding of climate change risks.* This integrates climate change science and action into the school curriculum and can raise awareness among a community's future leaders.

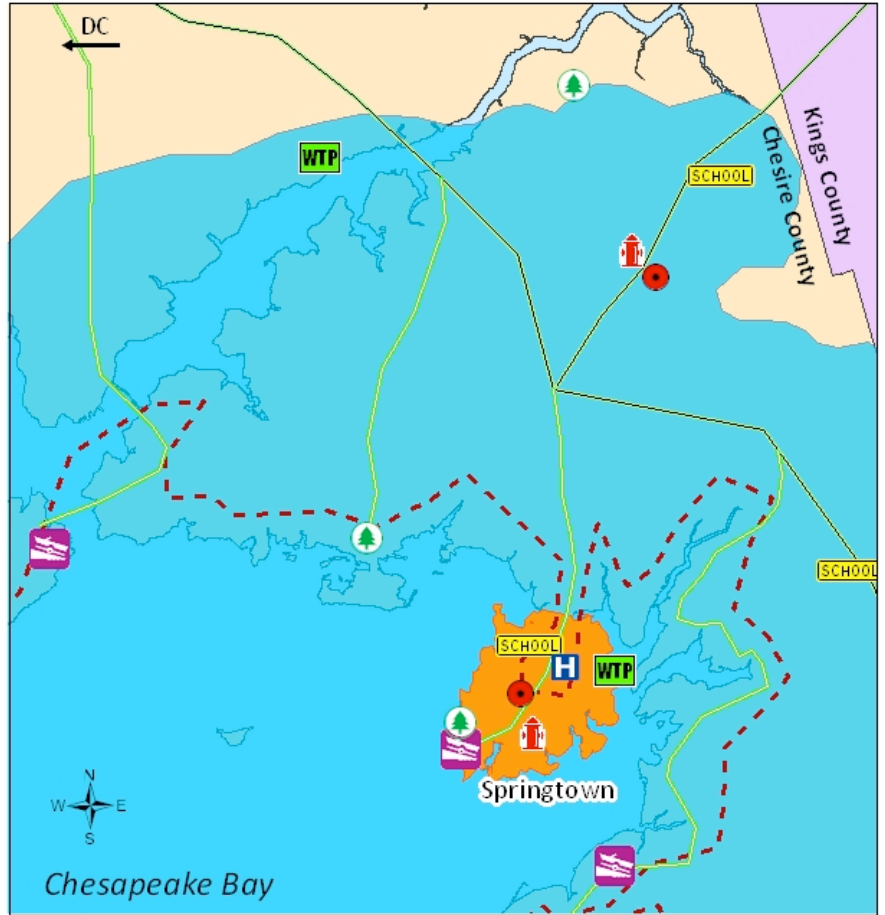
39. *Have schools adopt a section of shoreline at risk to climate change to study and work to protect (like an adopt-a-highway program).* Similar to many adopt-a-highway programs, this policy would give students an out-of-classroom experience to ground science in real world conservation and advocacy.

NOTE: These policies have been selected and modified from stakeholder interviews, Chapter 5 of Maryland Climate Action Plan, the ICLEI Preparing for Climate Change guidebook, the Heinz Center's Strategies For Managing The Effects Of Climate Change On Wildlife And Ecosystems, the Maryland Urban Tree Canopy Goals, the Maryland Forest Buffer Initiative and Stream Re-Leaf Program, Australia's Clean Up the World Campaign, and the Climate Adaptation Plans for Keene, NH, Berkeley, CA, and Durban, South Africa.

Appendix E: Storm Surge Map

Appendix E
Map of Chesire County - Storm Surge Inundation

-  Fire Department
-  Emergency Response Center
-  Hospital/Medical Services
-  School
-  County Park
-  Boat Ramp
-  Water Treatment Plant
-  County Road
-  State Highway
-  100-yr tidal floodplain
-  Category 2 Storm Surge Inundation Zone
-  Municipal Boundary
-  Chesire County
-  Kings County



0 0.5 1 2 3 4 Miles

Appendix F: Sea-Level Rise Map

Appendix F

Map of Chesire County - Sea Level Rise Vulnerability

-  Fire Department
-  Emergency Response Center
-  Hospital/Medical Services
-  School
-  County Park
-  Boat Ramp
-  Water Treatment Plant
-  County Road
-  State Highway
-  100-yr tidal floodplain
-  Sea Level Rise Vulnerability (1 ft)
-  Sea Level Rise Vulnerability (4 Ft)
-  Municipal Boundary
-  Chesire County
-  Kings County

