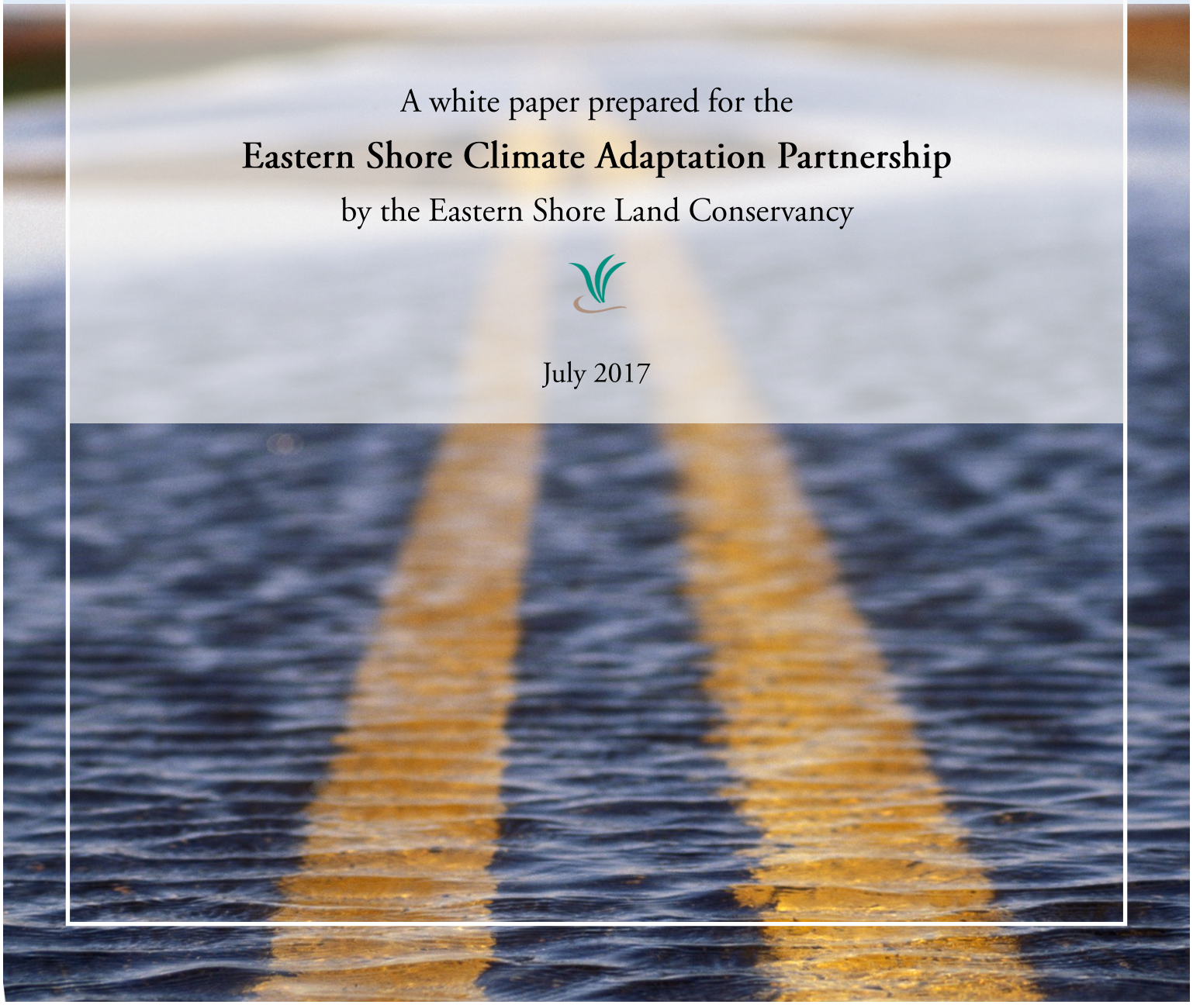
Prioritizing Local Climate Adaptation through Regional Collaboration on Maryland's Eastern Shore



A white paper prepared for the

Eastern Shore Climate Adaptation Partnership

by the Eastern Shore Land Conservancy

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Prepared by

Brian Ambrette
Coastal Resilience Manager
Eastern Shore Land Conservancy
114 S. Washington Street, Suite 101
Easton, Maryland 21601

External Review Committee

Abigail Abrash Walton
Co-director
Center for Climate Preparedness and Community Resilience
Antioch University New England

Annie Bennett
Institute Associate
Georgetown Climate Center
Georgetown University Law School

Anamaria Bukvic
Research Assistant Professor
Department of Geography
Virginia Polytechnic Institute

Elizabeth Fly
Coastal Climate Specialist
South Carolina Sea Grant Consortium

Jessica Grannis
Adaptation Program Manager
Georgetown Climate Center
Georgetown University Law School

Zoe Johnson
Climate Change Coordinator
National Marine Fisheries Service
NOAA Chesapeake Bay Program

Kif Scheuer
Climate Change Program Director
Local Government Commission

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David Harp

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EXECUTIVE SUMMARY

The Eastern Shore of Maryland has a long history of persevering through periods of economic, social, and environmental change. The present challenge that demands the region's perseverance is its changing climate. The Chesapeake Bay region is the country's third most vulnerable region to the impacts of sea level rise.[1] Intensifying rainstorms and longer periods of extreme heat also threaten rural communities and the region's agricultural and marine-resource dependent industries. Local governments can use common tools such as long-range planning and ordinances to make their communities better prepared, more resilient, and able to adapt to these changing conditions. With so much of the region's economy and character at stake, the sooner communities embrace these tools, the more effectively they will ensure the long-term viability and prosperity of the Eastern Shore.

Coordination and cooperation among the region's neighboring communities offers additional benefits and efficiencies. The Eastern Shore Climate Adaptation Partnership (ESCAP) was established in 2016 to assist communities in their response to climate vulnerabilities. The partnership is an informal regional collaboration of staff from seven local governments (Caroline, Dorchester, Kent, Queen Anne's, and Talbot counties, as well as the incorporated municipalities of Oxford and Cambridge), state agencies, academic institutions, and nonprofit organizations. The ESCAP promotes learning and collaboration among Eastern Shore communities to prepare for changes in weather patterns, flooding, and other environmental conditions. The ESCAP serves as a venue for partners to provide education, technical assistance, and resources to help communities build resilience.

Climate change is a slow moving but inescapable problem. While it is critical to address the causes in the very near term, there is time for thoughtful planning and preparation to reduce the consequences of sea level rise, intensifying rainstorms, and extreme heat – provided that planning for adaptation begins now. There are three key reasons the Eastern Shore's local governments should prioritize climate adaptation:

1) Real climate impacts are already affecting the Eastern Shore today (page 11);
2) Public support for climate adaptation and collaboration is high (page 13); and
3) Effective options and benefits are available if they are seized upon now (page 13).

Prioritizing adaptation today is a responsible approach that reduces current and future impacts on residents, on the region's economic engines, and on local governments' abilities to provide public safety and community services. This paper makes five broad recommendations for how to prioritize adaptation and collaboration. Briefly, communities in the region should:

1) Identify and support local champions of climate adaptation (page 23);
2) Engage collaborative partnerships (page 23);
3) Integrate climate adaptation strategies into planning processes and policies (page 24);
4) Encourage the state to expand support for local adaptation (page 25); and
5) Collectively, move the ESCAP toward a sustainable funding and governance model (page 26).

[1] Maryland Commission on Climate Change Adaptation and Response Working Group (2008). *Comprehensive Strategy for Reducing Maryland's Vulnerability to Climate Change. Phase I: Sea level rise and coastal storms*. This report is a component of the Governor's Commission on Climate Change, *Climate Action Plan* (August 2008).

INTRODUCTION

The Eastern Shore's story is one of resilient and adaptable communities. Across four centuries of history, the region has faced numerous challenges and periods of change with resourcefulness and steadfastness. Fisheries, canning, and agriculture have seen massive swings in fortune over time and yet communities maintain strong ties to the landscape, traditions, and people.

Change is once again challenging the Eastern Shore to embrace its resourcefulness, resilience, and adaptability. The region's weather is becoming more variable and extreme weather events more frequently affect residents. Shorelines are eroding faster and floodwaters from the Chesapeake Bay creep into yards and streets more often, even on sunny days. Farmers are encountering persistent shifts in their planting season[2] and watermen encounter new species of southern, warmwater fish in the Bay[3]. Many of these changes perceived by residents are confirmed by scientific research. More than 97% of scientists agree that the climate is changing.[4]

Local governments are typically the first responders when change affects a community. Indeed, many of the most effective decision making tools for addressing changes like those listed here are found in local government's toolbox. This paper makes the case that **preparing for, becoming resilient to, and adapting to the observed and anticipated effects of the Eastern Shore's changing climate should be a priority for local governments**.

The challenges and risks posed by the changing climate are shared by many communities and jurisdictions across the region. Also common to the region are the benefits that can be realized by residents, businesses, and local governments when actions are taken to anticipate change, reduce risk, and build the long-term capacity to prepare for changing environmental conditions. Acknowledging that there are significant shared risks, potential benefits, and resource constraints, this paper also advises that **organized, regional collaboration among the Eastern Shore's jurisdictions to address the challenges posed by a changing climate has greater benefits than actions taken individually.**

The foundation for adaptation and collaboration in the region is already in place and ready to act. The Eastern Shore Climate Adaptation Partnership (ESCAP) was established in 2016 to assist communities in their response to climate vulnerabilities. It is an informal, regional collaboration of staff from seven local governments (Caroline, Dorchester, Kent, Queen Anne's, and Talbot counties, as well as the incorporated municipalities of Oxford and Cambridge), state agencies, academic institutions, and nonprofit organizations. Members represent the spectrum of community roles: planning, emergency management, public health, public works, administration, education, research, and outreach. The ESCAP promotes learning and collaboration among Eastern Shore communities to prepare for changes in weather patterns, flooding, and other environmental conditions. The ESCAP serves as a venue for partners

Change is once again challenging the Eastern Shore to embrace its resourcefulness, resilience, and adaptability.

[2] *Kent County Climate Change and Sea Level Rise Vulnerability Report* (September 2016). Prepared by the Eastern Shore Land Conservancy. http://www.eslc.org/wp-content/uploads/2015/02/Kent-County-Climate-Change-Adaptation-Report_final_Sept2016.pdf

[3] Halvorson, Aimee (2007). *Recent Additions of Warmwater Fish Species to Chesapeake Bay*. Northeastern Naturalist, 14(4): p651-656

[4] Cook, John, et al (2016). *Consensus on consensus: a synthesis of consensus estimates on human-caused global warming*. Environmental Research Letters. Vol. 11, No. 4.

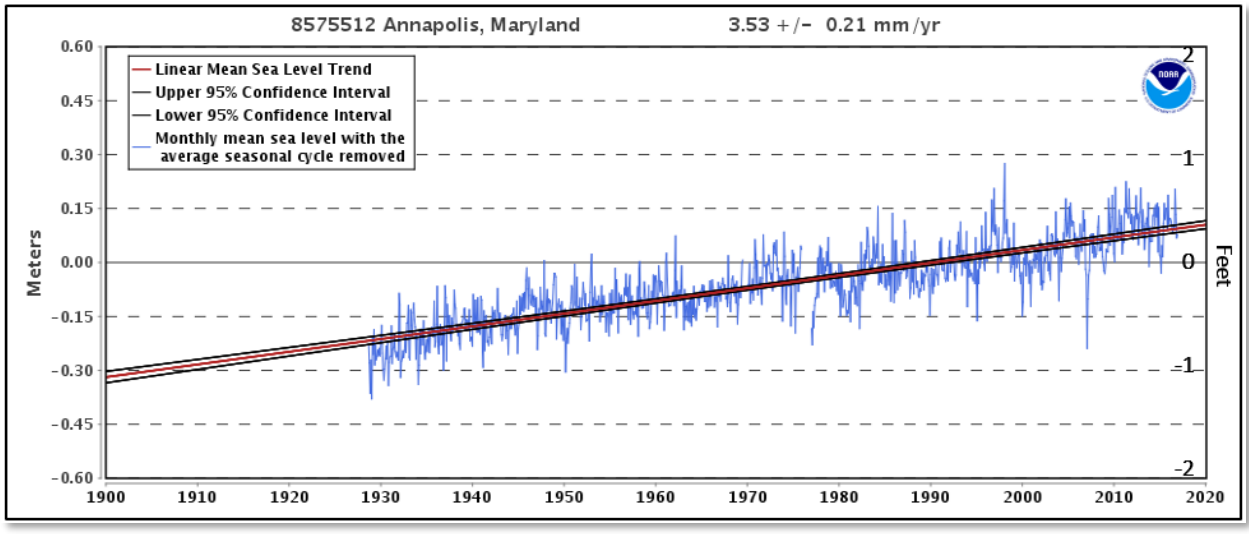

Figure 1. Tide gauge record for Annapolis, MD showing a rising sea level trend.[5]

to provide education, technical assistance, and resources to help communities build resilience. This paper describes how the ESCAP can be an effective catalyst for preparing the Eastern Shore for climate change impacts.

A BRIEF ASSESSMENT OF VULNERABILITIES

The University of Maryland and the State of Maryland's Scientific and Technical Working Group published a comprehensive report in 2008 that details the effects of Maryland's changing climate and updated the sea level rise projections in 2013. In this section, we highlight the most significant climate impacts on public safety, economic prosperity, and the environment.

Sea level rise – In the Chesapeake region, relative sea level has risen over one foot in the past century (Figure 1).[5] Land subsidence in the Chesapeake region accounts for approximately half of the observed rise. Global sea level rise driven by a warming atmosphere accounted for the other half of local sea level rise during the past century and will account for a greater proportion in coming years as the rate of global sea level rise accelerates. Maryland's Scientific and Technical Working Group recommends to the state's agencies and local governments that "it is prudent to plan for 2.1 feet of sea level rise by 2050…on top of which storm surge would have to be factored in, to judge the risk to land-based facilities".[6] The Working Group projects sea levels rising 3.7 to 5.7 feet in the Chesapeake by later in the 21st century. A more recent analysis by NOAA suggests that a worst-case scenario of 6 to 12 feet of global sea level rise may possible by

> "It is prudent to plan for 2.1 feet of sea level rise by 2050 on top of which storm surge would have to be factored in."

[5] NOAA. Mean Sea Level Trend for Annapolis, Maryland. Accessed January 17, 2017. https://tidesandcurrents.noaa.gov/sltrends/sltrends_station.shtml?stnid=8575512

[6] Boesch, Donald F. (2013). *Updating Maryland's Sea Level Rise Projections*. Special Report of the Scientific and Technical Working Group to the Maryland Climate Change Commission.

late century and should be considered when siting long-lived, critical facilities.[7] Maryland's Scientific and Technical Working Group is expected to update the state's projections, taking into consideration the new global data.

As sea levels rise, the frequency with which high tides exceed historic mean high water marks is increasing. The high tides that spill over the shoreline into streets, yards, and farm fields is known as nuisance flooding. Sometimes called "sunny day flooding", nuisance flooding is not caused by storms or inclement weather, though it can be exacerbated by prolonged rainy or windy periods. Cambridge has seen a fivefold increase since 1980 in the number of days per year with nuisance flooding.[8] Large portions of Dorchester County experience overtopping of roadways, as does the "causeway" in Oxford and the waterfront in Chestertown, even on days with otherwise calm and sunny weather. Nuisance flooding increases the wear on roadways; degrades the ability of local governments to provide timely emergency and public services; and imposes financial costs on residents, businesses, and governments in terms of time lost to detours, damage to vehicles, and reduced productivity.

Cambridge has seen a fivefold increase since 1980 in the number of days per year with nuisance flooding.

The frequency, extent, and depth of nuisance flooding will continue to increase as water levels rise. Eventually, the land that experiences frequent nuisance flooding will become permanently inundated. The 2 feet of sea level rise expected by 2050 will permanently inundate more than 33,000 acres or 2.9% of the land across the Mid and Upper Eastern Shore. The value of that inundated property approaches $1 billion (Table 1).[9]

Table 1. Permanent inundation by 2 feet of sea level rise

County	Percent of Land Area	Acres	Property Value
Caroline	1.2%	2,432	$16 million
Dorchester	7.0%	24,320	$417 million
Kent	1.2%	2,176	$64 million
Queen Anne's	0.6%	1,536	$180 million
Talbot	1.7%	3,008	$238 million
Cumulative	**2.9%**	**33,472**	**$915 million**

Source: Surging Seas Risk Finder Map (http://riskfinder.climatecentral.org)

Tropical storms and hurricanes will become more destructive when their storm surge is augmented by sea level rise. The Great Chesapeake-Potomac Hurricane of 1933 is the strongest storm on record to hit the Eastern Shore. A Category 1 hurricane, the storm breached the barrier island at Ocean City and created the inlet that defines the city today. Compared to the 1933 storm, Tropical Storm Isabel in 2003 was a weaker storm. However, Isabel caused nearly equivalent levels of flooding on the Eastern Shore. Approximately one foot of relative sea level rise occurred in the Chesapeake Bay during the seven decades between the two storms. This one-foot head start enabled Isabel to cause the same level of flooding despite being weaker than the 1933 storm. Likewise, a Category 1 hurricane occurring in 2050 could cause flooding equivalent to a Category 2 hurricane today, due to the additional 2 feet of sea level rise that is expected.[10] For residents, businesses, and communities, this means that future hurricanes will have more destructive storm surges than has been seen before, even when the strength of the storm is similar

[7] Sweet, W.V., R.E. Kopp, C. P. Weaver, J. Obeysekera, R. M. Horton, E.R. Thieler and C. Zervas (2017). *Global and Regional Sea Level Rise Scenarios for the United States*. NOAA Tech. Rep. NOS CO-OPS 83.

[8] Sweet, William, et al (2014). *Sea Level Rise and Nuisance Flood Frequency Changes around the United States*. NOAA Technical Report NOS CO-OPS 073.

[9] To see inundation and vulnerability maps, search for a community at http://riskfinder.climatecentral.org.

[10] Estimated by adding 2 feet of sea level rise to the US Army Corps of Engineers' SLOSH model estimates for storm surges from Category 1 and 2 hurricanes.

to past events. Towns and counties can expect greater emergency response needs and higher recovery costs as flooding impacts areas that historically have been considered safe.

Heat – The number of summertime extreme heat events more than doubled during the period from the 1980s to the 2000s as compared to the 1960s and 1970s.[11] The Scientific and Technical Work Group projects a rise of 4-8°F in average monthly temperatures by late this century.[12] Under these conditions the Eastern Shore will see a gradual shift to 60-90 days per year when temperatures exceed 90°F, up from an average of 30 days for the late 20th century. Annual days over 100°F will rise from just a handful to 10-25 days per year.[13]

Longer periods of high heat will have substantial consequences for communities, especially for vulnerable populations and aging infrastructure. Vulnerable populations include outdoor laborers in the agricultural, maritime, construction, and maintenance fields; the elderly and chronically ill; and those with low incomes who may not be able to escape the heat. Health emergencies spike when nighttime temperatures remain elevated and residents are unable to find relief from the heat for several days. These heat emergencies and the resulting health impacts will impose financial costs on residents, emergency services, hospitals, and health departments.

Infrastructure that was not built to withstand long periods of high heat will become increasingly vulnerable to underperformance, damage, and downtime. The HVAC (heating, ventilation, and air conditioning) systems in older buildings were not designed to handle the heat generated by today's computer equipment, let alone hotter exterior temperatures in the coming years. Likewise, the tar-and-chip construction methods used on many county roads are inadequate for extended periods of high heat. The tar in the roadways becomes soft under high heat and is then more easily deformed by heavy vehicles and farm equipment.[14] Extreme heat will require additional maintenance, repairs, and upgrades to roadways, buildings, and other infrastructure that will have significant financial costs for local governments.

Stormwater infrastructure that is not designed to handle this 'new normal' amount of precipitation will have an increased likelihood of failure.

Precipitation & drought – The Eastern Shore region has experienced a 5-10% increase in annual precipitation over the past six decades.[15] Over the next 75 years, precipitation is projected to increase by 10-20% above the annual amounts experienced at the end of the 20th century. However, the increase in precipitation will not be uniform throughout the year. Winter and spring are expected to become wetter, while summer is expected to be drier. Precipitation is also expected to be concentrated in intense downpours that deliver more rain in a shorter time period. Since the middle of last century, the most intense downpours have become even more intense. The amount of water that now falls during the heaviest 1% of rain events has

[11] Maryland Department of Health & Mental Hygiene (April 2016). *Highlights from the Maryland Climate and Health Profile Report.*

[12] The range in temperatures represents the outcomes of several scenarios for global greenhouse gas emissions. Actual outcomes will depend upon local, state, national, and international policies to reduce greenhouse gas emissions.

[13] Boesch, Donald F. (2008). *Global Warming and the Free State: Comprehensive Assessment of Climate Change Impacts in Maryland.* Report of the Scientific and Technical Working Group of the Maryland Commission on Climate Change.

[14] *Kent County Climate Change and Sea Level Rise Vulnerability Report* (September 2016). Prepared by the Eastern Shore Land Conservancy. http://www.eslc.org/wp-content/uploads /2015 /02/Kent-County-Climate-Change-Adaptation-Report_final_Sept2016.pdf

[15] Except where noted, precipitation data presented here is from the 2014 National Climate Assessment: http:// nca2014. globalchange.gov/

increased by 71% in Maryland. By the end of this century, the Eastern Shore is likely to experience two to three times as many 'twenty-year' rainstorms. Stormwater infrastructure that is not designed to handle this 'new normal' amount of precipitation will have an increased likelihood of failure. Roads, infrastructure, and property will be increasingly vulnerable to flooding and washouts. Washouts, in particular, hinder the ability of local governments to provide emergency services. Inadequate stormwater infrastructure will also hinder the ability of communities to meet their watershed implementation plan (WIP) water quality requirements.

As rainfall becomes concentrated in more intense downpours, the region will also see longer dry periods between precipitation events. Month-long droughts are expected to become five times more likely by late this century.[16] Severe droughts will have consequences for the agricultural economy, including reduced crop yields, potential crop failures, and expenses associated with switching to drought-resistant crop types.

Consequences of inaction

Sea levels, temperatures, precipitation patterns, and seasons are changing on the Eastern Shore. Local governments that inadequately prepare for their changing climate risk burdening their community with the costs of disaster recovery and with having to adapt faster in the future with fewer effective options and at greater expense. As previously stated, an early response to these vulnerabilities buys time for a community to explore options and select reasonable adaptation strategies. A failure to respond leaves the community with future choices that are more difficult and tradeoffs that are more unpalatable than those faced today.

Diminished public safety and well-being – **The greatest consequence of choosing not to prepare for climate change impacts will be a deterioration of public safety and well-being**. In the absence of sound planning and preparation, sea level rise and storm surges will impair critical emergency and health services that are delivered via vulnerable roadways and infrastructure. In Queen Anne's County, one-third of the county's emergency service facilities will experience flooding by storm surge by the year 2050 and a quarter of the county's drinking water treatment facilities will be threatened. Additionally, 30% of the county's residential properties and 35% of commercial properties would be impacted by storm surge from a Category 1 hurricane in 2050.[17] Along with the possibility of loss of life and property damage, each occurrence of flooding will impose economic and mental health costs on residents, communities, and the region due to disruption and displacement.

An early response to these vulnerabilities buys time for a community to explore options and select reasonable adaptation strategies.

Negative health outcomes – **Choosing not to prepare for climate change will lead to negative public health outcomes**. Increases in summertime extreme heat and extreme rainfall events will lead to higher rates of *Salmonella* poisoning in Maryland by 2040. Likewise, increases in extreme heat events are expected to increase hospitalizations for asthma by 11% and the risk of heart attacks by 11% in Maryland

[16] Boesch, Donald F. (2008). *Global Warming and the Free State: Comprehensive Assessment of Climate Change Impacts in Maryland.* Report of the Scientific and Technical Working Group of the Maryland Commission on Climate Change.

[17] *Queen Anne's County Sea Level Rise & Coastal Vulnerability Assessment* (March 2016). Prepared by Rummel, Klepper & Kahl.

by 2040.[18] Increases in incidents of infectious and vector-borne diseases along with mold and drinking water contamination could strain local public health departments. Failure to prepare with adequate cooling shelters and food and water safety training could lead to many otherwise preventable health emergencies.

Financial costs of inaction – **In the long term, choosing not to prepare for climate change will impose rising financial costs on communities**. A 2008 report from the University of Maryland describes the economic costs of inaction, including residential and rural coastal impacts, that communities may face if adaptation is not prioritized. The report cites tourism, agriculture, and health – all critical to the Eastern Shore's prosperity – as sectors that are expected suffer if attention is not given to climate adaptation and resilience.[19]

In the long term, choosing not to prepare for climate change will impose rising financial costs on communities.

As a rural region, the Eastern Shore is already sensitive to fluctuations in the economy and job markets. If climate vulnerabilities go unaddressed, increasing emergency response needs will strain county budgets, eroding the ability to provide basic services. More frequent disruptions to transportation and public health will make businesses less competitive, causing a drag on the region's economy. Residents will face economic displacement as the job market contracts, in addition to geographic displacement due to flooding and extreme weather.

Liability – Legal experts caution that local **governments *may* be held legally liable for failing to consider how climate change may exacerbate threats from natural hazards, like flooding, when issuing permits or designing and maintaining infrastructure.** The "failure to take climate change into account may be considered by a court to be 'unreasonable' and 'negligent' conduct, particularly where there is a concentration of risk factors," such as historical risk of flooding and erosion.[20] Furthermore, the "likelihood of successful [law]suits increases as the scientific support for human-induced climate change and resulting flood losses increases and climate-related risks are quantified." Regulators, in particular, should be wary when permitting development or subdivisions that may face increasing risk of flooding given sea-level rise and changing precipitation patterns as a result of climate change. In several cases, governments have been held liable for permitting decisions on construction, subdivisions, or improvements that increased flooding on other property.[21] It is at least conceivable that in places like the Eastern Shore, where there is a concentration of risk factors, that local governments could face lawsuits for issuing development permits in flood-prone areas despite knowledge of how climate change will exacerbate flood risks.

[18] Maryland Department of Health & Mental Hygiene (April 2016). *Highlights from the Maryland Climate and Health Profile Report.*

[19] Williamson, S. et al (2008). *Climate Change Impacts on Maryland and the Cost of Inaction.* A Review and Assessment by the Center for Integrative Environmental Research (CIER) at the University of Maryland. Prepared for the Maryland Commission on Climate Change and published in the Maryland Climate Action Plan. http:// cier.umd.edu/ climateadaptation/Chapter3.pdf

[20] Jon Kusler, Esq. April 2016. *Government Liability and Climate Change: Selected Issues for Wetland and Floodplain Managers*.

[21] For example, in True v. Mayor & Commissioners of Westport, 196 Md. 280, the court found that a municipality can be liable for negligence in the construction of a sewer system and failure to adequately maintain a sewer system where failure of that system causes a property owners land to flood. *See also*, Jon Kusler Esq. 2009. *A Comparative Look at Public Liability for Flood Hazard Mitigation* at pp. 42 – 45.

Governments that do not take action to reduce the risk of climate impacts may expose themselves to claims of negligence, fraud, or takings. "Although the success of a particular case will of course depend on the facts present and the idiosyncrasies of applicable state law, governments should be aware that inaction is no guarantee against legal liability. As the potential costs of climate change mount, litigation can impose liability of governments that do not take action to prevent the damage." [22]

THREE REASONS TO PRIORITIZE LOCAL CLIMATE READINESS

1) Real climate impacts are affecting communities right now

From permanent inundation to shifting planting seasons, residents and communities are experiencing the effects of the Eastern Shore's changing climate today. Many of the effects are gradual and have been increasing slowly for years, like rising groundwater tables from seawater intrusion that slowly infiltrates septic drainfields. Some effects are an inconvenience today – like a low-lying road that is flooded for several hours a month – but portend much more serious challenges to come. Other effects may seem inconsequential until an unexpected "shock" triggers a more serious economic or public health impact. For example, a 2-degree increase in summertime temperatures does not seem like an emergency; however, that small increase could intensify a heatwave and extend it by several days causing a serious public health emergency for an unprepared local government and local health care system. Likewise, a foot of sea level rise may have minor consequences in some communities until a hurricane adds several more feet of storm surge to the new

Residents and communities are experiencing the effects of the Eastern Shore's changing climate today.

normal water levels. The resulting flooding wipes out wastewater, electrical, and public safety facilities because such water levels were not considered when the facilities were designed and constructed. This happened along the coasts of New York and New Jersey during Hurricane Sandy with substantial costs to local governments.

Permanent inundation – As the sea rises, the lowest-lying coastal areas are the first to transition from experiencing frequent flooding to staying permanently inundated. In the southern parts of Dorchester County this process is already underway. Thousands of acres of saltmarsh have become open water.[23] In forested areas, saltwater intrusion into the soil is killing trees from the roots up, leaving behind the "ghost forests" that are a hallmark of rising seas. In slightly higher locations in the county, dry land containing homes has gradually become wetter, eventually transitioning to saltmarsh that encircles the homes and neighborhoods. Residents can cope with these conditions for a time but repeated flood damage and the inability to find willing buyers have left some in Dorchester County with no choice but to abandon their property.

In places with a high groundwater table, the ability of residential septic systems to remove pollutants from household wastewater is degraded. When low-lying septic systems are inundated from above by floodwaters or from below by a rising water table, untreated sewage may be released into groundwater, potentially creating a public health concern and adding

[22] Klein, Jennifer. August 2015. *Potential Liability of Governments for Failure to Prepare for Climate Change*. Copyright: Sabin Center for Climate Change Law, Columbia Law School.

[23] U.S. Fish & Wildlife Service (2009). Blackwater National Wildlife Refuge: Marsh loss and restoration. https://www.fws.gov/northeast/climatechange/pdf/blackwatermarshloss122009.pdf

remediation costs. On Southern Kent Island in Queen Anne's County, a major capital investment project is underway to convert hundreds of failing septic systems to public sewer service in order to alleviate this environmental and public health problem.

Nuisance flooding – Many towns and neighborhoods on the Eastern Shore are experiencing frequent nuisance flooding. Residents of Cambridge, Chestertown, Crocheron, Hooper's Island, Oxford, Rock Hall, and St. Michaels live with the reality of high tides spilling onto roads, driveways, parking lots, or yards. Vehicles that drive through saltwater experience faster rates of corrosion, adding to the financial burden of living with rising waters. Municipal and county vehicles, school buses, and emergency vehicles that are frequently driven through overtopped roadways must be replaced more regularly, at greater expense to taxpayers. In

Vehicles that are frequently driven through overtopped roadways must be replaced more regularly, at greater expense to taxpayers.

Dorchester County, school buses will not drive through standing water, leaving some families to find alternate means to transport their children to school or else miss school days. In coastal towns like Chestertown and St. Michaels, local businesses and tourism are experiencing financial consequences when nuisance flooding obstructs roads or damages storefronts and historical buildings.

Shoreline erosion – Across the region, shorelines are eroding at rapid rates. Historical marshlands are being converted to open water, robbing coastal communities of their protective buffers against waves and flooding from coastal storms.

Seasonal shifts in precipitation and temperature patterns are affecting agriculture.

Heat – Globally, sixteen of the seventeen hottest years on record have occurred since 2001.[24] In 2016, the hottest year on record globally, the Eastern Shore saw approximately 50% more days that exceeded 90°F than the average from 1980-1999.

Extreme rainstorms – In addition to the 1-in-1000-year rainstorm that ravaged Ellicott City, Maryland in July 2016, intense rain events affected Cambridge, Easton, and Salisbury between August and October that same year.

Agricultural challenges – Seasonal shifts in precipitation and temperature patterns are affecting agriculture on the Eastern Shore. The window for springtime planting is becoming compressed on both ends. Wetter winter and spring seasons have pushed springtime preparations for planting into April, whereas several decades ago those activities might have started in March.[25] The summer heat arrives earlier, shortening the time crops have to mature sufficiently to withstand the hot, dry conditions. With these seasonal shifts, a shock in the form of an unexpectedly long winter or early summer could severely curtail the planting window and deal a blow to the agricultural sector.

[24] NASA: https://www.nasa.gov/press-release/nasa-noaa-data-show-2016-warmest-year-on-record-globally

[25] *Kent County Climate Change and Sea Level Rise Vulnerability Report* (September 2016). Prepared by the Eastern Shore Land Conservancy. http://www.eslc.org/wp-content/uploads/2015/02/Kent-County-Climate-Change-Adaptation-Report_final_Sept2016.pdf

2) Eastern Shore residents want their local governments to address climate risks

There is strong public support on the Eastern Shore for local governments to prepare their communities for the impacts of the region's changing climate. **Two out of three residents want their local governments to take planning and regulatory actions to make communities safer from sea level rise**:

- 64% of Eastern Shore residents support "long-range planning that takes sea level rise into account"[26]
- 66% of Eastern Shore residents support "changes to regulations, such as zoning laws and increased 'set back' distances to discourage building in areas likely to be affected by sea level rise"[27]

Furthermore, **four out of five residents want to see greater cooperation across the region to prepare for and reduce the risks of a changing climate**:

- 82% of Eastern Shore residents want their local governments to "work together regionally to address the long term effects from rising sea levels and other impacts of climate change"[28]

These statistics suggest that local governments will enjoy broad support from residents across the political spectrum for actions that prioritize risk reduction, climate preparedness, and collaboration.

3) Effective options and financial benefits are available if adaptation begins now

It is a common practice for local governments to take future conditions into account in their decision making. Population growth, traffic studies, and wastewater treatment needs are frequently considered

Local governments will enjoy broad support from residents across the political spectrum for actions that prioritize risk reduction.

when communities contemplate changes to comprehensive plans or infrastructure spending. When future climate conditions are considered in plans, budgets, and permitting criteria, the community has a higher likelihood of avoiding excess maintenance and repair costs or facility downtime. **Decision making for infrastructure spending or capital investments should account for the climate conditions that facilities are likely to encounter throughout their design lifespan.** For example, a new stormwater conveyance that has been designed with additional capacity will be able to handle the larger flows that result from more intense downpours in future years. The additional capacity will reduce the number of times the design capacity is exceeded and lower the risk of damage to the facility or downtime when it is inoperable. In the case of a road culvert, extra capacity could enable a vital evacuation route to remain passable during a storm event. If added capacity prevents a road washout, then the direct costs of repairing the road and culvert are avoided, as well as the indirect costs in detours for drivers and lost public services for those cut off by the washout.

Financial benefits – Beyond the clear benefits for public safety and wellbeing, reducing risk can also

Reducing risk can bring substantial financial benefits to communities.

[26] Akerlof, K. & Maibach, E.W. (2014). *Adapting to Climate Change and Sea Level Rise: A Maryland survey, fall 2014*. Center for Climate Change Communication, George Mason University. (n = 476)

[27] Akerlof, K. & Maibach, E.W. (2014).

[28] Susquehanna Polling & Research (2015), for the Eastern Shore Land Conservancy. (n = 1,208)

Local governments that focus on resilient transportation infrastructure and prudent public health responses to climate change will strengthen their economies by preventing disruptions and attracting businesses.

bring substantial financial benefits to communities. Pre-disaster mitigation activities preemptively reduce a community's risk before a natural disaster occurs. Statistically, **every dollar a community spends to reduce risk before a disaster saves four dollars in post-disaster recovery and rebuilding costs**.[29] Many of the benefits are "avoided costs" that a community never has to pay because damage was prevented by sound planning, policy, and risk reduction projects. Few communities have sufficient financial reserves to bear the costs of a natural disaster, so pre-disaster mitigation is key to protecting a community's future prosperity. State and federal grant programs exist to assist communities with hazard mitigation and risk reduction.

Communities may realize financial benefits by taking advantage of programs that incentivize risk reduction and adaptation. The Federal Emergency Management Agency (FEMA) administers the Community Rating System (CRS). The program incentivizes communities to take flood risk reduction measures that go beyond the minimum standards required by law, including public awareness and open space projects. These additional measures earn discounts for residents on their flood insurance premiums – a real financial benefit that accrues directly to community members.

With sound adaptation and resilience planning, local and regional economies will not suffer as many disruptions. Business continuity, a healthy workforce, and a resilient supply chain are critical concerns for local businesses. When businesses remain competitive and retain jobs, the local economy prospers. Local governments that focus on resilient transportation infrastructure and prudent public health responses to climate change will strengthen their economies by preventing disruptions and attracting businesses that are looking to locate in low risk, prepared, and resilient communities.

HOW LOCAL GOVERNMENTS CAN PREPARE NOW

Eastern Shore communities are already preparing

Vulnerability assessments – Several Eastern Shore counties have already taken steps to understand their susceptibility to climate risks. Kent County completed a Climate Change and Sea Level Rise Vulnerability Study in 2016. The study described specific risks for Kent County and made recommendations for reducing the impacts of climate change on the county. Queen Anne's County also completed a Sea Level Rise & Coastal Vulnerability Assessment in 2016. Dorchester County has a sea level rise technical guidance document that was created in 2008. While the inundation projections may require an update, the technical recommendations in Dorchester's guidance can be instructive for all Eastern Shore communities.

Freeboard requirements – Freeboard is the additional height of a structure's first floor above the 1% chance (100-year) flood elevation. The purpose of freeboard is to add a margin of safety for homes and buildings

[29] Rose, Adam et al (2007). *Benefit-Cost Analysis of FEMA Hazard Mitigation Grants*. Natural Hazards Review.

For communities that immediately begin taking proactive steps to address their vulnerabilities, much of climate adaptation is a planning issue.

that reduces the likelihood of flood waters damaging the structure, its occupants, or its contents. Caroline, Dorchester, Kent, Queen Anne's, and Talbot counties all have requirements in their floodplain ordinances for 2 feet of freeboard. Cambridge, Oxford, and St. Michaels also have 2-foot freeboard requirements. Chestertown has a 1-foot freeboard requirements. Federal guidance recommends 2 or 3 feet of freeboard depending on how critical the structure is to the community.[30]

Long range planning – The Eastern Shore's local governments have several long-range planning processes, including comprehensive planning and hazard mitigation planning, that serve as effective vehicles to address vulnerabilities and challenges that evolve over longer time horizons.

Kent County's 2017 Comprehensive Plan calls for implementing the strategies recommended by the county's climate change and sea level rise vulnerability assessment.

Talbot County's 2016 Comprehensive Plan encourages the County to "research and implement plans to improve County resilience in the face of coastal and climate hazards".[31] Talbot County's 2017 Hazard Mitigation Plan has a strong emphasis on community resilience and makes specific recommendations for integrating climate considerations into decision making.

Planning and policy strategies for climate adaptation

Planning – For communities that immediately begin taking proactive steps to address their vulnerabilities, much of climate adaptation is a planning issue. Impacts like sea level rise, extended periods of high temperatures, and extreme precipitation events are phenomena that are increasing gradually but can accumulate over time to cause serious disruption. This 'slow moving crisis' affords communities a window of time in the near-term to plan thoughtfully and consider a broad range of response options that can be implemented as resources and capacity improve. A delay in beginning the planning process, however, may result in the need for communities to take urgent but reactive actions at a later time. The list of options at that time will be limited and costlier.

Planning for adaptation begins with assessing current and future vulnerabilities under a changing climate. Then the community identifies specific community priorities for adaptation and develops strategies for reducing vulnerability and preparing for the impacts that are unavoidable.[32] Table 2 is a helpful guide to

Planning for adaptation begins with assessing current and future vulnerabilities under a changing climate.

[30] Federal Flood Risk Management Standard. https://www.fema.gov/federal-flood-risk-management-standard-ffrms

[31] Talbot County 2016 Comprehensive Plan, Chapter 4 Community Services and Facilities, page 4-7. http://www.talbotcountymd.gov/uploads/File/PlanningPermits/PZ/Comprehensive%20Plan/2016%20Comprehensive%20Plan/4_ComService_CC_8_16_F.pdf

[32] A helpful adaptation planning resource for communities is California's Adaptation Planning Guide: http://resources.ca.gov/docs/climate/01APG_Planning_for_Adaptive_Communities.pdf

Table 2: PRINCIPLES OF CLIMATE CHANGE ADAPTATION

1. Go beyond climate variability and extreme events; address the anticipated impacts of climate change.
2. Incorporate climate change systematically in relevant decision-making processes.
3. Design decision processes to adjust over time in response to changing climate conditions.
4. Avoid measures that result in an increase in vulnerability to changing climate risks.
5. Consider the implications of an adaptation action both over the near- and long-term to ensure an action is effective over time.
6. Avoid adaptations that shift vulnerability from one sector or community to other locations, sectors, or natural systems
7. Ensure that the needs of more-vulnerable populations are addressed.
8. Consistently build adaptive capacity across populations within a community, particularly the most vulnerable.
9. Engage in monitoring and evaluation of climate change adaptation progress.
10. Ensure that climate change adaptation and mitigation actions are consistent with and supportive of each other.

Adapted from the Kresge Foundation's 2016 report *Climate Adaptation: The State of Practice in U.S. Communities*. http://kresge.org/library/climate-adaptation-state-practice-us-communities-full-report.

developing strategies that are comprehensive, complementary, and consistent.

Mapping areas of future flood risk is one of the most important steps for Eastern Shore communities. Flood risk mapping products from FEMA (i.e., digital flood insurance rate maps, or DFIRMs) analyze only historical flood statistics; they do not include additional risks from rising sea levels. One method for understanding future risk is scenario mapping. For example, Kent County's Climate Change & Sea Level Rise Adaptation Report examines three scenarios for future flooding: the 2.1 feet of sea level rise expected by 2050; the 5.7 feet of sea level rise expected by 2100; and the 7.6 feet of inundation expected from a Category 1 hurricane striking in 2050 (2.1 feet of sea level rise plus 5.5 feet of storm surge). In Kent County, it was observed that the '2050 sea level rise plus storm surge' scenario is closely approximated by FEMA's current 0.2% chance (500-year) floodplain. From these mapping and scenario exercises, jurisdictions can **develop sea level rise overlay districts** via their zoning ordinances.[33] An overlay enables geographically targeted construction and development policies that will reduce future risk to residents, businesses, and infrastructure.

In addition to mapping geographic areas of future risk, planners can identify specific communities (neighborhoods, demographic groups, and business sectors), community assets (gathering places, and cultural or heritage sites), and critical infrastructure (hospitals, shelters, water control systems) that may become increasingly vulnerable to flooding or heat-related emergencies. Making a comprehensive assessment of the community will help leaders and planners prioritize investments to prepare and protect residents and community assets in light of future risks.

[33] See pages 40-42 of *Sea Level Rise: Technical Guidance for Dorchester County* (2008) for more discussion of zoning overlays for addressing sea level rise hazards.

Facilities should be designed in anticipation of the future conditions that the structure will encounter during its lifetime.

Policy changes – Communities will benefit from policy changes that protect life and property based on the new understandings of future risks. At a minimum, these policy changes should **encourage more resilient building codes and practices for siting and construction**. Greater risk reduction can be realized by **directing new private development and public investment to less flood-prone areas** of the community.

For example, jurisdictions have authority to designate the extent of the floodplain they wish to regulate via their floodplain ordinances. The minimum standard is to regulate in anticipation of the 1% chance (100-year) flood. Forward-looking jurisdictions around the country are amending floodplain ordinances to prepare for the 0.2% chance (500-year) flood. They are extending their strongest protection measures out to the 500-year floodplain and raising flood protection elevations to the 500-year flood height. These actions prepare buildings, residents, and businesses for the flood conditions that will be likely by 2050, a meaningful time horizon given the duration of many mortgages or loans. Following destructive riverine flooding statewide from Tropical Storm Irene in 2011, Vermont took even greater action to protect life and property in the floodplain. For properties not subject to municipal regulation, the state prohibited new development in the 1% chance (100-year) floodplain.[34]

New construction and substantial improvements to buildings or facilities should be designed in anticipation of the future conditions that the structure will encounter during its lifetime. For the Eastern Shore's local governments, this means that **capital investment plans and maintenance plans should prepare infrastructure for more frequent flooding, higher temperatures and cooling loads, and increased precipitation and stormwater flows**.

The Eastern Shore's local governments should also consider how to reduce risk for vulnerable community groups. Whether it is low income groups who are unable to afford air conditioning or medical care, elderly groups with mobility or health challenges, groups with language barriers, or the agricultural sector which will be challenged to adapt to new crops and growing practices, these community groups will benefit from planning and policy considerations by local governments.

As jurisdictions use planning and policy tools to prepare communities and reduce risk, care should be taken that the interventions and strategies adopted **preserve adaptation options for future generations**. The impacts of climate change may be felt on timelines that are faster or slower than currently expected. As such, adaptation strategies should allow communities the flexibility to accelerate their responses or change course as conditions and the science dictate. Policies and incentives that reduce risky behavior among residents and businesses will build more robust community resilience than those

The impacts of the Eastern Shore's changing climate do not recognize county or municipal borders.

[34] Vermont Agency of Natural Resources, Department of Environmental Conservation. *Vermont Flood Hazard Area and River Corridor Rule*, effective March 1, 2015.

The Eastern Shore Climate Adaptation Partnership is one of the first rural, coastal collaboratives in the country.

that do not curb risk taking. For example, flood insurance subsidies encourage property ownership in riskier, flood prone areas. The Community Rating System, on the other hand, is an incentive program that rewards communities for taking steps to reduce flood risk.

BETTER WITH NEIGHBORS: Regional collaboration for climate adaptation

Climate vulnerabilities reach deep into many aspects of local government operations and the Eastern Shore way of life. The impacts of the Eastern Shore's changing climate do not recognize county or municipal borders. Vulnerabilities that can be expected in Talbot or Caroline counties will be similar to those already identified in Dorchester, Kent, and Queen Anne's counties. These communities share very similar risks with respect to climate change and sea level rise. Episodic flooding and permanent inundation will be a major concern for all counties, though the scale, severity, and timing will vary. Temperature and precipitation extremes will have similar effects on health, agriculture, and infrastructure across the region.

The challenges of addressing these impacts are also similar among Eastern Shore communities. Staff capacity, financial resources, and technical information are limiting factors for all local governments in the region. What is needed is the means to counter these limiting factors, to amplify the efforts of individual jurisdictions, and to expand the capabilities of the region as a whole.

Regional collaboration can achieve desired climate adaptation outcomes at a lower cost and with greater effect. When communities share the same risks and challenges, they can also share the work and benefits of preparing residents, businesses, and infrastructure for the anticipated impacts of climate change. Regional collaboratives are springing up across the country as local leaders recognize the benefits of cooperation and coordination across jurisdictional and departmental boundaries. Regional climate collaboratives have been operating for years in Florida, New Hampshire, and California (Figure 2). Newer collaborations have begun recently in the Boston, Seattle, and Tampa Bay metropolitan regions. Collaboration need not be limited to urban areas. The Sierra Climate Adaptation and Mitigation Partnership (Sierra CAMP) is a collaboration among rural communities in the mountainous, eastern region of California.

Figure 2. A sample of regional climate collaboratives.

The Eastern Shore Climate Adaptation Partnership (ESCAP) is one of the first rural, coastal collaboratives in the country. It was established to harvest the many benefits described in the next section. The ESCAP has the potential to attract funding and resources for this new type of rural assistance and to be a model of collaborative adaptation for other rural, coastal regions around the country.

Benefits of regional collaboration

The Eastern Shore's towns and counties already cooperate on a broad range of issues: higher education at Chesapeake College, economic development through the regional councils, healthcare via the University of Maryland Shore Regional Health network, and emergency management through mutual aid partnerships. Similar regional collaboration to improve climate preparedness can provide towns and counties with greater benefits and outcomes than individual actions. These benefits include: increased access to data and expertise for decision making; cost efficiencies; greater opportunities for grant funding and external resources; greater visibility and influence for the region at the state and federal levels; and greater long-term regional adaptive capacity for addressing vulnerabilities and coping with emergencies.

Sharing capacity and knowledge – Climate change is a complex problem that requires information and skills from a multitude of sources and backgrounds. It also requires cooperation across many local, regional, and state government roles. The Southeast Florida Regional Climate Compact, for example, leverages a broad range of expertise from county staff and regional agencies for specific collaborative projects and workgroups. Drawing on each other's strengths, the Compact produced a regional climate vulnerability assessment as well as unified sea level rise projections. These products give the individual jurisdictions the data they need to conduct their own planning and risk reduction projects.

> Public and private funders are looking for ways to magnify the impact of their investments.

It would be difficult for each of the Eastern Shore's communities individually to collect the data and expertise necessary to comprehensively address their climate vulnerabilities. Indeed, if this happened, there would be duplications of effort and costs across the region. Because jurisdictions share many of the same vulnerabilities and risks, a single joint effort may require less staff and resources than multiple individual efforts. Regional collaboration can "multiply individual impact by facilitating the easy sharing of resources and technical expertise, coordinate adaptation strategies and outreach across jurisdictional boundaries, and allow members to consolidate funding."[35] Sharing data, expertise, and lessons learned will help Eastern Shore communities analyze risks and make decisions more quickly and effectively. The quality of those decisions will improve over time as communities learn from one another and from their joint experience of working together.[36]

> The Eastern Shore's towns and counties already cooperate on a broad range of issues

Like local governments, state and federal partners are looking for ways to amplify the impact of their financial, technical, and human resources. When an agency can meet, communicate, and share resources with several communities through one channel, it makes their work more efficient. That efficiency may

[35] Institute for Sustainable Communities (January 2016). *Regional Governance for Climate Action*. http://www.adaptationclearinghouse.org/resources/regional-governance-for-climate-action.html

[36] Abrash Walton, A., Simpson, M., Rhoades, J., & Daniels, C. (2016). *Local solutions report: Identifying and meeting the needs of local communities adapting to climate change*. Keene, NH: Antioch University New England Center for Climate Preparedness and Community Resilience. http://www.communityresilience-center.org/applied-research/local-solutions-report-2016/

A multi-jurisdictional collaborative like the ESCAP allows funders to target multiple communities with a single investment.

lead to more participation from agencies and greater transfer of knowledge, expertise, funding, and other resources. Often agencies have access to funding that can be applied to local preparedness, resilience, and adaptation projects. Increased interaction and stronger relationships with agency staff via collaborative partnerships may increase the likelihood of that funding flowing to participating local governments.

Grant opportunities and external resources – Local governments have limited financial resources available to address climate vulnerabilities and, therefore, will likely need to rely on grant funding to initiate that work. Public and private funders are looking for ways to magnify the impact of their investments. A multi-jurisdictional collaborative like the ESCAP allows funders to target multiple communities with a single investment. Furthermore, by "demonstrating a broader regional benefit, collaboratives have been able to advance more competitive grant applications than they would have had they applied individually."[37] In 2016, a partnership between the three Virginia cities of Norfolk, Chesapeake, and Newport News received a federal grant for $120 million to adapt to more frequent flooding stemming from sea level rise.[38] In another example, the Los Angeles Regional Collaborative secured funding from the Department of Energy for an extreme temperature study. The members now have neighborhood-scale projections for future average temperatures and changes in the frequency and intensity of extreme heat events.

Cost efficiencies – Regional collaboration may help communities achieve cost savings compared to individual action. For example, a study of rainfall projections for the next 50 years would produce very similar data for each county on the Eastern Shore. Multiple jurisdictions could likely commission a single, regional report at lower total cost than if each had commissioned reports separately. Likewise, hiring a consultant to assist with earning credits in FEMA's Community Rating System may be marginally less costly for two counties than for one.

Shared products have benefits beyond the immediate cost savings that local governments realize. Multijurisdictional coordination may also benefit businesses and contractors who operate in the region. For example, when building standards and permitting requirements are aligned across several jurisdictions, businesses in the region may be able to reduce their compliance costs.

The proactive, leadership posture of regional collaboratives can earn a seat of influence for the region when state or federal governments are developing new policies.

Visibility and influence – Local governments may feel that their voices are not heard at the state and federal levels. This sentiment may ring particularly true for rural communities. A regional collaborative can amplify local concerns and increase the region's visibility by giving "local governments a stronger political voice in their dealings with the state or federal

[37] Georgetown Climate Center (January 2017). *Lessons in Regional Resilience: Case Studies on Regional Climate Collaboratives*. http://www.georgetownclimate.org/reports/lessons-in-regional-resilience.html

[38] Old Dominion University (January 2016). *Virginia Wins $120.5 Million Resilience Grant Spearheaded by Old Dominion University*. https://www.odu.edu/news/2016/1/hud_grant#.WJ4XxvKfUV0

governments."[39] The proactive, leadership posture of regional collaboratives can earn a seat of influence for the region when state or federal governments are developing new policies. "Some regions have used their collaborative to generate comments and recommendations on proposed state programs or legislation, in some cases with successful outcomes in state policy." For example, in California, the Sierra CAMP supported legislation "establishing state policies relating to watershed health and investment in low-income communities".[40] The group also underscored the important economic and resource-related ties between rural and urban areas of the state. Members of the Southeast Florida Regional Climate Change Compact successfully promoted state legislation that enables local governments to identify 'adaptation action areas' in their comprehensive plans. These high-vulnerability areas are now eligible for investment and land-use policy revisions to protect against flooding and sea level rise.

Regional adaptive capacity – Collaboration among the Eastern Shore's towns and counties can lead to greater regional ability than actions taken individually. Inter-jurisdictional and inter-departmental relationships are strengthened through repeated engagement, problem solving, and cooperation. These strengthened relationships are invaluable when disaster strikes, as are the understandings of each other's strengths and vulnerabilities. The practice of mutual aid, well-established in the emergency services profession, can be applied to long-range risk reduction and response as well. The ability to share knowledge and shuttle resources around the region, particularly during and after an emergency, means no one jurisdiction has to shoulder a crisis alone, even a gradually evolving one like the changing climate.

The Eastern Shore Climate Adaptation Partnership's vision is that Eastern Shore's communities are better prepared for, more resilient to, and able to adapt to the impacts of the changing climate and rising sea levels. With similar risks and vulnerabilities across the Eastern Shore and a shared reliance on key transportation routes and the agricultural sector, no one county or community is immune when calamity strikes a neighboring community – let alone when disaster strikes the entire region. Therefore, it makes sense for the region to collectively improve its ability to anticipate and respond to the challenges of its changing climate.

Roles of the Eastern Shore Climate Adaptation Partnership

The ultimate goal is to reduce the risks of loss of life, injury, damage to property, environmental degradation, and disruptions to the economic and social well-being of communities on the Eastern Shore. In order to accomplish this goal, decision makers must have access to relevant and timely information. Those tasked with implementing decisions must have access to the required knowledge, skills, and resources. All parties must be able to communicate effectively with each other, with residents, and with stakeholders. All of these requirements can be addressed through regional collaboration.

Information gathering and sharing – The ESCAP can identify data needs and coordinate the means for obtaining, housing, and sharing that information among members. In some cases, the data needs will be similar for multiple partners and may be obtained more cost effectively than if members acted individually. State and academic partners may be able to streamline access to data, enabling local decision makers to move more quickly towards implementation. As a rural area in close proximity to the Washington, D.C., region, the Eastern Shore has

[39] Institute for Sustainable Communities. September 2015. *Regional Resilience Primer*. http://www.iscvt.org/building-resilient-regions/

[40] Georgetown Climate Center. January 2017. *Lessons in Regional Resilience: Case Studies on Regional Climate Collaboratives*. http://www.georgetownclimate.org/reports/lessons-in-regional-resilience.html

the opportunity to access substantial expertise and technical resources from many sources within the federal government. The ESCAP is already attracting the attention of some of these potential partners.

Projections for extreme rainfall events are a specific data need that can be addressed for the region. Rainstorms are projected to be more intense and more frequent for the Mid-Atlantic region. The storm in Ellicott City in July 2016 is an example of extreme rainfall events that could become more common. In hindsight, Ellicott City's stormwater system was undersized for the flows that were produced during the storm. As stormwater managers and engineers design and install new culverts and other conveyances, they will need to know how much rain is likely to fall in the heaviest storm events expected during the life of those projects. Better rainfall intensity and frequency projections can help engineers design the appropriate capacity into stormwater projects, saving communities money in the long term. Precipitation changes will also need to be factored into county watershed implementation plans to ensure that runoff and pollution control practices are achieving performance targets.[41]

Facilitating risk reduction – The ESCAP can assist communities in utilizing existing resources, expanding capacities, and locating additional assistance to reduce risk. Communities will need to consider risk reduction in many areas, coastal flooding being chief among them. Several Eastern Shore counties are already enrolled in FEMA's Community Rating System (CRS), a program that incentivizes local flood risk reduction via discounts on residents' flood insurance premiums. There may be opportunities for work, particularly in flood risk communication, that can be accomplished more efficiently and cost effectively through multi-jurisdiction collaboration. For communities that are not yet enrolled in the CRS, it may be possible to provide enrollment assistance via a circuit rider or other cost effective means.

Risk reduction will also be necessary in the areas of public health, economic stability, and in the agricultural sector. The ESCAP can facilitate the targeting of specific risks and, through state and academic partners, bring in the expertise and resources needed to prepare and to protect human, economic, and environmental health.

Communication – Residents, business owners, and elected leaders will require information on changing risks, strategies for preparedness, and the progress being made. The ESCAP can facilitate educational events for residents, workshops for municipal and county staff, and briefings or seminars for elected leaders.

The Eastern Shore can become a national model of effective planning and preparedness for climate change.

A model for rural adaptation – With few examples of collaborative adaptation in rural areas, the Eastern Shore can become a national model of effective planning and preparedness for climate change. The expertise that is developed within the region would be valuable to many of the other 284 rural, coastal counties[42] in the United States. By becoming a national model for rural adaptation, the ESCAP may be able to bring additional attention, influence, and funding to the region for climate preparedness efforts.

[41] The ESCAP and the University of Maryland have a grant application pending for this research. All seven municipal and county governments provided letters of support, as well as several state partners, increasing the competitiveness of the application.

[42] The number of rural, coastal counties was calculated using the US Department of Agriculture's list of rural counties and the National Oceanic & Atmospheric Administration's list of coastal counties.

RECOMMENDATIONS

This paper has presented two main arguments: 1) that Eastern Shore communities should prioritize climate adaptation, and 2) that regional collaboration to address shared risks offers substantial benefits over action taken individually by jurisdictions. The following recommendations are offered as a pathway for implementation.

1) Identify and support local champions of climate adaptation

The first step local governments can take in prioritizing climate adaptation is to designate key staff to be leaders, educators, and catalysts for comprehensive responses to climate risks and vulnerabilities. The staff who already participate in the Eastern Shore Climate Adaptation Partnership are prime candidates to lead their community's efforts. The ESCAP serves as a support mechanism for these champions by providing information, access to technical assistance and resources, and the support of fellow champions in neighboring communities. The ESCAP can help the champions develop climate adaptation strategies for their communities and support cooperation among the champions for coordinated, regional strategies.

The champions should be enabled by the highest authorities of local government. They should be allocated resources to improve the understanding of how climate change will affect the community and how to prepare and protect the community. They should be encouraged to engage key community stakeholders, neighboring communities, and adaptation experts in the region, the state, and nationally.[43] Champions should work across silos and sectors to 1) increase the understanding of local climate risks; 2) assemble stakeholders within and outside of local government; and 3) enable all functions and levels of local government to incorporate climate adaptation into planning and operations.

2) Engage collaborative partnerships

Local governments should encourage their champions, staff, and elected leaders to create and strengthen partnerships with neighboring jurisdictions as well as with regional, state, federal, academic, nonprofit, and private partners. The ESCAP was established to facilitate collaborative learning, projects, and communication in order to assist communities and the region in addressing climate vulnerabilities and reducing risk. The ESCAP has a capable membership and can assist local governments in three key ways:

1. Assist communities in utilizing existing resources, expanding capacities, and locating additional assistance to reduce risk, and to prepare and to protect human, economic, and environmental health.
2. Collect, house, and share information among members.
3. Educate members, residents, and elected leaders on changing risks, potential adaptation strategies, and the ESCAP's work.

[43] For more information on supporting local champions, see: Philip, Alexandra (2014). *Sustaining Champions of Climate Adaptation in Coastal Communities: A Northern New England Study*. New Hampshire Sea Grant. Publication number UNHMP-R-SG-14-20. http://seagrant.noaa.gov/LinkClick.aspx?link=https%3a%2f%2fseagrant.unh.edu%2fsites%2fseagrant.unh.edu%2ffiles%2fmedia%2fpdfs%2fextension%2fclimate_champions_2014.pdf&tabid=268&portalid=0&mid=715

The ESCAP is already attracting the attention of potential resource and assistance providers from across the state and the country. These providers are eager to bring their expertise and resources to the Eastern Shore. In particular, some organizations specializing in adaptation are beginning to realize the critical need for assistance in rural areas. They are looking for organized collaboratives like the ESCAP to share their knowledge with and to help give voice to rural communities on the front line of climate change. The ESCAP should leverage these opportunities.

The ESCAP is already attracting the attention of potential resource and assistance providers from across the state and the country.

Other partnerships and networks stand ready to assist local governments in various aspects of risk reduction. These include the Adaptation & Response Working Group of the Maryland Commission on Climate Change, the Maryland Resiliency Partnership, and the Maryland/District of Columbia Silver Jackets Program hosted by the U.S. Army Corps of Engineers.

3) Integrate climate adaptation strategies

Informed by their champions and ESCAP representatives, local governments should next commit to "mainstreaming" climate adaptation strategies into planning processes, policies, and operations. The community's comprehensive plan is an effective place to make such a commitment and provide a vision for how the community intends to become prepared for, resilient to, and able to adapt to their changing climate. Specific strategies and actions can be implemented alongside the community's other priorities via traditional governing tools. These tools include but are not limited to capital investment plans, hazard mitigation plans, land use ordinances, floodplain ordinances, Critical Area ordinances, building codes, stormwater management, and watershed implementation plans. Specific examples of steps that communities can consider to prepare and protect lives and property are:

- Include a Climate Adaptation chapter or Coastal Resilience chapter in local **comprehensive plans** that identifies risk reduction priorities and strategies.[44]
- Incorporate climate considerations into **capital investment plans** as well as in the design and maintenance of long-lived infrastructure and facilities.
- Use **hazard mitigation plans** to identify and address changing climate risks including nuisance flooding, storm tides, extreme precipitation events, extended periods of high heat, and public health threats.
- Develop science-based **climate planning scenarios** to assist planning and decision making.
- Update **floodplain and stormwater ordinances** with greater margins of safety against the risks associated with sea level rise and increased intensity of precipitation events. Account for intensifying precipitation in watershed implementation plans (WIPs), where projects that provide flood protection benefits can also improve water quality and earn the community best management practice credit.
- Adopt Maryland's CoastSmart Construction Guidelines for siting and construction of infrastructure and development projects.

[44] The City of Keene, New Hampshire integrated climate change into their Comprehensive Master Plan in 2010. See pages 65-68: https://www.ci.keene.nh.us/departments/planning/keene-comprehensive-master-plan.

In 2007, Marin County, California also incorporated responses to climate change in their comprehensive Countywide Plan. See Chapters 1.3, 2.7, and 3.6: http://www.marincounty.org/depts/cd/divisions/planning/2007-marin-countywide-plan/plans-and-documents

- Use **pre-disaster recovery planning** to identify adaptation and resilience projects that may be paid for with funds from a presidential disaster declaration (Hurricane Sandy recovery funds were allowed to be used on projects that increased resilience, rather than rebuilding to pre-disaster specifications).

The ESCAP can coordinate and amplify the voices of the Eastern Shore's rural communities.

Peer learning through the ESCAP will make developing these strategies easier. The ESCAP can identify useful models from around the country and connect towns and counties to technical assistance and funding and to each other.

4) Encourage the state to expand support for local adaptation

The Eastern Shore Climate Adaptation Partnership is a convenient and effective venue for local governments and the state to interface. The ESCAP can coordinate and amplify the voices of the Eastern Shore's rural communities in advocating for technical assistance, funding, and policy changes. Maryland's state agencies are well positioned to provide guidance, assistance, resources, and incentives to local governments for climate adaptation. The Department of Natural Resources (DNR) provides Community Resiliency grants and technical assistance to help local governments address flooding, storm events, and sea level rise. DNR also offers trainings and workshops for local planners, emergency managers, and others to learn about adaptation and resilience strategies. Maryland's Emergency Management Agency provides grants to local governments for hazard mitigation planning. In a report for Maryland's Adaptation & Response Working Group, the Georgetown Climate Center identified seven ways[45] that the state can support local adaptation and resilience:

- Establish risk-based climate change projections that provide a baseline for state and local decision making.
- Provide technical assistance and build local capacity.
- Use state funding programs as a carrot to encourage local adaptation.
- Provide funding or financing to support private adaptation.
- Require or encourage local governments to consider climate change in local plans.
- Ensure equity in adaptation efforts at all levels of government.
- Protect cultural and historic resources.

Maryland's state agencies have already begun incorporating climate adaptation into their planning, decision making, and operations. In the process, the state has generated experience and products that can be useful to local governments. Local governments

There is a compelling case to be made to both private and public funders that the ESCAP can be a model for climate adaptation in rural, coastal regions of the country.

and the ESCAP should request that state agencies develop guidance for addressing climate in local planning, budgeting, emergency management, public health, natural resource management, facilities

[45] Georgetown Climate Center (2016). *Recommendations for the Maryland Adaptation and Response Working Group*. http://www.georgetownclimate.org/reports/adaptation-policy-considerations-for-the-maryland-commission-on-climate-change.html

management and maintenance, and other areas of operations. Towns, counties, and the region can serve as pilot areas for refining these guidance and planning products from the state.

Furthermore, local and regional voices should encourage the state to develop incentives that would accelerate local adaptation. One possible incentive would be to set specific minimum criteria (e.g. climate risk informed floodplain ordinances, adoption of CoastSmart Construction Guidelines) for addressing climate vulnerabilities. Once the criteria are met, these communities would be eligible for dedicated adaptation funding. Tools (e.g. model ordinances, mapping services, and risk assessment workshops) could be made available to assist communities in meeting those initial minimum criteria at a lower cost to the community. Again, the ESCAP communities can be pilot areas for testing and refining the incentive programs.

5) Move the ESCAP toward a sustainable funding and governance model

Currently, the ESCAP is organized with backbone support from the Eastern Shore Land Conservancy, under the guidance and input of its members. The ESCAP does not yet have a dedicated source of funding. Its long-term viability would be improved by a multi-year funding program. Federal grant programs have existed for the last several years to support regionally collaborative climate partnerships. These programs often require local matching funds. Private foundations also support some regional collaboratives, typically in urban areas. There is a compelling case to be made to both private and public funders that the ESCAP can be a model for climate adaptation in rural, coastal regions of the country. The case would be strengthened by committed support from local governments.

As the ESCAP matures, it will no doubt become necessary to further refine decision making practices and its governance structure. There are several models around the country for regional collaboration ranging from informal, voluntary partnerships like the ESCAP to legally established bodies with specific delegated authorities. Each model along this spectrum has benefits and drawbacks.[46] Should the region decide that a tighter partnership would be beneficial, there are a number of experts and resources available[47] to identify models and structures that are appropriate for the goals and values of the Eastern Shore's communities.

Maryland's Eastern Shore has a long history of meeting change and adapting to new conditions.

CONCLUSION

Maryland's Eastern Shore has a long history of meeting change and adapting to new conditions. The region is experiencing many new challenges and threats related to the changing climate. Many of the impacts (such as flooding, health emergencies, agricultural losses, and economic disruption) will be felt locally and chronically. These challenges urgently demand the sustained attention of the region's local governments. Residents overwhelmingly want their local governments to take steps to prepare for sea level rise and to protect against the other impacts of climate change. It is urgent that planning, preparedness, and adaptation actions begin now in order to avoid the costs of inaction and to reduce the debilitating disruptions and expenses of post-disaster recovery. When communities start preparing now, they have

[46] Institute for Sustainable Communities (January 2016). *Regional Governance for Climate Action*. http://www.adaptationclearinghouse.org/resources/regional-governance-for-climate-action.html

[47] For example, the Georgetown Climate Center, Antioch University's Center for Climate Preparedness & Community Resilience, the Institute for Sustainable Communities, and others.

effective and beneficial strategies available to them, while delaying will reduce options and increase costs. Collaboration among towns, counties, the state, and the region's academic and nonprofit institutions can be a cost-effective means of developing and implementing adaptation strategies. The Eastern Shore Climate Adaptation Partnership is an existing, collaborative framework that will help the region's towns and counties become prepared for, resilient to, and able to adapt to the impacts of climate change. The ESCAP is an effective venue for state agencies and other partners to provide assistance and share resources with local governments. The ESCAP can amplify the voice of the Eastern Shore in state and federal arenas in calling for greater support of local adaptation. Through the ESCAP, the Eastern Shore region is poised to act and to serve as a model for how other rural regions around the country can organize, attract resources, adapt to climate change, and build a stronger rural voice.