

# Advancing Resilience-Supportive Economic Development on Virginia's Eastern Shore

January 2018

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This report was prepared by the Environmental Finance Center at the University of Maryland College Park, with funding from the US EPA Chesapeake Bay Program Office. EFC would like to thank the following individuals for their input and review: Mark Bershatsky, DC Net Impact; Cristina Carollo, The Nature Conservancy; Shannon Cunniff, Environmental Defense Fund; Zoe Johnson, NOAA; and Brad Rogers, Moreland Capital Advisors. We also wish to thank Curtis Smith and Shannon Alexander of the Accomack-Northampton Planning District Commission for their input and guidance.

## About the Environmental Finance Center

The Environmental Finance Center (EFC) at the University of Maryland is part of a network of university-based centers across the country that works to advance finance solutions to local environmental challenges. Our focus is protecting natural resources by strengthening the capacity of local decision-makers to analyze environmental problems, develop effective methods of financing environmental efforts, and build consensus to catalyze action. Our goal is to equip communities with the knowledge and tools they need to create more sustainable environments, more resilient societies, and more robust economies. The Environmental Finance Center is housed within the School of Architecture, Preservation and Planning.



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# 1. Executive Summary

## Introduction

Virginia's Eastern Shore is a 70-mile-long stretch of land located on the Delmarva Peninsula, bounded by Maryland to the north, the Atlantic Ocean to the east, and the Chesapeake Bay to the west and south. Comprising the counties of Accomack and Northampton, the Eastern Shore covers 695 square miles<sup>1</sup> and is home to 45,000 people.<sup>2</sup> It is a predominantly rural region – with a population density nearly 75% below the statewide average<sup>3</sup> – known for chicken and soybean farms and for miles of pristine beaches and coastal wetlands, much of which is preserved in the Chincoteague National Wildlife Refuge. Like most of the Delmarva Peninsula, Virginia's Eastern Shore's topography is predominantly low and flat.

As a low-lying coastal region, the Eastern Shore is vulnerable to the impacts of a changing climate, especially shoreline erosion and recurrent flooding due to increasingly intense rain events, sea level rise, and higher storm surges. The Virginia Institute of Marine Sciences (VIMS) has projected that the region may experience 4.5 to 7 feet of sea level rise by 2100, more than three times higher than the global average.<sup>4</sup> A moderate projection of 1.5 feet of sea level rise and 3-foot storm surge over the coming 30 to 50 years would put an estimated 41% of Accomack County and 46% of Northampton County at risk of increased and more frequent flooding, impacting 3% of developed areas and a total of 370 miles of roadways.<sup>5</sup>

These impacts threaten the safety of the region's residents and the integrity of critical infrastructure (transportation, communications, water, wastewater). They could also undermine the foundation of the region's economic viability. Under the leadership of the Accomack-Northampton Planning District Commission (A-NPDC), the Eastern Shore has articulated goals for growing its economy around core industry clusters of agriculture, tourism aerospace and defense, and entrepreneurial development.<sup>6</sup> Yet all of these plans could be thwarted without concerted and proactive efforts to reduce the region's vulnerability to climate impacts.

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<sup>1</sup> U.S. Geological Survey. 1994. *USGS Water-Supply Paper 2401: Hydrogeology and Analysis of the Ground-Water-Flow System of the Eastern Shore, Virginia*. Available: <https://pubs.usgs.gov/wsp/2401/report.pdf>

<sup>2</sup> U.S. Census Bureau, 2011-2015 American Community Survey 5-Year Estimates.

<sup>3</sup> Average population density in Accomack and Northampton Counties is 66 people per square mile, compared to 202 for Virginia as a whole. Source: U.S. Census Bureau, 2011-2015 American Community Survey 5-Year Estimates.

<sup>4</sup> Research by the Virginia Institute of Marine Sciences Center for Coastal Resource Management, cited in The Nature Conservancy.

"Coastal Resilience: Virginia Eastern Shore." Accessed 6/20/17: <http://coastalresilience.org/project/virginia-eastern-shore/>

<sup>5</sup> Virginia Institute of Marine Science Center for Coastal Resources Management. January 2013. *Recurrent Flooding Study for Tidewater Virginia*. Available: [http://ccrm.vims.edu/recurrent\\_flooding/Recurrent\\_Flooding\\_Study\\_web.pdf](http://ccrm.vims.edu/recurrent_flooding/Recurrent_Flooding_Study_web.pdf)

<sup>6</sup> These goals are set forth in: Accomack-Northampton Planning District Commission. May 2016. *Stronger Economies Together: Regional Economic Development Plan, 2017-2022*.

The Eastern Shore's successful response to climate threats will depend on the region's ability to mobilize support and resources around concrete adaptation and mitigation actions (available options were summarized in recent reports by the Virginia Institute of Marine Sciences,<sup>7</sup> and The Nature Conservancy<sup>8</sup>). Additionally, it will be important to integrate resilience and economic development strategies, so that investments in economic growth are also supportive of the region's adaptation and mitigation efforts. This will achieve synergies and efficiencies, enabling greater levels of implementation with available funds. Success in both these arenas will require cultivating capacity to effectively plan for and attract investment in resilient-ready economic development initiatives and infrastructure.

The Eastern Shore's successful response to climate threats will depend on the region's ability to integrate resilience and economic development strategies, so that investments in economic growth are also supportive of the region's adaptation and mitigation needs.

### **Report background and structure**

It is in the above context that the Chesapeake Bay Program Office commissioned the University of Maryland Environmental Finance Center (EFC) to assess the vulnerability of the Eastern Shore's economic development priorities in light of climate hazards, and to recommend strategies for advancing and financing resilience-supportive economic development in the region. These strategies build on both the Eastern Shore's identified economic development priorities and on the EFC's previous work in other coastal communities to identify connections between stormwater management, water quality, and community resilience finance.<sup>9</sup> It also integrates concepts from the EFC's emerging work to accelerate public and private investment in projects that will help communities become more climate resilient, and it incorporates feedback from resilience finance experts.

To conduct this analysis, the EFC interviewed A-NPDC representatives; conducted desktop research into climate threats in the region; reviewed local and regional economic development plans; and inventoried major regional assets that could be leveraged in support of resilience-focused economic growth strategies. Our findings and recommendations are organized into three sections. The first (Section 2) reviews the Eastern Shore's major economic assets and economic development priorities, as well as

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<sup>7</sup> Virginia Institute of Marine Science Center for Coastal Resources Management. January 2013. *Recurrent Flooding Study for Tidewater Virginia*. Available: [http://ccrm.vims.edu/recurrent\\_flooding/Recurrent\\_Flooding\\_Study\\_web.pdf](http://ccrm.vims.edu/recurrent_flooding/Recurrent_Flooding_Study_web.pdf)

<sup>8</sup> The Nature Conservancy in Virginia. June 2011. *The Eastern Shore of Virginia: Strategies for Adapting to Climate Change*. Available: [http://www.esf.edu/glrc/library/documents/VirginiaEasternShoreCCAdaptationReportFinal\\_2011.pdf](http://www.esf.edu/glrc/library/documents/VirginiaEasternShoreCCAdaptationReportFinal_2011.pdf)

<sup>9</sup> See: University of Maryland Environmental Finance Center. June 2016. *Financing A Resilient Annapolis, Maryland*. and University of Maryland Environmental Finance Center. June 2015. *Final Report: Providing Technical Assistance to Chesapeake Bay Communities*.

their vulnerability to climate impacts. Section 3 assesses the region's capacity to plan for and finance resilient-ready economic development initiatives and resilience infrastructure.

Finally, in Section 4 we present recommendations for advancing integrated economic development and community resilience planning and financing on Virginia's Eastern Shore. These include high-level, foundational approaches, as well as specific economic development opportunities that would grow the region's economy and support its resilience needs. These strategies could better position Virginia's Eastern Shore to be environmentally and economically resilient in the face of natural disasters or other shocks.

### **Summary findings and recommendations**

Virginia's Eastern Shore is vulnerable to the impacts of a changing climate, including more frequent and intense storms, greater levels of precipitation, increased storm surge, and coastal inundation. Particularly broad-reaching threats include potential damage to the region's infrastructure assets, as well as impacts to the area's groundwater supplies. These impacts would affect residents' safety and wellbeing as well as the region's economic prosperity and future economic development plans.

Despite these challenges, the Eastern Shore also enjoys a set of assets and competitive strengths that could be leveraged to both improve the region's adaptive capacity and to accelerate resilience-supportive economic growth. The region has embraced an asset-based approach to fostering economic growth, particularly via the recent *Stronger Economies Together (SET)* regional economic development plan. Through the *SET* planning process and other ongoing initiatives, Virginia's Eastern Shore has demonstrated an aptitude and capacity for regional collaboration. This capacity is essential for building community resilience, given the financial, technical and geographic scale of the challenge. The region's efforts to coalesce stakeholders around economic development priorities lays critical groundwork for advancing a regional approach to resilience planning and finance.

Virginia's Eastern Shore has many of the conditions it needs to successfully implement this type of collaborative, regional approach. It has strong institutional leadership and planning capacity, and it enjoys active engagement on economic and adaptation issues from citizens and diverse public and private partners including the local business community. Where there is room for additional capacity building is in the region's financing institutions and mechanisms. Needs include the ability to raise and leverage revenue at a scale commensurate with the financing challenge, as well as the flexibility to employ financing approaches that maximize the efficiency of investments. There is also opportunity for

Virginia's Eastern Shore to engage the private sector to a greater degree. Though infrastructure planning and finance is ultimately the responsibility of the public sector, the scale and complexity of the resilience challenge necessitates that all resources – public and private – be utilized in support of solutions.

These findings lead us to make the following recommendations. Decision to pursue these or any other strategies will necessarily be made at the regional level, ideally through a broadly representative stakeholder engagement process that is guided by a lead agency which can champion change. Specific implementation steps should be developed after this locally-driven process identifies the broad strategies it wishes to pursue.

***Develop a regional resilience infrastructure financing and implementation plan.***

Considerable research and planning has been conducted to characterize the extent of climate impacts on Virginia's Eastern Shore and to identify adaptation and mitigation options – as well as to lay out economic development opportunities. However, there is a need to better integrate economic development and climate readiness, as well as to map out specific implementation actions and investment strategies in order to achieve goals. A comprehensive resilience infrastructure financing and implementation plan would function as a roadmap for effectively coupling economic and adaptation efforts, a critical need given the fact that the ability to bounce back after shocks depends not just on effective individual infrastructure assets but on the performance of the overall economic system.<sup>10</sup> The plan would also lay the groundwork for developing a portfolio of integrated, investment-ready resilience infrastructure projects – an approach that would enable the region to leverage its strengths to meet its needs.

***Authorize a regional financing facility to advance financing system innovations and accelerate investment in resilience infrastructure.*** The scale and nature of the resilience challenge presents an unprecedented hurdle for many local jurisdictions, especially those in rural regions like Virginia's Eastern Shore. Meeting the challenge requires not only regional coordination but also creative financing approaches. One such idea is the development of a regional financing entity or facility. This entity would be charged with prioritizing, coordinating and implementing resilience infrastructure projects across the region. At a basic level, this institution could facilitate the coordination of existing infrastructure planning and investments across the region, in order to find efficiencies. At a more ambitious level, the entity could develop and administer new regional revenue mechanisms, consolidate water management planning and financing programs (hazard mitigation, stormwater, water quality), and broker public-private partnerships for large-

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<sup>10</sup> Brugmann, J. 2011. *Financing the Resilient City*. ICLEI White Paper.

scale infrastructure projects. The entity could also manage innovative financing mechanisms such as infrastructure banking.

***Invest in resilience-supportive economic development opportunities within key sectors that leverage the region's competitive advantages.*** The *SET* regional economic development plan suggests focusing economic development activity within the region's four "anchor industries" of aerospace and defense; agribusiness and food processing; arts, entertainment and recreation, and visitor industries; and entrepreneurship development. We suggest further targeting economic development investments in opportunities that will not only build on the region's unique assets to spur economic growth but also shore up the region's climate resilience and overall adaptive capacity. We suggest opportunities within the areas of aquaculture, sustainable agriculture, natural shoreline protection, and navigable waterways.

***Catalyze the development of a resilience technologies research and development hub.*** Virginia's Eastern Shore has developed a reputation for research savvy and technology development related to aerospace, defense, and coastal ecosystem science. We suggest that this social capital offers an opportunity to build a new industry hub related to resilience technologies and innovation. Catalyzing entrepreneurial and business development in this field would not only attract skilled workers and economic activity to the region, it would offer the opportunity to use Virginia's Eastern Shore as proving ground for innovative resilience practices and projects – thereby building the region's resilience as well as its reputation as a national leader in this increasingly-important space.

## 2. Vulnerability Assessment

To identify opportunities to integrate economic development and resilience initiatives on Virginia's Eastern Shore, it is helpful to understand the region's vulnerability to climate impacts – particularly those that will adversely affect the area's core economic assets and economic development plans. Below, we briefly characterize the anticipated regional effects of climate change, review the Eastern Shore's major economic strengths and economic development goals, and discuss how these priorities may be affected by a changing climate.

### Anticipated climate impacts

Coastal and low-lying, Virginia's Eastern Shore is prone to storms, shoreline erosion, flooding, and damage from high winds. The region's identity has been shaped both literally and figuratively by major storms occurring throughout its history, from the first recorded hurricane in 1635 to the infamous 1933 Chesapeake-Potomac hurricane and more recent events such as Hurricane Irene in 2011 and Superstorm Sandy in 2012.<sup>11</sup>

A changing climate will likely intensify the region's vulnerability to extreme weather events, as sea levels are expected to rise and storms are expected to become more severe and frequent. Recent research indicates that the occurrence of extreme precipitation events in Virginia has already been increasing, with a 33% rise between 1948 and 2011.<sup>12</sup> And the biggest storms have been getting bigger, producing roughly 11% more precipitation during that same time frame.<sup>13</sup>

These trends are expected to continue and even accelerate. After reviewing available projections for factors that contribute to flooding (sea level rise, storm severity, and precipitation levels), the Virginia Institute of Marine Science (VIMS) concluded that the "frequency and severity of flooding events is only likely to increase" in Virginia's Tidewater region.<sup>14</sup> VIMS researchers project that the region may experience 4.5 to 7 feet of sea level rise by 2100, more than three times greater than the global average.<sup>15</sup> Exacerbating sea level rise is the expected land subsidence of the Delmarva Peninsula. Anticipated impacts

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<sup>11</sup> National Weather Service. "The Hurricane History of Central and Eastern Virginia." Available: <https://www.weather.gov/media/akq/miscNEWS/hurricanehistory.pdf>

<sup>12</sup> Madsen and Wilcox 2012, cited in Virginia Institute of Marine Science, Center for Coastal Resources Management. January 2013.

*Recurrent Flooding Study for Tidewater Virginia*. Available: [http://ccrm.vims.edu/recurrent\\_flooding/Recurrent\\_Flooding\\_Study\\_web.pdf](http://ccrm.vims.edu/recurrent_flooding/Recurrent_Flooding_Study_web.pdf)

<sup>13</sup> Madsen and Wilcox 2012, cited in Virginia Institute of Marine Science, Center for Coastal Resources Management. January 2013.

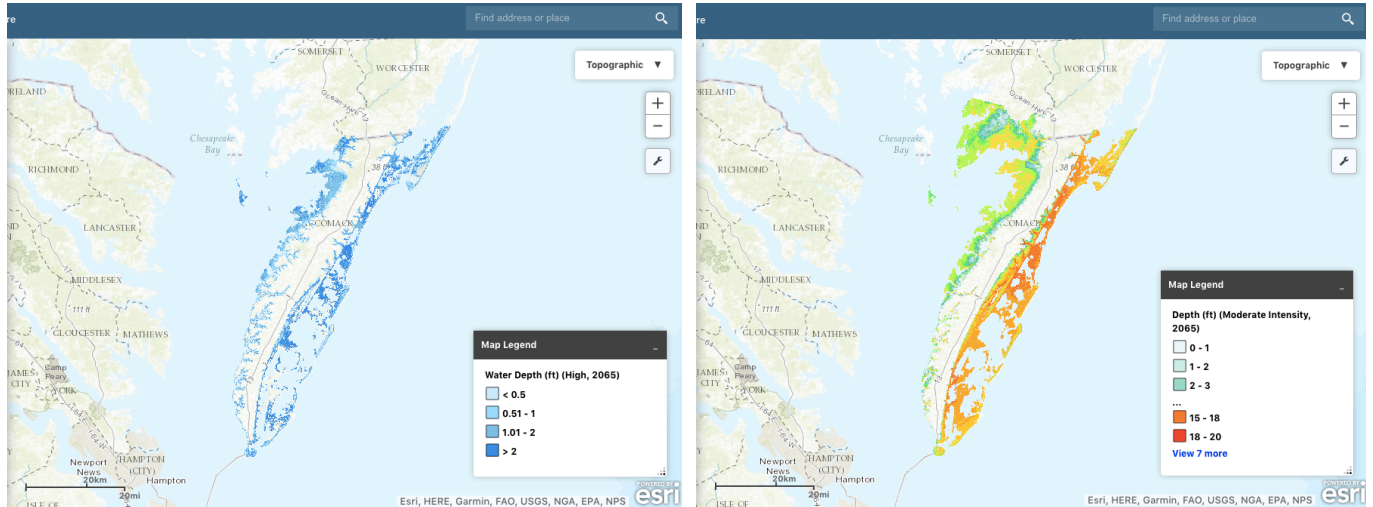
*Recurrent Flooding Study for Tidewater Virginia*. Available: [http://ccrm.vims.edu/recurrent\\_flooding/Recurrent\\_Flooding\\_Study\\_web.pdf](http://ccrm.vims.edu/recurrent_flooding/Recurrent_Flooding_Study_web.pdf)

<sup>14</sup> Virginia Institute of Marine Science Center for Coastal Resources Management. January 2013. *Recurrent Flooding Study for Tidewater Virginia*. Available: [http://ccrm.vims.edu/recurrent\\_flooding/Recurrent\\_Flooding\\_Study\\_web.pdf](http://ccrm.vims.edu/recurrent_flooding/Recurrent_Flooding_Study_web.pdf)

<sup>15</sup> Research by the Virginia Institute of Marine Sciences Center for Coastal Resource Management, cited in The Nature Conservancy. "Coastal Resilience: Virginia Eastern Shore." Accessed 6/20/17: <http://coastalresilience.org/project/virginia-eastern-shore/>



of these trends include not only coastal inundation and recurrent flooding, but also shoreline erosion, saltwater intrusion into groundwater sources and drainage ditches, increased water temperatures, rising ocean acidity, habitat degradation, and species loss.



Figures 1 and 2. Projected flood and sea level rise, Virginia Eastern Shore. Left image: basic inundation, climate year 2065, high scenario. Right: storm surge, map values displayed as water depth, climate year 2065, medium storm type. Source: Virginia Eastern Shore Coastal Resilience Mapping and Decision Support Tool, The Nature Conservancy. Available: <http://coastalresilience.org/project/virginia-eastern-shore/>

The areas most vulnerable to these impacts are, predictably, those located closest to the coast. Figures 1 and 2, above, illustrate the potential impacts from coastal inundation (left) and storm surge (right) for scenarios modeled for the year 2065.

Using moderate projections of 1.5 feet of sea level rise and 3-foot storm surges over a 30 to 50-year time horizon, VIMS found that 41% of Accomack County and 46% of Northampton County are at risk of increased and more frequent flooding. This would impact 3% of total developed areas and a total of 370 miles of roadways (see Table 1).<sup>16</sup>

**Table 1. Potential for increased and more frequent flooding in Virginia’s Eastern Shore counties over coming 30-50 years, with moderate assumptions (1.5’ sea level rise, 3’ storm surge)\***

	Percent of total area potentially at risk of increased and more frequent flooding	Percent of <i>developed</i> area potentially at risk of increased and more frequent flooding	Road miles potentially flooded
<b>Accomack County</b>	41%	2%	326 mi
<b>Northampton County</b>	46%	1%	44 mi

Source: Virginia Institute of Marine Science Center for Coastal Resources Management. January 2013. *Recurrent Flooding Study for Tidewater Virginia*. Available: [http://ccrm.vims.edu/recurrent\\_flooding/Recurrent\\_Flooding\\_Study\\_web.pdf](http://ccrm.vims.edu/recurrent_flooding/Recurrent_Flooding_Study_web.pdf)

\*See original source for inputs, assumptions, and further details.

<sup>16</sup> Virginia Institute of Marine Science Center for Coastal Resources Management. January 2013. *Recurrent Flooding Study for Tidewater Virginia*. Available: [http://ccrm.vims.edu/recurrent\\_flooding/Recurrent\\_Flooding\\_Study\\_web.pdf](http://ccrm.vims.edu/recurrent_flooding/Recurrent_Flooding_Study_web.pdf)

Impacts are expected to be more severe on the region's developed islands. Tangier Island, for example, a fishing community in the Chesapeake Bay, lies nearly entirely at sea level and 90% of its buildings are located within the 100-year floodplain.<sup>17</sup> Over the coming 50-100 years, Tangier is projected to lose 99% of infrastructure and residences due to inundation and shoreline erosion.<sup>18</sup> The better-known Chincoteague Island, also in Accomack County but on the Atlantic side of the peninsula, is less at risk but also vulnerable to shoreline erosion and sea level rise. Because this island is home to the Town of Chincoteague, the gateway to the Chincoteague National Wildlife Refuge, these impacts may disproportionately affect the region's economic health.

Moderating these impacts are the region's extensive coastal wetlands and 60 miles of undeveloped barrier islands,<sup>19</sup> much of which is permanently protected through the National Park Service, the US Fish and Wildlife Service, and The Nature Conservancy. These vital assets absorb high winds, flood waters, and eroding waves, thereby buffering the mainland from the most severe climate impacts. Nevertheless, there is little question that the region will experience increasingly severe climate change impacts in coming decades, and that these impacts will influence the region's long-term economic development goals and policies.

### **Key industry sectors and economic development priorities**

Many of the qualities that make Virginia's Eastern Shore vulnerable to weather events are the same qualities that make the region a desirable place to live, work, and recreate – proximity to the ocean, level topography, and charming coastal towns. The region's rich aquatic resources, access to major markets and urban centers, and acres of productive farmland have long sustained the traditional natural-resource based industries of fishing and agriculture. The Eastern Shore is known for its corn, soybean and chicken farms, and the region's productive coastal waters support the "largest clam aquaculture industry in the country," an industry that generates an estimated \$60 million in economic impact annually.<sup>20</sup>

In addition, the region's beauty, recreational opportunities, and proximity to major population centers (Washington DC, Baltimore, Philadelphia, Norfolk) make it a major

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<sup>17</sup> Virginia Institute of Marine Science Center for Coastal Resources Management. January 2013. *Recurrent Flooding Study for Tidewater Virginia*. Available: [http://ccrm.vims.edu/recurrent\\_flooding/Recurrent\\_Flooding\\_Study\\_web.pdf](http://ccrm.vims.edu/recurrent_flooding/Recurrent_Flooding_Study_web.pdf)

<sup>18</sup> Bilkovic, D et al, Virginia Institute of Marine Science. 2009. *Vulnerability of Shallow Tidal Water Habitats in Virginia to Climate Change*. Available: [http://ccrm.vims.edu/research/climate\\_change/COASTALHABITATS\\_FinalReport.pdf](http://ccrm.vims.edu/research/climate_change/COASTALHABITATS_FinalReport.pdf)

<sup>19</sup> The Nature Conservancy. "Coastal Resilience: Virginia Eastern Shore." Accessed 6/20/17: <http://coastalresilience.org/project/virginia-eastern-shore/>

<sup>20</sup> The Nature Conservancy. "Coastal Resilience: Virginia Eastern Shore." Accessed 6/20/17: <http://coastalresilience.org/project/virginia-eastern-shore/>

tourist destination. Visitors flock to the region to enjoy picturesque scenery and activities such as beach-going, boating, birding, and fishing. A major tourist draw is the Chincoteague National Wildlife Refuge, which attracts 1.5 million visits each year and is one of the most heavily visited refuges in the US.<sup>21</sup> The Refuge generates millions of dollars in spending and supports thousands of jobs in the region.<sup>22</sup>

Another major employer and economic driver in the region is the Wallops Flight Facility, a NASA space launch base located on Wallops Island just south of Chincoteague. The facility has an economic impact of \$230 million annually in Virginia alone (\$700 million nationwide) and is the eighth largest employer in the region, supporting over 2,000 jobs, including many well-paid scientist and engineer positions.<sup>23</sup> Further buttressing the Eastern Shore's reputation as a scientific research hub, the region is home to the University of Virginia's Virginia Coast Reserve Long Term Ecological Research program, which seeks to predict how coastal barrier systems will respond to long-term environmental changes in climate, sea level and land use.<sup>24</sup>

These economic assets and core industries are the basis of regional economic development goals articulated in the *Stronger Economies Together (SET)* report, an economic roadmap for Virginia's Eastern Shore. Coordinated by the Accomack-Northampton Planning Development Commission, *SET* was a cooperative regional planning process designed to build on the region's competitive advantages in order to lay out an economic blueprint for its future.<sup>25</sup> The *SET* initiative launched in 2015 and concluded in 2016, with planning and implementation guided by a regional leadership team.<sup>26</sup>

The region's core assets and industries are the basis of the regional economic development plan *Stronger Economies Together*, which lays out an economic blueprint for the region's future.

*SET* articulated economic development priorities within the region's four "anchor economies:"<sup>27</sup> aerospace and defense; agribusiness and food processing; arts,

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<sup>21</sup> US Fish and Wildlife Service. Undated. "Chincoteague National Wildlife Refuge" brochure. Available:

[https://www.fws.gov/uploadedFiles/Region\\_5/NWRS/South\\_Zone/Chincoteague\\_Complex/Chincoteague/ChincoteagueBrochure.pdf](https://www.fws.gov/uploadedFiles/Region_5/NWRS/South_Zone/Chincoteague_Complex/Chincoteague/ChincoteagueBrochure.pdf)

<sup>22</sup> The Nature Conservancy. "Coastal Resilience: Virginia Eastern Shore." Accessed 6/20/17:

<http://coastalresilience.org/project/virginia-eastern-shore/>

<sup>23</sup> NASA. 2010. "Economic Impact of Langley and Wallops." Available: [https://www.nasa.gov/centers/langley/pdf/420356main\\_FS-2010-01-177.pdf](https://www.nasa.gov/centers/langley/pdf/420356main_FS-2010-01-177.pdf)

<sup>24</sup> University of Virginia. "Virginia Coast Reserve Long-Term Ecological Research." Accessed 6/29/17:

<https://www.vcrlter.virginia.edu/home2/>

<sup>25</sup> *Cape Charles Mirror*. 12/31/15. "Stronger Together Initiative (SET): Meeting January 12th." Available:

<http://www.capecharlesmirror.com/news/stronger-economies-together-set-meeting-january-12th/>

<sup>26</sup> Accomack-Northampton Planning District Commission. 12/15/15. "SET Session I: SET Overview and Exploration of Regional Data." Available: <http://www.a-npdc.org/wp-content/uploads/2015/11/SET-Session-I-Summary-Eastern-Shore.pdf>

<sup>27</sup> Accomack-Northampton Planning District Commission. May 2016. *Stronger Economies Together: Regional Economic Development Plan, 2017-2022*.

entertainment and recreation (tourism); and entrepreneurship development.<sup>28</sup> These industries were targeted based on an industry cluster analysis, which found that these sectors have good potential for growth in the region. These four clusters – and the region’s economic development priorities within them – are discussed briefly below. We then provide an assessment of the climate change risks and vulnerabilities associated with each sector.

***Aerospace and defense.*** The NASA Wallops Flight Facility is a major economic driver on Virginia’s Eastern Shore, as described above, and the region has sought to leverage this asset to support growth in the aerospace, aviation and defense cluster. This cluster is growing and expected to continue growing, with a projected 49% increase in atmospheric and space-related jobs between 2012 and 2022 in Virginia.<sup>29</sup>

The Wallops Research Park is an example of the region’s commitment to fostering growth in this sector. Opened in 2015, this industrial park is located just outside the entrance of the Wallops Flight Facility and consists of more than 200 acres of land prepared for private development. More than \$8 million has been invested in infrastructure including water, sewer, stormwater, electric, telecommunications, roads, runways, and concrete pads.<sup>30</sup> Orbital ATK, a company that designs and builds aviation, defense and space systems, recently located a facility in the Wallops Research Park, and Eastern Shore leaders hope that additional enterprises will follow suit. As we address later in the report, the success of the research park also provides a model for how Eastern Shore leaders can incentivize resilience investment across the peninsula.

In addition to investment in the research park, the region is collaborating with state and federal partners to grow the Mid-Atlantic Regional Spaceport, a space launch facility located on NASA property and operated by the Virginia Commercial Space Flight Authority (“Virginia Space”). With \$5.8 million in state funding, a new 3,000-foot runway was constructed at the site in 2017, in order to accommodate unmanned vehicle systems, or drones.<sup>31</sup> The drone industry is a high-growth sector that is projected to create 3,500 jobs and generate \$2.7 billion in economic impact in Virginia between 2015 and 2025.<sup>32</sup>

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<sup>28</sup> Accomack-Northampton Planning District Commission. May 2016. *Stronger Economies Together: Regional Economic Development Plan, 2017-2022*.

<sup>29</sup> Accomack-Northampton Planning District Commission. May 2016. *Stronger Economies Together: Regional Economic Development Plan, 2017-2022*.

<sup>30</sup> Chincoteague Chamber of Commerce. “Accomack County-Wallops Research Park.” Accessed 6/29/17: <http://www.chincoteaguechamber.com/2106-accomack-county-wallops-research-park>

<sup>31</sup> Alexandria News. 5/19/17. “Virginia Opens Unmanned Aircraft Runway on Wallops Island.” Available: <http://www.alexandrianews.org/2017/05/virginia-opens-unmanned-aircraft-runway-on-wallops-island/>

<sup>32</sup> AUVSI. 2013. *The Economic Impact of Unmanned Aircraft Systems Integration in the United States*.

To build on the value and growth potential of the aerospace cluster, *SET* identified the following economic development priorities:

- “Grow the Wallops Complex (NASA Wallops, Virginia Space, and Wallops Research Park) into the nation’s spaceport-of-choice for access to space for the platform spectrum from nano/micosats to small satellites, return space vehicles through medium class orbital missions supporting the nation’s science, national defense and commercial objectives.
- Increase technology development, manufacture, and operations for unmanned aerial, underwater and ground-based system (unmanned systems) in the Eastern Shore of Virginia region. This shall include the full spectrum of activities from design through manufacture, pilot testing, test, and operations. The goal would be to increase the number of local jobs and operational hours by 25% each year from a base year of 2016.”<sup>33</sup>

**Agribusiness and food processing.** Agriculture has long been an economic mainstay of Virginia’s Eastern Shore. Roughly a third of the region (133,000 acres) is in agricultural use, with major crops including corn, soybean, wheat and poultry.<sup>34</sup> The poultry integrator companies Perdue and Tyson are the top two employers in the region.<sup>35</sup> Forestry and viticulture are growing sub-sectors within this cluster, and the region is also a major producer of farmed shellfish. While wild-caught finfish and shellfish harvests have been steadily declining,<sup>36</sup> the Shore’s abundant tidal and coastal waters make it well-suited for raising shellfish in aquaculture beds. Hard clams have become second most valuable crop in the region (after poultry), valued at \$26.8 million in 2012, and the Eastern Shore produces more than a third of the nation’s hard clam supply.<sup>37</sup>

The *SET* plan identified the agribusiness and food processing cluster as “mature” – that is, strong but declining – but saw potential for it to transition to the “star” category: strong and advancing. Jobs in the sector have been decreasing since 1970, as have proceeds from agricultural crop sales, yet that same timeframe saw growth in proceeds from livestock and value-added agricultural products.<sup>38</sup>

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<sup>33</sup> Accomack-Northampton Planning District Commission. May 2016. *Stronger Economies Together: Regional Economic Development Plan, 2017-2022*.

<sup>34</sup> USDA Census of Agriculture. 2012. *County Summary Highlights*.

<sup>35</sup> Accomack-Northampton Planning District Commission. May 2016. *Stronger Economies Together: Regional Economic Development Plan, 2017-2022*.

<sup>36</sup> The Louis Berger Group. 2001. *Chesapeake Bay Bridge-Tunnel Commuter Toll Impact Study*.

<sup>37</sup> Hudson, K et al. 2015. *Virginia Shellfish Aquaculture Situation and Outlook Report: Results of the 2014 Virginia Shellfish Aquaculture Crop Reporting Survey*. cited in Accomack-Northampton Planning District Commission. May 2016. *Stronger Economies Together: Regional Economic Development Plan, 2017-2022*.

<sup>38</sup> US Department of Labor, Bureau of Labor Statistics. 2016. *Occupational Employment and Wages*. Available: <https://www.bls.gov/oes/current/oes452092.htm> and Economic Profile System. 2015. *Farm Business Income 2014.*, both cited in Accomack-Northampton Planning District Commission. May 2016. *Stronger Economies Together: Regional Economic Development Plan, 2017-2022*.

To advance profitability in this cluster, the region is seeking to grow capacity for value-added production and to capture a greater share of markets for regional products. Specific goals for this cluster identified in the *SET* plan include:

- “Develop a value added fresh food marketing cooperative to aggregate and market locally produced aquaculture, produce and viticulture; create an identifiable Eastern Shore brand; increase crop diversity; and increase production and sales by 20% by December 2018. This goal supports and targets small farmers.
- Develop a wholesale production facility supporting larger-scale farmers to add value to crops grown on the Shore and create value-added opportunities for larger-scale farmers with a focus on supporting potato chip production on the Eastern Shore. The final goal is to attract Jimmy Ash potato chip manufacturer to the Eastern Shore.
- Develop a pine sawmill on the Eastern Shore of Virginia by December 2018.
- Equip individuals with appropriate skills to work in the agribusiness and food processing cluster.”<sup>39</sup>

***Arts, entertainment and recreation, and visitor industries.*** The *SET* plan identified the tourism cluster – which includes visitor-related subsectors – as a “star” cluster: strong and growing. According to the Eastern Shore of Virginia Tourism Commission, the Eastern Shore is the second-fastest growing tourism region in the state, with a 25% increase in spending between 2012 and 2017<sup>40</sup> (which followed a 22% rise over the previous five years).<sup>41</sup> Travelers to the area spend more than \$260 million per year in the region and generate \$7 million in tax revenue.<sup>42</sup>

Current tourism promotion efforts in the region are focused on expanding the visitor season from summer to fall and winter, marketing the region to a younger demographic, and building on state initiatives such as the Oyster Trail and the Artisan Trail,<sup>43</sup> both of which tap into a growing trend for tourism tied to local food and craft-made products. In addition to these state marketing programs, the Coastal Virginia Tourism Alliance – a regional coalition founded in 2012 that represents not just the Eastern Shore but also the

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<sup>39</sup> Accomack-Northampton Planning District Commission. May 2016. *Stronger Economies Together: Regional Economic Development Plan, 2017-2022*.

<sup>40</sup> Vaughn, C. 2/16/17. “Tourism brings millions to Virginia Shore.” *DelmarvaNow*. Available: <http://www.delmarvanow.com/story/news/local/virginia/2017/02/16/virginia-eastern-shore-tourism/97939196/>

<sup>41</sup> Accomack-Northampton Planning District Commission. May 2016. *Stronger Economies Together: Regional Economic Development Plan, 2017-2022*.

<sup>42</sup> Vaughn, C. 2/16/17. “Tourism brings millions to Virginia Shore.” *DelmarvaNow*. Available: <http://www.delmarvanow.com/story/news/local/virginia/2017/02/16/virginia-eastern-shore-tourism/97939196/>

<sup>43</sup> Vaughn, C. 2/16/17. “Tourism brings millions to Virginia Shore.” *DelmarvaNow*. Available: <http://www.delmarvanow.com/story/news/local/virginia/2017/02/16/virginia-eastern-shore-tourism/97939196/>

Hampton Roads region<sup>44</sup> – is attempting to articulate “one voice for tourism in the region”<sup>45</sup> and build its brand as a destination.

The region’s economic development plan asserts a strong interest in continuing to grow this industry, including the goal of developing the Eastern Shore as a well-managed tourism destination. Specific ideas for achieving this goal include implementing an ambassadorship, mentorship, and internship program to educate workers and citizens on hospitality and tourism opportunities.

***Foundational and entrepreneurship development.*** The Eastern Shore recognizes that its economic strength depends on the capacity of its residents to innovate, to capitalize on emerging business opportunities, and to be flexible in the face of economic or industry change. It also depends on a healthy ecosystem of institutions and services to support prospective entrepreneurs, such as research, business start-up assistance, community financing, and a culture of knowledge-sharing.

While entrepreneurship development is not an industry sector in itself, the *SET* plan targets it for growth because it underpins all other economic activity, is essential to growth in core and emerging sectors, and provides essential career opportunities for younger workers. Indeed, small businesses represent the vast majority of new ventures nationally, and account for 64% of new private sector jobs created in the United States each year.<sup>46</sup>

The *SET* plan outlined the following four main goals for strengthening the foundation of the region’s economy and its residents’ entrepreneurial savvy:

- “Build an entrepreneurship culture in the region by 2020.
- Increase access to funding from entrepreneurial and Eastern Shore small business efforts to improve our economy.
- Increase market and value-added opportunities for Eastern Shore products and providers.
- Develop affordable and reliable infrastructure to facilitate Eastern Shore businesses.”<sup>47</sup>

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<sup>44</sup> Vergakis, B. “Coastal Va.’ backers seek end to identity crisis.” *The San Diego Tribune*. Available: <http://www.sandiegouniontribune.com/sdut-coastal-va-backers-seek-end-to-identity-crisis-2014mar17-story.html>

<sup>45</sup> Coastal Virginia Tourism Alliance. “About CoVa.” Accessed 7/1/17: <http://visitcova.com/about-cova/>

<sup>46</sup> US Census Bureau. 2010. *Small Business GDP: Update 2002- 2010*.

<sup>47</sup> Accomack-Northampton Planning District Commission. May 2016. *Stronger Economies Together: Regional Economic Development Plan, 2017-2022*.

## **Vulnerability of economic development priorities to climate impacts**

The Eastern Shore's competitive strengths and asset-based economic development plans lay the groundwork for future growth and prosperity – and for the region's adaptability and resilience to future shocks, as we discuss later in the report. Yet these assets and plans could be undermined without a coordinated, aggressive strategy to protect the region from the damaging effects of a changing climate. Below, we briefly discuss some of the major ways that climate could impact economic development priorities in each of sectors targeted for growth in the region.

**Cross-sector vulnerabilities.** Extreme weather events have the potential to affect all aspects of a community's economy and society. In a recent report on climate impacts to Virginia's Eastern Shore, The Nature Conservancy (TNC) asserted that climate change will “profoundly affect all people who live here, regardless of age, occupation or neighborhood. Livelihoods will be jeopardized, infrastructure will be threatened and human health and safety will be at greater risk.”<sup>48</sup> Sustained and recurrent losses from storms and floods would impact not only the region's economy but also residents' safety and way of life.

Regarding future economic development priorities, however, two impacts could have particularly far-reaching consequences: damage to the region's infrastructure, and impacts on the region's groundwater. Economic growth in the region depends on reliable infrastructure facilities and services – transportation, telecommunication, water, waste management, and public safety. In the above-referenced report, TNC assessed the current state of the region's infrastructure and identified the following specific threats:

- Inundation and flooding of residential property in low-lying areas;
- Inundation of emergency shelters, such as schools and fire stations, in low-lying areas;
- Damage to bridges that span geographic necks;
- Damage to transportation infrastructure in general, especially the Chincoteague Causeway;
- Storm damage to Wallops Flight Facility infrastructure; and,
- Siltation of deep-water ports and marine landings.<sup>49</sup>

Additional infrastructure vulnerabilities could be added to this list, including the risk of septic systems in the region becoming inundated due to sea level rise and flooding; improper functioning of these systems could create a serious public health hazard.

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<sup>48</sup> The Nature Conservancy in Virginia. June 2011. *The Eastern Shore of Virginia: Strategies for Adapting to Climate Change*. Available: [http://www.esf.edu/glrc/library/documents/VirginiaEasternShoreCCAdaptationReportFinal\\_2011.pdf](http://www.esf.edu/glrc/library/documents/VirginiaEasternShoreCCAdaptationReportFinal_2011.pdf)

<sup>49</sup> The Nature Conservancy in Virginia. June 2011. *The Eastern Shore of Virginia: Strategies for Adapting to Climate Change*. Available: [http://www.esf.edu/glrc/library/documents/VirginiaEasternShoreCCAdaptationReportFinal\\_2011.pdf](http://www.esf.edu/glrc/library/documents/VirginiaEasternShoreCCAdaptationReportFinal_2011.pdf)



Disruptions to groundwater supply – quantity or quality – is the second major cross-sector threat. The Eastern Shore’s supply of fresh water for drinking, irrigation and other uses comes solely from two underground aquifers. Changes in annual precipitation levels (including the potential not only for more rain but also for prolonged droughts) would affect these aquifer’s recharge rates, vulnerability to contamination, and potential for saltwater intrusion. These two broad-reaching threats will be a necessary focus of a regional resilience infrastructure investment and implementation plan, if developed as recommended in Section 4 of this report.

***Sector-specific vulnerabilities.*** In addition to these cross-sector climate risks, there are specific risks to each of the four economic development priority areas, including:

- *Aerospace.* The Wallops Flight Facility’s presence in the region is central to growth plans in the aerospace and defense cluster. Yet the proximity to shore of the NASA site as well as other critical infrastructure in this sector (e.g. Virginia Space, the Wallops Research Park) puts them at particular risk of damage from storm events, shoreline erosion, and coastal inundation. Impacts to these facilities could have significant ripple effects on the regional economy, given their role as anchor businesses in one of the region’s anchor industries. Damage to transportation networks in the region could also impact these businesses by preventing employees, contractors, and resource suppliers from accessing the facility safely.<sup>50</sup>
- *Agribusiness and aquaculture.* Within the agribusiness and food processing cluster, major threats to future prosperity include changes in precipitation levels and groundwater recharge rates, as well as saltwater intrusion into the water supply. Shellfish aquaculture farms are vulnerable not only to damage from intense coastal storms but also to shoreline erosion, ecosystem changes, and water quality impairment (including an increase in ocean acidity). As with other industries, agriculture and aquaculture depend on reliable transportation networks to access markets, and given their need for refrigeration, they may be even more vulnerable to disruptions in energy supply (such as power outages during intense storms).
- *Tourism and recreational activities.* Tourism would be affected by impacts to basic visitor services and amenities, including lodging, dining and transportation infrastructure. The industry would also be weakened by damage to key tourism draws, such as shoreline erosion and habitat loss at Chincoteague National Wildlife Refuge and other beaches and recreation areas, or siltation of popular boating and fishing destinations. As with agriculture and aquaculture, tourism is at risk from

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<sup>50</sup> There are a variety of additional climate threats and resilience infrastructure needs at Wallops Island facilities, including those related to energy distribution and cyber security.

power disruptions caused by storm events and other natural or manmade disasters. The recent widespread power outages in North Carolina's Outer Banks – a neighboring region with similar geographic and economic characteristics as Virginia's Eastern Shore<sup>51</sup> – illustrates this vulnerability. Economic losses for the Outer Banks' thousands of small businesses is expected to have effects that reach far beyond the region.<sup>52</sup>

- *Entrepreneurship.* Finally, the goal of fostering entrepreneurial activity across the region is also at risk from the impact from climate change. The process of launching, growing, and running a new business enterprise is inherently risky for a variety of economic and financial reasons. Entrepreneurs seek opportunities to mitigate risk and increase their likelihood of success. If entrepreneurs and business owners are confident that regional leaders are taking steps to reduce climate risks and advance resilience infrastructure implementation, they will be more likely to focus their business development efforts on Virginia's Eastern Shore. Conversely, if climate change risk is viewed as unacceptably high, that activity will shift to other regions.

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<sup>51</sup> With the distinction that the Outer Banks' barrier islands are developed, whereas the Eastern Shore's development is mostly on its mainland.

<sup>52</sup> Terry, Marshall. 8/2/17. "Economic Impact From Outer Banks Outage Will Be Felt Statewide." *WFAE 90.7*. Available: <http://wfae.org/post/economic-impact-outer-banks-outage-will-be-felt-statewide>

### 3. Capacity Assessment

In order to address the vulnerabilities discussed above and to advance resilience priorities, it will be necessary for Virginia’s Eastern Shore to plan, prioritize, and package infrastructure investment opportunities – and then to assemble capital for projects, deploy and manage funds, and effectively implement projects. This process requires sufficient capacity in several areas, which collectively can be considered the “enabling conditions” for implementing resilience initiatives. These conditions include: strong leadership; planning expertise; regulatory consistency; financing capacity; and the ability to leverage community assets. While there is crossover between these conditions, below we review them each in turn and assess the Eastern Shore’s region capacity in each.

#### Leadership strength

Effective leadership at both the regional and local level is essential to attract and deploy investment in resilience efforts. Strong political and institutional leaders can initiate community conversations around resilience needs; mediate among diverse opinions to lift up shared community goals; and inspire action to advance those goals.<sup>53</sup>

Virginia’s Eastern Shore has strong institutional leadership via several established organizations that provide long-term, consistent guidance on issues of importance to the region. Chief among these organizations is the Accomack-Northampton Planning District Commission (A-NPDC), which has been leading efforts to assess and respond to climate vulnerability in the region – and to plan for the region’s future economic development. One of 21 regional planning districts in the Commonwealth of Virginia, A-NPDC facilitates cooperation among local governments on issues of regional significance.

A-NPDC is well-positioned to effectively engage the many county and local leaders throughout the region who represent the area’s diverse small towns and are essential allies in on-the-ground implementation of economic development and resilience initiatives. Many of these leaders are engaged in the regional resilience conversation, particularly via the Eastern Shore of Virginia Climate Adaptation Working Group, which is coordinated by A-NPDC.

The Accomack-Northampton Planning District Commission (A-NPDC) is a key leader in regional efforts to assess and respond to climate vulnerability – and to plan for the Eastern Shore’s economic future.

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<sup>53</sup> The Rockefeller Foundation’s Resilient 100 Cities Initiative is an example of an effort to create such leaders in communities throughout the country.

The region also benefits from leadership capacity within several private and nonprofit organizations, including The Nature Conservancy (TNC), which has spearheaded efforts to protect the region's barrier islands and other critical natural resources. TNC has also been a thought leader on climate and economic development issues. In addition, Wallops Island Regional Alliance and Wallops Research Park Leadership Council provide advice and guidance to public officials regarding development and operations strategies for the Park's research and technology-based commercial endeavors.

The ability of these various leaders to work together is evidenced through the recent the *Stronger Economies Together (SET)* regional economic development planning effort, the ongoing collaboration of the Climate Adaptation Working Group, and various additional natural resource and community engagement efforts. Initiatives such as these build leadership on resilience issues and lay the groundwork for further advancing a regional resilience financing and economic development effort.

### **Planning expertise and consistency**

Resilience cuts across departments and processes that are often isolated from one another in local governments, including hazard mitigation, emergency management, long-range land use planning, zoning and code enforcement, economic development, public works, public budgeting, and capital improvement planning. Effective planning both within and across these areas is important for a locality to identify and pursue resilience priorities, bundle projects for investment, and ensure that projects are implemented in a coordinated, effective way.

As mentioned, several ongoing initiatives and recent planning processes demonstrate the Eastern Shore's ability to address threats and opportunities on a regional level. These include the *SET* economic development planning process, as well as The Nature Conservancy's *Strategies for Adapting to Climate Change* report, which identified strategies for making the region more resilient by 2080. Individual communities also have developed long-range comprehensive plans, capital improvement plans, natural resource protection plans, and hazard mitigation plans, each of which may contain elements that could inform a regional resilience infrastructure financing approach. A-NPDC provides support for local planning efforts.

The Eastern Shore's planning capacity is robust, especially compared to many rural areas, and the region has demonstrated ability to articulate a collective economic vision. However, the *SET* plan stopped short of identifying infrastructure necessary for ensuring

growth in priority sectors, assessing the potential impact of climate change on that infrastructure, and mapping out what is needed to ensure key economic sectors and goals can withstand future shocks from climate impacts. In addition, there is opportunity for enhanced regional alignment of various planning processes and products, including state, regional and local plans addressing economic development, hazard mitigation, emergency management, transportation, water quality, housing, and energy. A comprehensive review and alignment of these plans would better position the region to articulate a resilience vision and attract economic development. A particularly promising opportunity is to integrate Comprehensive Economic Development Strategies with local / regional hazard mitigation plans.

Alignment of existing plans would lay the groundwork for developing a comprehensive, actionable regional resilience infrastructure financing plan. The region arguably has the planning expertise necessary to conduct such an exercise; political will and funding for implementation may present bigger hurdles.

### **Regulatory alignment**

The regulatory framework is an essential element of building a resilient future. Regulations related to land use and zoning, building codes, floodplain management, and stormwater management have a direct effect on the built environment and its ability to withstand and adapt to stressors. To advance regionally-identified resilience and economic development goals, local regulations should be crafted to support these goals. They should also be supportive of one another. For example, building codes that support climate-ready residential home construction would advance the Eastern Shore's goal to attract more regional employees to live in the region, while making the area less vulnerable to impending climate impacts. Similarly, stormwater regulations can be designed to prioritize green infrastructure, which offers multiple co-benefits related to flood management and resilience.

Contrary to a common notion that regulations hinder economic growth, clear and consistently-enforced regulations actually promote economic development, by protecting the shared resources on which growth depends (such as clean water and adequate infrastructure). In addition, they let developers know what to expect and thus reduce uncertainty and risk. When regulations and permitting processes are consistent from one local jurisdiction to the next, developers and other investors save time and money and thus are better motivated to invest in the region. Consistency among regulations in neighboring communities is also important for a regional approach to resilience.

A comprehensive audit of the substance and consistency of regulations should be part of a long-term resilience plan for the region. The processes and institutions necessary for ensuring regulatory consistency are already in place on the Eastern Shore.

### **Financing capacity**

Successfully implementing large-scale community infrastructure projects – whether in big cities or in rural regions – requires appropriate mechanisms for acquiring sufficient funds and deploying these funds effectively. Community financing systems or institutions need to have the capacity to establish, allocate, and invest revenue; incentivize private sector engagement and investment in resilience infrastructure; and leverage and invest fiscal resources.

***Capacity to generate sufficient revenue.*** Sufficient, sustainable, and dedicated revenue is essential in order to complete any public infrastructure initiative, from transportation to water management to resilience. While private partners can play a role in developing and financing public infrastructure, there is no getting around the need for public revenue at the local, regional and/or state levels. To be effective, public revenue generation mechanisms for resilience infrastructure should be:

- *Sufficient to achieve goals.* While local and state governments may not have the capacity to finance all infrastructure needs, they should be able to provide for core infrastructure needs.
- *Sustainable.* Achieving community resilience is a long-term effort, and revenue streams must be able to be sustained at sufficient levels over a reasonable time horizon.
- *Dedicated to the intended purpose.* Establishing dedicated revenue streams ensures revenue cannot be redirected to other public needs.

Virginia's Eastern Shore has statutory authority to generate sufficient and dedicated revenue. The Commonwealth of Virginia enables local governments to establish sales taxes, fuel taxes, and stormwater management fees – each of which are appropriate mechanisms for supporting infrastructure projects, including green infrastructure. Political and administrative challenges are likely barriers to new fee or tax structures. In addition, the Eastern Shore's revenue generation potential is limited by the region's small population (about 45,000 people) and by the region's relatively low income levels (with a \$33,000 median household income, about half the state average).

Eastern Shore towns and counties are making investments in critical capital needs, largely through the traditional avenues of general funds and capital improvement plan funds (see

Table 2, below). These sources of funding are and will continue to be important, but they do not represent a dedicated source of funding for resilience. Further, though there has been no assessment of regional resilience funding needs or gaps, it is very likely that the need outpaces the capacity of existing sources. If that is the case, new mechanisms for sufficient, sustainable, dedicated revenue will need to be developed. A promising approach is to move toward an enterprise financing system model, as discussed in the Recommendations section. Introduction of any new revenue mechanisms will need to be accompanied by a robust education and outreach effort – one that emphasizes the benefits to be gained rather than simply the costs – in order to build public support.

**Table 2. Annual capital improvements spending in Eastern Shore of Virginia’s two counties and two largest towns, FY 2016-2017 or 2017-2018**

	Accomack Co.	Northampton Co.	Chincoteague	Cape Charles
Capital improvements budget	\$354,545	\$340,500	\$879,003	\$3,212,600
Total budget	\$65,616,657	\$42,375,399	\$6,785,764	\$7,179,702
Percentage of total budget spent on capital needs	0.54%	0.80%	12.95%	44.75%

Sources:

County of Accomack, VA. “Fiscal Year 2017 Annual Fiscal Plan.” Available: <https://co.accomack.va.us/home/showdocument?id=4995>

County of Northampton, VA. “Annual Operating Budget 2016-2017.” Available:

[http://www.co.northampton.va.us/departments/pdf/fy2017\\_finance/MASTER%20BUDGET%20BOOK%202016-2017.pdf](http://www.co.northampton.va.us/departments/pdf/fy2017_finance/MASTER%20BUDGET%20BOOK%202016-2017.pdf)

Municipal Corporation of Cape Charles, VA. “Fiscal Year 2017/2018 Proposed Budget and Utility Rates.” Available:

<http://www.capecharles.org/files/documents/FiscalYear2017-2018BudgetSummary1468014517070617PM.pdf>

Town of Chincoteague, VA. “Proposed Town of Chincoteague Draft Fiscal Year 2017 Budget.” Available: <http://www.chincoteague-va.gov/files/FY17BUDGET.pdf>

***Capacity to engage the private sector.*** While establishing adequate public revenue streams is foundational to financing resilience infrastructure, it is also important to maximize the efficiency and effectiveness of public investments. Ways to achieve this include coordinating infrastructure investment; embedding resilience into private economic development; and establishing codified public-private partnerships where appropriate:

- *Coordinate infrastructure investments.* A recent report found that \$1 trillion could be saved annually on global infrastructure investments if projects were selected and delivered more effectively.<sup>54</sup> This represents up to a 40% savings. The report outlines three processes that will enable communities to achieve these cost savings: selecting projects more carefully, delivering them more efficiently, and getting more out of existing assets as an alternative to building new ones.<sup>55</sup> These goals may be best achieved if public resilience funds are administered by an independent

<sup>54</sup> Richard Dobbs, et al. 2013. *Infrastructure productivity: How to save \$1 trillion a year.* McKinsey Global Institute.

<sup>55</sup> Ibid.

financing entity that has the authority and flexibility to find such efficiencies (this idea is discussed further in the Recommendations section).

Virginia's Eastern Shore has demonstrated its capacity to work in partnership with various state and federal agencies to target investments in support of common infrastructure goals. For example, the Wallop's Research Park was a local-state-federal partnership developed with pooled capital in addition to tax incentives to attract potential tenants. This coordinated financing effort resulted in the region's flagship economic development project, which has the potential to be the anchor of a regional resilient economic development effort.

- *Embed resilience into private economic development.* Building community resilience requires embedding resilience goals into the community's economic fabric, and this requires engaging business and industry. A prime avenue for making these public-private connections is the economic development planning and implementation process, and in this regard, Virginia's Eastern Shore is well positioned. The region's active business community is represented by local economic development departments (DEDs) who along with their associated industry counterparts (agriculture development, fisheries, tourism, etc) are formal participants in water quality restoration and climate resilience efforts. These individuals have the appropriate connections to engage industry partners in the resilience planning and financing effort.

Public investment in economic development activity is a direct means to incentivize private involvement. Again, an example is the Wallop's Research Park, which used local, state and federal dollars to jump-start private investment and business development associated with the aerospace industry. This project demonstrates the capacity of Eastern Shore communities to link with the private sector in support of economic development goals. The next step is to expand those capacities through the development of more expansive financing mechanisms as discussed later in the report.

- *Establish contractual public-private partnerships where appropriate.* Formal public-private partnerships (P3s) can leverage private capital and expertise in order to reduce public sector risk and accomplish goals more efficiently and effectively. Defined as a "contractual arrangement between a public agency (federal, state or local) and a private sector entity [in which] the skills and assets of each sector (public and private) are shared in delivering a service or facility for the use of the



general public,”<sup>56</sup> P3s can be used at various stages in the plan-design-finance-build-maintain process. They are especially effective in situations in which long-term operations and maintenance is needed in addition to design and construction.

Though various factors affect a P3’s success, one of the most important is a dedicated revenue source, which is necessary for long-term return on investment for the private partner. Virginia law gives local jurisdictions the authority to engage in P3s for infrastructure projects. The Eastern Shore region is already pursuing private partnerships and may benefit from engaging in more of these arrangements, and/or from using P3s on a larger scale.

***Authority and flexibility to leverage and invest fiscal resources.*** A final critical financing capacity is the authority and flexibility to employ a full range of debt and lending products in financing infrastructure projects. An independent financing entity may be the best candidate for functioning in this way, but partnership with state agencies may also make it possible. Having the ability to utilize various financing mechanisms would enable the Eastern Shore to fund projects in the most effective ways, as well as to leverage and pool both public and private sources of funding.

### **Ability to leverage community assets**

A final enabling condition for effective infrastructure financing is leveraged – or strategically utilized – community assets. Taking an asset-based approach to economic development, as Virginia’s Eastern Shore is doing with its *SET* plan, builds on existing strengths to meet community needs. Community assets can be used to attract capital, financing, and expertise needed to augment community resilience. These assets may be tangible (e.g. natural resources; built infrastructure; existing industries) or intangible (e.g. unique institutions; skilled labor force; entrepreneurial cultural).

Abundant natural resources, a diversified economy, and capacity for regional cooperation are all assets that Virginia’s Eastern Shore can leverage to attract investment in resilience infrastructure.

On Virginia’s Eastern Shore, the following assets could become central to attracting resilience-oriented economic development:

- *Natural resources and open space:* Virginia’s Eastern Shore’s most valuable asset may be its abundant natural resources: rich farmland, miles of unspoiled coastal wetlands and beaches, productive coastal waters. In particular, the region’s relative availability of land offers opportunity to spur business and industry development,

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<sup>56</sup> National Council for Public-Private Partnerships. “7 Keys to Success.” Accessed 8/20/17: <http://www.ncppp.org/ppp-basics/7-keys/>

expand agricultural production, enable population growth, and foster other economic development activities.

- *Diverse economy:* The region's economy is rooted in both traditional, natural-resource based industries such as agriculture and tourism, as well as in the more high-tech cluster of aerospace and defense. These diverse industries – and their accompanying infrastructure, skills, and support services – can be leveraged to attract growth in related economic sectors.
- *Regional cooperation, organization, and planning:* Rural regions can be at a disadvantage when it comes to economic and infrastructure development, as small communities often lack the scale needed to plan for and attract investment. This is perhaps especially true in regards to climate adaptation planning and investment. Regional collaboration is key to surmounting this challenge, and Virginia's Eastern Shore has demonstrated both the willingness and the aptitude for such cooperation. Regional approaches accelerate economic and resilience investment by enabling the region to bundle suites of projects, scale up incentives for investment, and recruit bigger investors.

## **4. Recommendations for Accelerating Investment in Community Resilience on Virginia's Eastern Shore**

Virginia's Eastern Shore has done the difficult and essential work of bringing together stakeholders to establish both climate adaptation priorities and economic development goals for the region. Successfully implementing these plans – so that the region is both economically secure and climate ready – will depend on many factors. Chief among these is the effective integration of adaptation and economic development so that the two are planned, financed, and implemented in concert. This comprehensive approach focuses not on separate adaptation or economic development strategies, but rather on the system-wide capacity to bounce back from shocks and to thrive in the future.

In addition to integrated planning approaches, our recommendations include augmenting institutional and financing mechanisms so that they are equipped to help the region attract and manage infrastructure investment; strategically engaging private partners; and targeting public investments in economic development opportunities that are aligned with creating a more resilient region. We also suggest that Virginia's Eastern Shore has strong potential to catalyze the growth of a resilience technologies research and development hub, a new industry sector that would build on the region's reputation and capacity for innovation in the areas of aerospace, defense, and coastal ecosystem science.

### **Develop a regional resilience infrastructure financing and implementation plan**

Successful implementation of economic development and resilience projects on Virginia's Eastern Shore necessarily begins with a clear understanding of shared goals and an achievable roadmap for implementing them. As discussed, the region has begun to articulate a vision about how it intends to adapt to and thrive in a rapidly changing climate. Many short-term resilience issues and infrastructure needs have been identified in existing plans, such as the *SET* plan and local hazard mitigation plans. However, greater investigation is needed into issues such as possible shifts in core economic sectors as well as long-term impacts on population centers and critical infrastructure assets.

A regional resilience infrastructure plan would comprehensively assess these needs; articulate resilience goals related to economic development and resource protection; and catalogue the specific actions and investments necessary to achieve these goals.

As regional leaders and stakeholders progress in identifying and prioritizing economic development and resilience projects, effort should be made to think holistically, shifting from considering individual adaptation projects (whether gray or green) to thinking in terms of *packages* of projects. These portfolios might include a list of desired investments (related to climate resilience, water quality protection, economic development, and other community goals), as well as regional assets that can be leveraged to generate revenue for portfolio investors

These packages can then be marketed to private and public capital providers in order to match projects with financing. The portfolio investment model represents an assets-based approach to economic development and hazard mitigation – one that enables communities to leverage their strengths to meet their needs. By bundling projects, it is possible to combine projects that offer a low rate of return to investors but are important to the region with other, higher-yield projects that private investors may find more attractive. This would enable the region to drive investment toward priority projects that may not otherwise get funded.

The development – and implementation – of a comprehensive regional resilience plan will be aided by efforts to integrate resilience and economic development planning processes region-wide and within individual towns. Community resilience relies in part on the extent to which resilience planning is integrated across departments and programs, and this requires dedicated leadership and effort at all levels. As described in Section 3, Virginia’s Eastern Shore has strong planning capacity and expertise, but there is opportunity to more effectively integrate the processes for conducting hazard mitigation, climate adaptation, and economic development planning. Hazard mitigation plans are required in order to receive federal relief funds in the event of a natural disaster; ensuring that these plans incorporate resilience goals will enable the region to put recovery funds to immediate use implementing their vision.

Given institutional capacity constraints common in small towns, it would be unlikely – and perhaps inefficient – for each community to retain dedicated resilience staff to integrate resilience planning across programs. However, A-NPDC is in a good position to assist communities with this local-level integration, given its existing relationships with localities and its own efforts to coordinate hazard mitigation and economic development planning. A-NPDC’s assistance should focus on helping communities understand and manage the complexities of integrating resilience into local comprehensive, emergency management, and capital investment planning.

## Authorize a regional financing facility to advance financing system innovation

As discussed in Section 3, the Virginia Eastern Shore has many of the enabling conditions needed to advance integrated resilience and economic development investment. Where there is particular room for improvement is in the region's financing systems and mechanisms. Needs and opportunities include augmenting revenue streams for resilience initiatives; consolidating or coordinating water management planning and financing (stormwater, flood mitigation, resilience); and developing market-based financing mechanisms to help reduce costs, create efficiencies, and provide market signals that encourage private sector participation.

All of these functions would be aided by the establishment of a regional financing facility – an independent entity charged with coordinating, prioritizing, and implementing resilience infrastructure projects across the region. The primary responsibilities of such an entity would include:

- Supporting the development of a detailed resilience infrastructure implementation and investment strategy, with specific outputs associated with short, mid, and long-term financing needs;
- Coordinating infrastructure investments among local governments across the region;
- Identifying, prioritizing, and packaging regional resilience infrastructure projects;
- Structuring projects to incentivize private engagement; and aligning these projects with funding and financing;
- Brokering public-private partnerships and finding other opportunities to realize efficiencies in project design, construction, and operations;
- Providing support as local jurisdictions seek to integrate resilience into capital improvement planning, stormwater management programs, and related programs.

A regional financing entity would be charged with prioritizing and packaging resilience infrastructure projects and aligning these with funding (public and private).

This entity could also broker public-private partnerships, coordinate existing sources of funding for resilience, administer any new regional revenue programs, and implement innovative financing approaches such as infrastructure banking.

At a more ambitious or established level, the financing facility could be structured to administer regional financing mechanisms, such as stormwater management and flood protection fees, with revenue to be used for natural infrastructure projects. Or the facility could incorporate infrastructure banking and debt financing programs with goal of

reducing the cost of capital to Eastern Shore towns and communities. There are existing state-based infrastructure lending and banking programs that can serve as a model for a more regionally-focused institution (though the entity may be designed to cover a wider region than just the two Eastern Shore counties).

A major contribution of such an entity is that it may be able to access financing instruments and opportunities local jurisdictions are not able to access on their own, thus bringing new funds to Eastern Shore towns and counties. An example here is green bonds, or climate bonds, for which the national market is growing. Ability to tap into a greater array of funding sources – and to effectively assemble blending financing for large-scale projects – is only one benefit of a regional financing entity. Additional potential advantages include:

- *Creation of scale in the financing system.* A regional financing entity would be positioned to coordinate stormwater and flood mitigation management and financing programs around the region, enabling towns to reduce costs, realize efficiencies, and accelerate implementation. This regional approach would also make it possible to couple water resources management with resilience infrastructure planning and investment. Given the tremendous overlap between water management and resilience, coastal communities like Virginia’s Eastern Shore have much to gain from coordinating water management (stormwater, flood mitigation, drinking water) and resilience programs. Shifting the region’s traditional water resources and stormwater management funding systems to a structure that integrates resilience would create programmatic efficiencies and lead to better planning that addresses both immediate water management priorities as well as longer-term risks associated with climate change impacts.
- *Coordination among local, regional, and state financing entities.* A regional entity charged with coordinating resilience, economic development and water management planning and financing would be well-positioned to coordinate investments not only across topics but also across jurisdictions and levels of governments. Pooling infrastructure implementation among communities not only creates scale but also spreads the implementation risk and provides long-term stability. This coordination and scaling function would translate to revenue generation as well, if the entity is given the authority to function like a utility or to manage an enterprise fund. It would be particularly appropriate for such an entity to aggregate stormwater management revenue in support of resilience projects, especially those that also support economic development priorities.
- *Effective private sector linkages.* Layering resilience needs over economic development goals magnifies the need to incentivize private investment and

engagement. In the short term, a regional financing facility could function in many ways like an economic development authority, the distinction being that a financing facility would be focused on attracting investment to regional resilience infrastructure projects that accelerate economic development.

While the private funding will never obviate the need for public funding, the private sector can play a critical role in augmenting government funds and finding operational efficiencies so that funds achieve greater impact. An independent financing entity may be better suited than existing government agencies to identify and enable opportunities for private partnerships that enhance public investment at the regional and local level. For example, there are a variety of infrastructure systems that are uniquely appropriate for private financing, including the built environment, energy, telecommunications, land development and production, and natural resources.

When these infrastructure systems are bundled with other more public-focused systems such as water, wastewater, and transportation, there is an opportunity to incentivize investment at a scale greater than what could be achieved if these systems were financed in isolation. This is the portfolio-based approach to infrastructure financing discussed above, and it represents a promising way to link economic development and resilience in order to catalyze investment into the region.

A regional resilience financing entity would function like an economic development authority, with the distinction that its focus would be to attract investment in regional resilience projects that also accelerate economic development.

While the structure of a regional financing entity for Virginia's Eastern Shore would ultimately need to be the outcome of a local, consensus-driven process, Table 3, below, lists several existing financing entities in and beyond the Mid-Atlantic region that function in many of the ways described above and may provide effective examples from which to draw. As the Table indicates, these entities come in various institutional form. One such form is a financing entity embedded within an existing state or regional institution, as is the case with the Maryland Water Quality Financing Authority. Alternatively, other examples feature an independent entity, separate from state agencies, that operate either statewide or regionally, such as the Rhode Island Infrastructure Bank. Finally, the Great Lakes Protection Fund is an example of a multi-state water quality fund that provides a sustainable, long-term source of revenue for restoration projects.

**Table 3. Effective financing entities and funds**

Entity	State	Description	Unique / effective features
Chesapeake and Atlantic Coastal Bays Trust Fund (Trust Fund)	MD	The Trust Fund was established in 2007 to provide a dedicated source of funding for Bay restoration. The Fund focuses on cost-efficient projects in areas where pollution reductions will have the greatest impact on water quality. Over the past 10 years, the Trust Fund has guided more than \$380 million in state-based water quality investments, which has resulted in an additional \$190 million in leveraged investment.	Established within an existing agency (Maryland Department of Natural Resources); funds invested in a market-like and performance-driven manner, with investments targeted to projects that generate the greatest nutrient reductions per dollar spent
Great Lakes Protection Fund	Multi-state	Established by the governors of Great Lake states in 1989, the Fund is a private, nonprofit organization guided by a board of directors. One-time investments by member states created an \$81 million endowment. These funds are managed to produce income as well as maintain the endowment over time.	Multi-state; permanent endowment; a “state share payback mechanism” has returned \$49 million to contributing states <sup>57</sup>
Maryland Water Quality Financing Administration (WQFA)	MD	An entity within the Maryland Department of the Environment, WQFA’s primary charge is to finance water and wastewater infrastructure projects through the state SRF. With expanded funding through the Bay Restoration Fund (tax paid by Maryland households), WQFA’s programs now include stormwater investments.	One of WQFA’s funding sources, the Bay Restoration Fund, is model for generating sufficient revenue to make needed infrastructure upgrades
Pennsylvania Infrastructure Investment Authority (PENNVEST)	PA	PENNVEST is a state authority charged with improving water quality by providing low-interest loans and grants for the design and construction of wastewater, drinking water, and stormwater infrastructure projects. PENNVEST also manages the PA’s nutrient trading program, serving as a clearinghouse for nitrogen and phosphorous credits. It invests an average of \$284 million in grants and loans annually, <sup>58</sup> with revenue coming from the Clean Water SRF, the Drinking Water SRF, state general obligation bonds, PENNVEST revenue bonds, and loan repayments and interest earnings.	Has several of the key capabilities described above: the ability to (1) pool, hold, and leverage revenue; (2) facilitate nutrient credit trading; (3) manage investments across a range of finance mechanisms from traditional debt financing to water quality trading; and (4) target investments toward nonpoint source pollution reduction projects likely to achieve strong results
Rhode Island Infrastructure Bank (RIIB)	RI	Established in 1989 to implement water and wastewater loan financing through the SRF, RIIB is a standalone state agency guided by a board of directors. RIIB’s charter was expanded in 2015, and the agency now implements a variety of	Offers diverse financing resources in addition to traditional subsidized loans (Commercial Property Assessed Clean Energy or C-PACE financing, sewer tie-in grants, resilience project investments)

<sup>57</sup> Great Lakes Protection Fund website. Accessed 1/29/18: <http://glpf.org/about-us/history-endowment/>

<sup>58</sup> Paul Marchetti, PennVEST. Communication with EFC, 6/15/17.



		financing programs across multiple areas including energy, transportation, and brownfields.	
Water Quality Improvement Fund (WQIF)	VA	Established by Virginia legislature and administered by the state's Department of Environmental Quality and Department of Conservation and Recreation, WQIF makes grants for nonpoint projects to local governments, soil and water conservation districts and other entities. Capitalized via state real estate recordation fees and a portion of any state surplus general funds.	Though annual capitalization levels have fluctuated, WQIF is a permanent, non-reverting fund, meaning that dollars can be rolled over from year to year and invested in high-performing projects

As these examples demonstrate, financing facilities can take a variety of institutional forms. Choosing the most appropriate model – or blend of models – will require considering the following factors at the outset.

*Location and institutional authority.* A basic question is where a resilience financing facility will be housed and who would have authority for its operations. As illustrated above, entities can range from independent nonprofit organizations to entities within an existing state agency. Key questions that the communities of Virginia’s Eastern Shore will want to consider include: does the institutional capacity to house and manage a facility already exist?; and are the necessary financing functions primarily public or private in nature?

*Financing capacity.* The type of financing mechanisms needed to advance the region’s resilience goals will guide the financing entity’s structure. The entity will likely need to directly engage with the private sector by making equity investments, subsidized and targeted loans, and grants. In addition, the facility or institution may need the capacity to allocate and invest tax and fee revenue. This would be similar in scope and function to infrastructure banks that manage SRF programs.

*Infrastructure blend and focus.* The entities profiled in Table 3 all have an exclusive or partial focus on water resources, which means they tend to be modeled after state drinking water or clean water SRF programs. A broader focus on resilience, however, will involve financing a variety of infrastructure categories. The Rhode Island Infrastructure Bank is a good example of this multi-sector mandate, as its charter was recently expanded to invest not only in water infrastructure but in resilience infrastructure more generally. An effective resilience financing entity on Virginia Eastern Shore’s will be able to finance an array of project types, such as:

- Stormwater infrastructure. Projects might include gray and/or green infrastructure to address nuisance flooding, inundation from sea level rise, and high storm surge. Appropriate financing mechanisms would include clean water SRF loans, grants, and

potentially equity investments for those projects that are connected to new development.

- Transportation projects. Though transportation investments are traditionally managed by local or state transportation agencies, there are opportunities for private or third-party investment to leverage these investments in support of additional infrastructure needs, for example, linking stormwater management to transportation development or redevelopment projects.
- Energy projects. Energy presents diverse investment opportunities in regard to resilience and sustainability. Energy projects can be as basic as supporting energy efficiency or as complex as advancing renewable fuels and micro grid systems. The Rhode Island Infrastructure Bank's C-PACE program is a good model in this arena.
- Economic development initiatives. The economic development component of the Eastern Shore's resilience goals will require engaging in financing functions that are traditionally associated with economic development corporations. Specifically, this might involve administering tax benefits and incentives, making direct investments in key industries, and promoting business development in the region's communities.

### **Invest in resilience-supportive economic development opportunities within key sectors**

As previously discussed, despite the challenges that Virginia's Eastern Shore faces, it also enjoys a host of assets on which it can grow its economy and augment its adaptive capacity. Chief among these is the region's rich natural resources. In addition to being the backbone of the region's economic base, natural resources offer a platform for accelerating economic and environmental resilience. The region would benefit from targeting infrastructure investments in four arenas with strong potential to advance resilience and sustain economic growth: aquaculture production, sustainable agriculture, natural shoreline protection, and navigable waterways. Investment in these arenas would also be supportive of the region's eco-tourism industry, which has strong growth potential on the Eastern Shore.

Natural resources have long sustained Virginia's Eastern Shore, and they offer a platform for future investments that both build community resilience and advance economic growth.

**Aquaculture.** Virginia's Eastern Shore is well-suited to aquaculture production, and the region has made laudable progress in expanding this industry, even as wild harvests of traditional species such as the Eastern Oyster have steadily declined throughout the Mid-

Atlantic region. Such investments not only strengthen a sector that is critically important to the region's culture and heritage, they also pay off economically. As mentioned, Virginia's Eastern Shore now has one of the biggest clam aquaculture fisheries in the country, and oyster aquaculture investments and production are on the rise.

Continued investment in this industry promises to yield not only cultural and economic gains, but also benefit to the community's resilience efforts. Shellfish provide invaluable ecosystem services, including enhanced water quality. Strategically placed shellfish reefs can also mitigate storm surges. This combination of market value and ecosystem service provision makes aquaculture a unique economic development investment opportunity, with equally unique financing opportunities, especially when environmental values can be monetized.

Investment opportunities include entrepreneurial development or incubator programs for startup businesses in the industry, as well as business assistance for early and later-stage companies (focusing on topics such as business planning, obtaining financing, branding and marketing, expanding market opportunities, etc). These services should be targeted not only to harvesters but also to businesses along the entire aquaculture value chain: suppliers, processors, packers, aggregators, marketers and distributors. A market study could help identify gaps in the value chain that, if filled, would grow the entire sector. This could include, for example, investments in cold storage facilities, shucking houses, or distribution networks.

***Sustainable agriculture.*** Like aquaculture, sustainable agriculture offers both economic and environmental benefits. Sustainable farming practices have well-documented effects on cropland productivity, reduced carbon footprint, erosion control, and water quality protection. Additionally, conservation practices such as vegetated riparian buffers can absorb and mitigate the impact of floodwaters. And a more diversified agricultural sector could also boost regional food security – an important component of community resilience. While the region will rightly want to protect its existing agricultural industries that are so valuable to the area's identity and economy, it would also have much to gain by expanding and diversifying agricultural production to include more small-scale, organic farms and farming practices.

Beyond its resilience benefits, this approach has the potential to grow market value for Shore-raised products. Sustainably-raised and locally/regionally-produced agricultural goods are experiencing a boom in consumer demand, and they command a premium price. Virginia's Eastern Shore is ideally located to tap into this lucrative market, given its

proximity to the Washington DC, Philadelphia, Baltimore and Norfolk metro regions. Diversifying the Shore's crop production to include sustainably-raised products would expand market opportunities for the region's farmers. An ancillary value-added for farmers is the potential to offer agri-tourism opportunities related to sustainable farming practices.

Successfully growing the sustainable agricultural sector will require a regional approach as well as coordination among the broad spectrum of agricultural stakeholders on Virginia's Eastern Shore. A region-wide initiative to identify needs and investment opportunities within this sector would be the ideal starting point. The *SET* plan articulated several goals that would advance sustainable agriculture opportunities, including growing value-added production and developing a marketing cooperative to aggregate and market regional products and build the Eastern Shore brand. Additional opportunities include:

- *Investigate the potential for an agriculture cooperative specifically for producers who commit to sustainable farming practices.* Large-scale conventional farming is by no means a risk-free endeavor, but its well-established supply chains, distribution networks, funding and subsidy programs, and markets mitigate some of the risk inherent in farming. Shifting to new production practices such as sustainable or organic farming may be seen as unacceptably risky for individual farmers. An agricultural cooperative could be a solution for mitigating risk and boosting profitability. Cooperatives are common in the agriculture sector and provide benefits to their members including access to lower-cost supplies, marketing support, and entrée to bigger markets. An Eastern Shore sustainable agricultural cooperative could enable farmers to share innovative production practices, reduce risk, build a brand for their goods, and increase access to markets.
- *Foster new entrants to sustainable farming through agricultural apprentice programs and connection to farmland and business assistance programs.* Nationally, the average age of farmers is rising, and Virginia is no exception. The average age of a farmer in Virginia is 59.5 years (slightly above the national average of 58.3 years<sup>59</sup>), with more than 30% over the age of 65.<sup>60</sup> Prospective young entrants are deterred by various factors, including high entry costs especially for land and equipment. Innovative land and equipment rental and purchase programs could help offset these barriers.

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<sup>59</sup> USDA Census of Agriculture. Census Highlights. Accessed 8/20/17: [https://www.agcensus.usda.gov/Publications/2012/Online\\_Resources/Highlights/Farm\\_Demographics/](https://www.agcensus.usda.gov/Publications/2012/Online_Resources/Highlights/Farm_Demographics/).

<sup>60</sup> Virginia Department of Agriculture and Consumer Services; Agriculture Facts and Figures. <http://www.vdacs.virginia.gov/markets-and-finance-agriculture-facts-and-figures.shtml>. Last accessed: August 1, 2017.

- *Embed agricultural investment into regional resilience finance efforts.* The previously-discussed regional financing facility could be charged with preferentially investing in sustainable agriculture opportunities that also advance regional resilience. Such a regional facility would be in prime position to bring together existing intellectual, institutional, and financial agricultural capital in the region – and to strategically target these resources in support of regional goals.

***Living shorelines.*** As discussed, Virginia’s Eastern Shore is vulnerable to shoreline erosion, storm surge, and coastal inundation. However, the region also enjoys a remarkably extensive swath of natural shoreline – sandy beaches and dunes, coastal wetlands and forests – which are particularly well suited to absorb and mitigate climate impacts. Continued investment in natural shoreline protection is essential to protect the region’s population and economy. Fortunately, this is an area in which significant planning and research has been conducted, especially by The Nature Conservancy. Regional leaders can leverage this work to develop a coordinated shoreline protection and restoration strategy as part of a larger resilience infrastructure plan.

One strategy here may be to offer incentives to landowners to invest in living shorelines on their own properties; the driver may take the form of a rebate or cost-share program or some other incentive such as a state tax deduction. Another opportunity to support living shorelines is to invest in the reestablishment of oyster reefs. Oyster reefs help absorb waves and therefore reduce erosion, improve water quality, and provide habitat for marine wildlife; they are also resilient to small changes in sea levels. In addition, reestablished reefs would benefit the aquaculture industry by providing additional habitat and potentially by increasing cultivated stocks’ disease resistance.

A handful of oyster reef restoration and construction projects have been completed or are underway in the region, including the Man and Boy Marsh Oyster Reef Restoration Project, coordinated by TNC and completed in 2015. Another three reefs are being constructed at Chincoteague National Wildlife Refuge with funding from the US Department of Interior and the National Fish and Wildlife Foundation.<sup>61</sup> These projects restore and enhance natural defenses against intense storm events, while also providing work for contractors and protecting shore-based community assets. Supported by varied funding sources and broad coalitions of private and public sector partners, the projects represent a good model for additional investment in this area.

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<sup>61</sup> The Nature Conservancy. “Nature Based Solutions in Action.” Accessed 9/14/17: <https://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/virginia/explore/oyster-restoration-at-man-and-boy-marsh.xml>

***Navigable waterways.*** A final investment opportunity is in the area of navigable waterways. Safe and accessible waterways are vital to the Eastern Shore’s economy, culture, and quality of life. They support key industries and activities, including seafood harvesting, tourism, and recreational boating and fishing. Unfortunately, there has been a decline in federal funding for maintenance of federal channels, and state and local funding for maintaining other waterways is limited. This has resulted in nearly 70% of federal waterways in the region failing to meet authorized depths, and many non-federal channels in need of dredging and maintenance.<sup>62</sup> Public marinas in the region have access to financial assistance offered by the Virginia Port Authority for small channel projects (under \$100,000) but larger projects are not eligible for this funding, and recreational (non-commercial) harbors in particular have suffered from deferred maintenance.<sup>63</sup>

A regional dredging needs assessment was completed in 2016.<sup>64</sup> This report recommends developing a comprehensive strategic plan for dredging waterways in the region, as well as identifying funding options and increasing state funding for waterway maintenance projects. Such implementation and funding plans should be integrated with a regional resilience implementation and financing plan if developed. Additionally, improvements to harbors and waterways should be designed so they are resilient-ready. Specific infrastructure investment projects could be packaged into broader resilience investment portfolios as described above, especially where there are opportunities for private funders to realize a return on investment.

### **Catalyze a coastal resilience research and innovation hub**

Virginia’s Eastern Shore has considerable research and development capacity in the areas of aerospace, defense and coastal ecosystem science. The Wallops Complex (NASA’s Wallops Flight Facility, Virginia Space, and the Wallops Research Park) is a nucleus for the development, manufacture and operations of technologies related to space and unmanned vehicles, satellites, and related aerospace and defense applications. In addition, a handful of institutions focused on applied coastal ecosystem research have a presence in the region, including:

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<sup>62</sup> Accomack-Northampton Planning District Commission. 2016. *Eastern Shore of Virginia Regional Dredging Needs Assessment*. Available: [http://www.a-npdc.org/wp-content/uploads/2016/05/RDNA\\_2016.pdf](http://www.a-npdc.org/wp-content/uploads/2016/05/RDNA_2016.pdf)

<sup>63</sup> Ibid.

<sup>64</sup> Ibid.

- The University of Virginia’s Virginia Coast Reserve Long Term Ecological Research program, which seeks to predict and understand the effects on coastal barrier systems of long-term changes in climate, sea level, and land use;
- The Virginia Institute of Marine Science, which has more than 50 teaching faculty and several post-doctoral researchers, as well as its Eastern Shore Laboratory, a field research office located in the town of Wachapreague and focused on coastal ecology and aquaculture;
- William & Mary’s School of Marine Science, housed at VIMS;
- Eastern Shore Agricultural Research and Extension Center, a research outpost in the town of Painter associated with the Virginia Tech system that specializes in agronomics; and
- The Nature Conservancy’s Virginia Coast Reserve, which manages and protects a 1,250-acre seaside farm called Brownsville Preserve as well as 45,000 acres of natural landscape including 14 barrier and marsh islands, multiple mainland holdings, and a seascape that is being successfully restored with eelgrass, oysters, and scallops.<sup>65</sup>

The human and social capital embedded in these institutions offers an opportunity to attract startup or relocating enterprises that work on coastal resilience research, technology development, and applied innovation. There are natural overlaps and synergies between this field and the Eastern Shore of Virginia’s existing strengths – including the gains to be made for climate-vulnerable communities if local resilience solutions can be forged.

Building a hub for applied resilience research would transform resilience from an economic cost in the region into an economic driver. Making this a reality will require collaboration, leadership, and an explicit investment strategy – perhaps coordinated by a new regional financing facility. A good model is the Wallops Research Park, where a broad coalition of partners and support was mobilized to catalyze economic activity around one of the region’s key competitive advantages. Institutions and businesses associated with a new resilience hub might focus on opportunities related to renewable energy and the development of energy security systems specifically through the use of micro-grids;<sup>66</sup> innovations in shoreline fortification, both natural and engineered; effective policy, regulatory and planning approaches to ensure a sustainable built environment; cybersecurity; and related needs. Research and technology development in these areas

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<sup>65</sup> Cristina Carollo, The Nature Conservancy. Correspondence with EFC, 10/31/17.

<sup>66</sup> This could link to the region’s sustainable agriculture economic development initiatives, especially as it relates to developing and producing alternative fuels such as switch grass and manure-to-energy.

would have direct applications within the region, building resilience and fostering economic growth.

This strategy both supports, and would be supported by, broader resilience efforts in the region, particularly those being undertaken by the Wallops Complex. Many of the mechanisms that would protect Wallops' assets – such as shoreline fortification and flood control structures – would be ideal areas for technological, policy, and/or finance innovation. Piloted at Wallops or at other Eastern Shore locations, effective approaches could be scaled up and replicated throughout the region and the country, making Virginia's Eastern Shore a national model for community coastal resilience.



## Conclusion

There is no question that a changing climate will impact Virginia's Eastern Shore in the coming years – physically, socially, and economically. The region's capacity to bounce back from shocks and to thrive in the face of uncertainty will depend on its ability to coalesce around shared goals and mobilize resources to build adaptive capacity. Thoughtful integration of resilience and economic needs will enable the region to target investments in economic development activities that also support adaptation and mitigation priorities. The resulting synergies will enable available funds to stretch further and thereby achieve greater levels of infrastructure implementation.

Some of the ideas discussed in this report may not represent dramatically new ideas or ways of doing business on Virginia's Eastern Shore, such as taking a regional approach to identify shared priorities and identify concrete action steps, or making strategic investment in sectors that have potential to grow the economy and make the region more resilient. Other ideas may seem more innovative, such as creating a financing facility to coordinate existing investments, raise new revenue, and partner with the private sector; or taking a portfolio-based approach to infrastructure investments so that seemingly disparate projects are financed and implemented in concert. Whatever strategies Virginia's Eastern Shore elects to pursue, its leaders and residents should be commended for taking action now to ensure the region is physically, socially and economically ready to meet whatever challenges lie ahead.