Hampton Roads Planning District Commission

Integrating Coastal Resilience Into Local Plans, Policies, and Ordinances

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Virginia Coastal Zone
MANAGEMENT PROGRAM

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INTEGRATING COASTAL RESILIENCE INTO LOCAL PLANS, POLICIES, AND ORDINANCES

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Prepared by the staff of the Hampton Roads Planning District Commission

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ABSTRACT
This report documents the results of work by the staff of the Hampton Roads Planning District Commission on developing recommendations for local governments to promote coastal resilience. This report consists of four major sections. The first part consists of a review of local plans, policies, and regulations in Virginia's coastal zone that address coastal resilience or hazards. The second part documents several case studies from other coastal communities and regions. The third part synthesizes the lessons of the assessment and case studies to identify some best practices that localities in Hampton Roads and coastal Virginia can implement on their own. The fourth section describes how the findings from this project were conveyed to local staff through presentations and a workshop. In addition to these sections, there are four (4) appendices with supporting information.

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Executive Summary

The Hampton Roads Planning District Commission is a state-enabled, locally-created regional planning organization for southeastern Virginia, representing seventeen member local governments with over 1.7 million residents. Since 2008, the HRPDC staff has worked on a series of studies, projects, and efforts to better inform the region's local governments on the impacts of climate change, including sea level rise, and possible steps to adapt or mitigate those impacts. The majority of these efforts have been funded in part by the National Oceanic and Atmospheric Administration (NOAA) through grants from the Virginia Coastal Zone Management Program (VCZMP).

This report is the sixth in a series of projects completed by the HRPDC staff in consultation with local government staff, principally members of the HRPDC's Regional Environmental and Coastal Resiliency advisory committees.[1] It documents the findings and results of four deliverables completed as part of a grant funded by the Virginia Coastal Zone Management Program. The first is a review of existing plans, policies, and ordinances for counties and cities in Virginia's coastal zone ("Tidewater"). The second is a series of case studies from communities – cities, counties, and regions – that have demonstrated resilience planning in some form. The third is a description of some best practices for localities wishing to incorporate coastal resilience into their plans, policies, and ordinances, which is based on the assessment and ordinances in the first two sections. The fourth is a description of the outreach and educational efforts the HRPDC staff undertook to communicate the project's findings to locality staff in Hampton Roads. The overall goal of the report is to inform local resilience planning efforts in Hampton Roads and coastal Virginia.

Assessment of Coastal Resilience in Current Local Plans and Policies

Many communities in Virginia address coastal hazards or otherwise incorporate coastal resilience into their local plans, and policies, and ordinances, but the extent and substance varies significantly across the coastal zone. This study examined forty-seven localities in the coastal zone – seventeen cities, twenty-nine counties, and one town – to determine how each of these communities currently address resilience in its local policies. The documents examined as part of this assessment included comprehensive plans, hazard mitigation plans, floodplain management plans, and floodplain management ordinances. Overall, flooding and floodplain

[1] The Regional Environmental Committee and Coastal Resiliency Committee are official advisory committees of the Hampton Roads Planning District Commission.

management are commonly addressed through local policies, but sea level rise is not. Several localities also participate in the National Flood Insurance Program's Community Rating System.

Coastal Resilience Case Studies

Six government entities from around the country were looked at to identify potential options for Hampton Roads. Four of these case studies were local governments: Charleston County, South Carolina; Charleston, South Carolina; Hampton, Virginia; and Miami-Dade County, Florida. Two case studies were regional entities: the Middle Peninsula Planning District Commission in Virginia and the Southeast Florida Regional Climate Change Compact. Each of these case studies was selected because they offer a specific example of how a local government may integrate coastal resilience into their own policies. Each case study includes specific language that localities in Hampton Roads and other parts of coastal Virginia could use to begin or continue promoting coastal resilience.

Best Practices for Integrating Coastal Resilience into Local Policies

One of the goals of this project is to identify some best practices for integrating resilience into local policies. The research for this report has identified several specific examples of best practices in six categories: outreach and communication, coordination, planning, public facilities, local ordinances, and national and state programs. This section summarizes the practices identified through the assessment and case study analysis.

Education and Training

As part of this project the HRPDC staff regularly informed its Regional Environmental and Coastal Resiliency Committees of the status of the project and new findings throughout the process. HRPDC staff also presented on the project at the 2017 Environment Virginia Symposium held at the Virginia Military Institute in Lexington, Virginia. The main focus of this component of the project was the development of a curriculum for and the delivery of a workshop for local government staff. The workshop was held on May 9, 2017. Thirty-one (31) individuals, including local staff, state agencies, and interested non-governmental parties, attended the workshop.

Conclusions and Next Steps

The research completed for this report has increased the level of familiarity that the HRPDC staff has for the existing state of resilience practice in Virginia and some of the work conducted by entities outside Virginia. The HRPDC staff intends to use this study to initiate discussions with the HRPDC's Coastal Resiliency Committee and local governments about potential local and regional policies to develop or pursue. By providing an assessment of what actions

communities in Virginia have already taken and some examples of best practices, this study can serve as a road map for communities wishing to undertake additional resilience strategies. The HRPDC staff will also examine how it can maintain up-to-date information on local efforts in Virginia to better provide technical assistance and learning opportunities for local governments in Hampton Roads. The HRPDC staff will also provide this study to local governments throughout coastal Virginia through the network of coastal Planning District Commissions supported by the Virginia Coastal Zone Management Program.

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1. Introduction

The Hampton Roads region is located in southeastern Virginia and includes sixteen county-equivalent localities, including ten independent cities and six counties. Localities in Hampton Roads range in size from about 6,700 in Surry County to over 450,000 in Virginia Beach, the largest city in Virginia by population. The region's water access and temperature climate have contributed significantly to its growth as a tourist hub and commercial and military port. However, the region's relatively flat and low-lying topography and location on the coast make it vulnerable to coastal hazards such as tropical and subtropical storms, tides, and sea level rise. Rising sea levels and land subsidence make Hampton Roads one of the most vulnerable regions in the country to flooding and storm surge. Addressing these hazards through local plans, policies, and ordinances will be important to ensuring the region's long-term sustainability.

Coastal Virginia communities have made significant progress in assessing vulnerability to coastal hazards. The region's vulnerability to flooding is increasing due to sea level rise and the level of development in coastal and other flood-prone areas. Though state and federal leaders are aware of the significance of these challenges, in many cases the resources needed to undertake projects are lacking. However, local governments are making progress by developing new policies to change development patterns, increasing awareness of the impacts of coastal hazards to their communities, and promoting mitigation strategies.

While many Hampton Roads localities have incorporated efforts to mitigate coastal hazards such as storms, tidal flooding, and sea level rise into their local policies, room for improvement exists, particularly in better integrating local hazard mitigation plans and related policies, including the Community Rating System programs, with local comprehensive and other land use plans. This project is an attempt to identify best practices for integrating those often disparate actions. The first part of this project was a review of the current status of locality plans, policies, and ordinances in Coastal Virginia that relate to coastal hazards. The second part was a case study review of coastal communities to identify examples and best practices. The third part of the project was to develop recommendations for Hampton Roads communities based on these examples. The last part of the project was the completion of a workshop intended to educate and train local staff in Hampton Roads on the findings to help them begin implementing the identified practices in their communities.

The Hampton Roads Planning District Commission is a state-enabled, locally-created regional planning organization for southeastern Virginia, representing seventeen member local governments with over 1.7 million residents. Since 2008, the HRPDC's staff has worked on a

series of studies, projects, and efforts to better inform the region's local governments on the impacts of climate change, including sea level rise, and possible steps to adapt or mitigate those impacts. The majority of these efforts have been funded in part by the National Oceanic and Atmospheric Administration (NOAA) through grants from the Virginia Coastal Zone Management Program (VCZMP). Through these efforts several reports have been published by the HRPDC that have provided baseline vulnerability assessments to local governments and made recommendations for response strategies. In addition, the HRPDC has worked with other partners in the region and the Commonwealth, including Old Dominion University, the University of Virginia, and the Virginia Institute of Marine Science on related efforts to promote public awareness.

This report is the sixth in a series of projects completed by the HRPDC staff in consultation with local government staff, principally members of the HRPDC's Regional Environmental and Coastal Resiliency advisory committees. It documents the findings and results of four deliverables completed as part of a grant funded by the Virginia Coastal Zone Management Program. The overall goal of the report is to inform local resilience planning efforts in Hampton Roads and coastal Virginia by providing policy guidance and specific examples for local governments to learn from or emulate.

2. Assessment of Coastal Hazards in Current Local Plans and Policies

2.1. Existing Legal and Policy Structure for Coastal Hazards in Virginia

2.1.1. Code of Virginia

The Code of Virginia expressly allows and requires localities to plan for and address flooding and sea level rise. Because Virginia is a Dillon Rule state, localities require enabling legislation to enact local ordinances and policies. The Dillon Rule, named for Judge John Foster Dillon of Iowa, was first expressed in 1868 court cases and later in *Treatise on the Law of Municipal Corporations* (1872) and states the following:

- Municipal governments are created by and thus derive all of their powers and rights from state legislatures
- Therefore, municipal governments only have the powers expressly granted to them by the legislature, are implied by an express grant of power, or powers inherent to the municipality achieving its purposes
- Other powers are implicitly denied

Localities are authorized to use various policy tools to plan for coastal hazards, including Comprehensive, Hazard Mitigation, and Floodplain Management Plans. The requirements for developing a comprehensive plan are found in Section §15.2-2223 of the Code of Virginia. Local planning commissions are charged with making "…careful and comprehensive surveys and studies of the existing conditions and trends of growth, and of the probable future requirements of its territory and inhabitants."[2] The comprehensive plan is designed to guide development in accordance with present and future needs. Areas of the locality are to be designated for specific uses, including flood plain and drainage. The Code includes a specific requirement for Tidewater localities to incorporate the Comprehensive Coastal Resource Management guidance developed by the Virginia Institute of Marine Science that describes shoreline best management practices with respect to projected sea level rise. Section §15.2-2223.3 requires localities in the HRPDC to "… incorporate into the next scheduled and all

[2] Code of Virginia §15.2-2223

subsequent reviews of its comprehensive plan strategies to combat projected relative sea-level rise and recurrent flooding…"[3]

Section §15.2-2280 of the Code of Virginia authorizes localities to classify their territory into districts that they can regulate and for which they can determine appropriate uses.[4] Some example uses include structures, agricultural, residential, floodplains, etc. Most Tidewater localities use their Floodplain Ordinance to manage these uses.

Another Section of the Code of Virginia that influences how coastal localities manage floodplains is the Chesapeake Bay Preservation Act (§ 62.1-44.15:67), also known as the Bay Act.[5] The Bay Act and its associated regulations (the Chesapeake Bay Preservation Area Designation and Management Regulations) together establish a cooperative state-local program between the Department of Environmental Quality and Tidewater localities to balance the two goals of continuing economic development and protecting the health of the Chesapeake Bay. The Act and regulations require these local governments, with assistance from the state, to establish Chesapeake Bay local programs to implement the Act's requirements. These local programs consist of seven elements, including sections of the local comprehensive plan and various ordinances or ordinance revisions (zoning, subdivision, erosion and sediment control) which must be adopted. The Bay Act expands local government authority to manage water quality and establishes a more specific relationship between water quality protection and local land-use decision making. The regulations define floodplains as "…all lands that would be inundated by flood water as a result of a storm event of a 100-year return interval" and also specify that floodplains are to be included in designations of Resource Management Areas.

2.1.2. National Flood Insurance Program

In addition to state regulatory requirements, there are also federal laws and regulations that impact floodplain management. Localities must participate in the National Flood Insurance Program (NFIP) in accordance with 44 CFR 60 Subpart A – Requirements for Flood Plain Management Regulations in order for their residents to be able to purchase flood insurance policies.[6] The NFIP is a federal program administered through the Federal Emergency Management Agency that aims to reduce the impacts of flooding by providing flood insurance and encouraging communities to adopt and enforce floodplain management regulations. The

[3] Code of Virginia §15.2-2223.3
[4] Code of Virginia §15.2-2280
[5] Code of Virginia § 62.1-44.15:67
[6] Virginia Department of Conservation and Recreation. Floodplain management ordinances. 2017. http://www.dcr.virginia.gov/dam-safety-and-floodplains/fpordnce.

Department of Conservation and Recreation Division of Dam Safety and Floodplains provides model ordinances, technical assistance, and other resources to assist localities in implementing their floodplain management program.

Localities who participate in the NFIP can reduce flood insurance premiums by participating in the Community Rating System (CRS) Program. The CRS Program is an incentive for localities to adopt more stringent floodplain management regulations by providing discounts on flood insurance premiums.[7] The program awards point to localities for various activities that improve the effectiveness of their floodplain management programs. Points are awarded for activities such as public outreach campaigns, requiring more stringent construction standards, and developing extensive flood zone mapping. Localities enter the CRS at a Class 10 rating, and as they are awarded points, they move closer to the top-rated Class 1. The better a locality's class rating, the higher its insurance discounts will be.

2.1.3. Local Policies

Federal and state laws and regulations establish the minimum requirements for local governments in addressing coastal hazards. The state has given localities the authority necessary to take specific actions to promote and implement mitigation strategies. Localities develop hazard mitigation plans to analyze risks and resources and set goals for capital improvement mitigation projects. The hazard mitigation plan informs the comprehensive plan, which establishes the vision for the locality's future. The vision is then implemented through ordinances, such as the zoning, subdivision, floodplain management, etc., and on the ground projects.

2.2. Assessment of Current Local Plans and Policies

HRPDC staff completed a survey of local plans and policies to determine how and if coastal hazards are addressed. The comprehensive plans, hazard mitigation plans, floodplain management ordinances, floodplain management plans, and Community Rating System membership, if applicable, of 47 communities of the Virginia Coastal Zone were included in the survey. The 47 communities included 17 cities, 29 counties, and 1 town. The survey assessed the date the plans were last adopted and the extent to which the existing plans address coastal hazards such as flooding, storms, and sea level rise. A detailed report of the findings for each locality can be found in Appendix A.

[7] Virginia Department of Conservation and Recreation. The Community Rating System (CRS). 2017. http://www.dcr.virginia.gov/dam-safety-and-floodplains/fp-crs.

2.2.1. Comprehensive Plans

The comprehensive plan provides the road map for a locality's future. It leads to implementation through ordinances and projects. All 47 of the comprehensive plans reviewed include considerations for floodplain protection. Less than half of the comprehensive plans, 15, include evaluating the potential impacts of sea level rise. Two factors determined whether sea level rise was considered – proximity to the coast and how recently the plan was updated. Of the 15 communities who considered sea level rise, 8 of them established goals to address sea level rise in their comprehensive plan. Examples from the cities of Virginia Beach and Suffolk are presented below.

Locality	Goal
City of Virginia Beach	2.2-2.9: Complete the City Comprehensive Response Plan to Sea Level Rise and Recurrent Flooding for all areas of the City and implement the recommendations therein, subject to funding.
City of Suffolk	Policy 5-4: Develop strategies to ensure that low-lying areas of the City located along the James and Nansemond Rivers and their associated tributaries are not adversely impacted by sea level rise.

2.2.2. Hazard Mitigation Plans

Hazard mitigation plans contain specific actions designed to protect residents, business owners, and the developed environment from those hazards that pose the greatest risk. There are seven regional hazard mitigation plans that cover Coastal Virginia: 1) Eastern Shore, 2) George Washington Regional Commission, 3) Hampton Roads, 4) Middle Peninsula, 5) Northern Neck, 6) Northern Virginia, and 7) Richmond-Crater Multi-Regional.[8] Each of these plans includes extensive coverage of coastal hazards, including an evaluation of the risks and recommended mitigation actions. Three of the hazard mitigation plans included strategies to integrate the mitigation planning process into their other planning documents. The examples are provided below.

[8] Prior to the current regional hazard mitigation plan being adopted, the Hampton Roads region had four active plans. Chesapeake and Poquoson had separate plans, and there were regional plans covering the other localities on the Peninsula and in South Hampton Roads.

Regional HMP	Goal
Eastern Shore	Regional Mitigation Project - All counties and towns participating in the Hazard Mitigation Planning process incorporate the Eastern Shore of Virginia Hazard Mitigation Plan into the Comprehensive Plan for their respective locality.
Middle Peninsula	Regional Strategy 1.1.19 - Integrate mitigation strategies into locality plans, policies, codes, and programs across disciplines and departments.
Hampton Roads	City of Hampton Mitigation Action 12 - Build resiliency into how the city addresses its social, economic and physical challenges.

2.2.3. Floodplain Management Plans

The purpose of a floodplain management plan is to analyze the causes of localized flooding, identify vulnerabilities due to flooding, analyze the locality flood management practices, and provide feasible solutions to strengthen the flood management system to reduce the damage cause by flooding. It is somewhat similar to a Hazard Mitigation Plan. Unlike regional Hazard Mitigation Plans, Floodplain Management Plans are traditionally developed for a single locality. These plans contain detailed descriptions of the impacts of flooding to the community and specific strategies to reduce these impacts. Floodplain Management Plans are developed with significant input from the affected stakeholders. Two of the 47 coastal communities surveyed have developed Floodplain Management Plans – Gloucester County and Portsmouth.

Gloucester County developed their plan in July 2009 following the guidelines outlined by FEMA and updated the plan in August 2014. Gloucester County formed a Floodplain Management Committee to guide plan implementation, review the plan annually, and provide input to the required 5-year update. The Committee was made up of county staff, Virginia Commonwealth University professors, and other stakeholders, including the former Director of Planning and the former Emergency Management Coordinator. The Committee met three times and provided initial feedback on the draft plan. Three public meetings were held during the development of the plan. Some of the recommendations included in the plan are to: 1) maintain the Floodplain Management Plan and consider requiring more stringent construction standards in the Coastal A zone, 2) provide more information to residents and property owners regarding property protection and flood insurance, 3) evaluate the potential impact of sea level rise and consider management options, and 4) continue to enforce building codes and encourage residential clustering with flood-prone areas. The County also formed an annual review committee, whose

16 members are landowners, residents, and business owners of the flood prone areas, Board members, and county staff. Gloucester County's plan is available on the county's website.[9]

The City of Portsmouth developed their Floodplain Management and Repetitive Loss Plan in 2005 and updated it in 2010, and most recently in August 2015. The US Army Corps of Engineers partnered with the City for the 2015 update. The City formed the Portsmouth Floodplain Management Plan Task Force to engage the public and create new development standards. The members of the Task Force were appointed by City Council and included citizens from a wide range of neighborhoods, military command representatives, Portsmouth Public Schools, Virginia Cooperative Extension, other local organizations, City staff from different departments, and media. The Task Force met five times while developing the draft plan update. The plan has six core elements: 1) the City's flooding history, 2) sea level rise, 3) repetitive and severely repetitive loss structures, 4) financial aspects, 5) continuing actions, and 6) long term actions. The mitigation actions are grouped into categories, such as economic development, infrastructure, and repetitive loss area activities. There is an emphasis on providing information pertaining to flood risk, regulations requirements, flood insurance, and protection measures to citizens and the real estate community. Portsmouth's plan is also available on the city's website.[10]

2.2.4. Floodplain Management Ordinances

Communities participating in the NFIP are required to adopt and implement floodplain management ordinances that meet certain minimum requirements. One component of these ordinances is the freeboard required for development within floodplains. Freeboard is a factor of safety usually expressed in feet above a flood level for purposes of floodplain management (see image below). The minimum freeboard requirement for NFIP communities for residential development in Special Flood Hazard Areas is 0 feet.[11] However, many communities establish a higher standard. HRPDC staff compared the freeboard requirements across the 47 communities surveyed for this project. Of the 47 communities surveyed, 33 of them require freeboard above the base flood elevation ranging from 1-foot to 3-feet. Eight localities require 3 feet, seven

[9] Gloucester County. "A Coastal Floodplain Management Plan for Gloucester County, Virginia." Gloucester County. August 2014. http://www.gloucesterva.info/Portals/0/es/documents/AdoptedFloodplainManagementPlan9-2-14.pdf

[10] City of Portsmouth. "City of Portsmouth, Virginia 2015 Floodplain Management Plan and Repetitive Loss Plan Update." City of Portsmouth. August 2015. https://www.portsmouthva.gov/DocumentCenter/View/564

[11] See 44 CFR 60.3 - Flood plain management criteria for flood-prone areas.

localities require 2 feet, seven localities require 1.5 feet, and eleven require 1 foot of freeboard. Table 1 shows the distribution of freeboard requirements among the localities surveyed.

The Department of Conservation and Recreation maintains a model Floodplain Management Ordinance that includes a baseline standard for the "floodplain" to include areas vulnerable to the 1% annual chance flood (Zones A, AE, VE, etc.).[12] DCR's model ordinance recommends that localities adopt a freeboard of one foot or higher for various flood zones. In addition, localities have the flexibility to regulate areas outside of the local flood hazard areas identified by FEMA. The City of Hampton has used this existing authority to establish freeboard of three feet in the flood zone and 1.5 feet in the X (shaded) zone or 0.2% chance/500-year floodplain (Hampton's floodplain management policies are included in the case study section of this report).

Figure 1: Base Flood Elevations for A-Zone and V-Zone Buildings

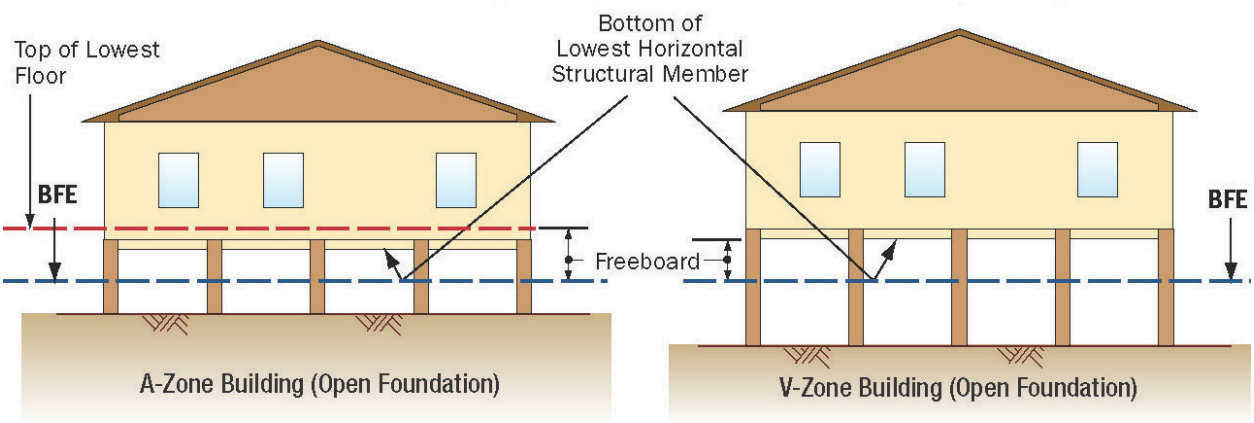


Image source: FEMA Home Builder's Guide to Coastal Construction Technical Fact Sheet No. 1.4, "Lowest Floor Elevation"

[12] Virginia Department of Conservation and Recreation

Table 1: Freeboard Requirements in Coastal Virginia Localities

Freeboard Above BFE	Localities
3'	Accomack County, Caroline County, Hampton, Norfolk, Poquoson, Portsmouth, Stafford County, York County
2'	Gloucester County, Hopewell, James City County, Middlesex County, Newport News, Northumberland County, Virginia Beach
1.5'	Chesapeake, Fairfax, Fredericksburg, Isle of Wight County, King William County, Lancaster County, New Kent County
1'	Alexandria, Arlington County, Colonial Heights, Essex County, Fairfax County, Falls Church, Henrico County, Northampton County, Prince George County, Richmond, Spotsylvania County
0'	Charles City County, Chesterfield County, Hanover County, King and Queen County, King George County, Mathews County, Petersburg, Prince William County, Richmond County, Smithfield, Suffolk, Surry County, Westmoreland County, Williamsburg

A relatively new addition to local floodplain management ordinances is the Coastal A Zone. The Coastal A Zone is defined as the area between the landward edge of the Coastal V Zone and the Limit of Moderate Wave Action (LiMWA), which is a new feature on most coastal locality Flood Insurance Rate Maps (FIRMs). Previously, Coastal V Zones were those where the flood elevation included wave heights equal to or greater than 3 feet. However, additional research and documentation has shown that wave heights between 1.5 feet and 3 feet can still cause significant structural damage.[13] As a result, FEMA has begun adding the LiMWA line to FIRMs in coastal communities as a non-regulatory, advisory line and now recommends applying similar standards in these areas as those used in Coastal V Zones. Of the 47 communities surveyed for this report, 27 have incorporated Coastal A Zones and the LiMWA into their floodplain management ordinances to some degree.

2.2.5. Community Rating System

The Community Rating System is a part of the NFIP that incentivizes communities to adopt more stringent floodplain management regulations by providing discounts on flood insurance policy premiums. To be recognized as part of the program, communities must describe, measure, and submit their flood management activities to the CRS. The activities are awarded points in accordance with the CRS Coordinator's Manual. A community receives a CRS

[13] Federal Emergency Management Agency. "Limit of Moderate Wave Action (LiMWA) Fact Sheet." Federal Emergency Management Agency. 2015. https://www.fema.gov/media-library/assets/documents/96413

classification based upon the points for their activities. Class 1 requires the most points and gives the greatest discount, up to 45% in the Special Flood Hazard Area. By comparison, Class 9 communities are awarded a 5% discount.

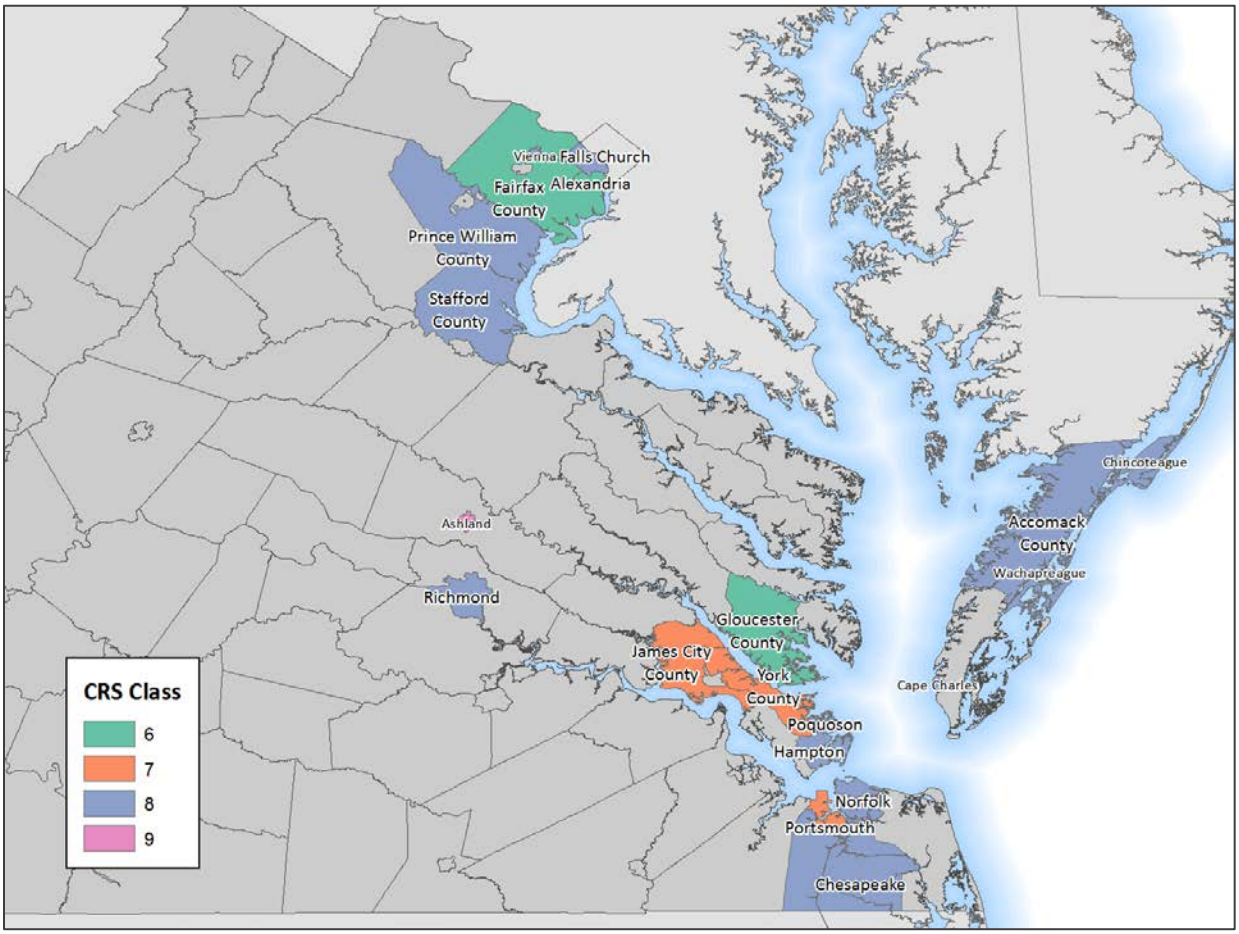
Of the 47 communities surveyed, sixteen are in the CRS. The localities and their classes are listed below (coastal towns that were not included in the survey are also included). Eleven of these communities have been part of the CRS since the early 1990s.[14] Two cities, Chesapeake and Richmond, have joined within the last two years. In addition, the cities of Newport News and Virginia Beach recently began the application process for joining the CRS.

Table 2: CRS Communities in Coastal Virginia

CRS Class	Localities	SFHA Policy Discount
6	Alexandria, Fairfax County, Falls Church, and Gloucester County	20%
7	James City County, Portsmouth, and York County	15%
8	Accomack County, Arlington County, Cape Charles, Chesapeake, Chincoteague, Hampton, Norfolk, Poquoson, Prince William County, City of Richmond, Stafford County, Vienna, and Wachapreague	10%
9	Ashland	5%

[14] Federal Emergency Management Agency. "Community Rating System (CRS) Communities and their Classes." Federal Emergency Management Agency. 2016. https://www.fema.gov/media-library/assets/documents/15846 (accessed 2017).

Figure 2: Map of CRS Communities in Coastal Virginia



Source: Federal Emergency Management Agency

3. Coastal Hazards Planning Case Studies

3.1. Charleston, South Carolina
CRS Program and Local Separate Plan

3.1.1. Summary

Charleston, South Carolina, is a major historic city located on South Carolina's Atlantic Coast. The city is the largest in the state by population with over 130,000 residents with a total land area of approximately 109 square miles. Founded in 1670, the city shares many characteristics with Hampton Roads communities: a long history that dates back to colonial times, a natural harbor and major seaport, a substantial military presence, and an intact, historic urban core. However, also like some Hampton Roads communities, the city is located in a low-lying, coastal environment, with aging water management infrastructure, including both stormwater management systems and flood mitigation projects. As a result, the city is vulnerable to flooding, tropical storms, and sea level rise, with nuisance flooding already resulting in significant impacts.

In response, the city has pursued several efforts to address the impacts of present day recurrent flooding and prepare the city for future sea level rise. These have included both governmental actions and efforts by non-governmental organizations in the city and surrounding area. Government actions have included the development and adoption of a Sea Level Rise Strategy document and participation in the CRS. These efforts are described in greater detail below. An example of a non-governmental action is an annual campaign, called "Awakening," by an area non-profit, Enough Pie. The most recent campaign focused on educating and engaging area residents on King Tides[15] and flooding through a series of public events.

The purpose of Charleston's Sea Level Rise Strategy, adopted in December 2015, is to act as an overall guidance document to help the city achieve three goals while responding to sea level rise: (1) protection of lives and property; (2) economic development and sustainability; and (3)

[15] King Tide is a term used in some communities to describe exceptionally high tides beyond typical spring tides. https://oceanservice.noaa.gov/facts/kingtide.html

improvement of quality of life.[16] The strategy is separate from the city's comprehensive plan and capital improvements program. It is the result of two years of work by multiple city departments, including Emergency Management, GIS, Planning, Preservation and Sustainability, and Public Service, to identify or develop strategies to help the city adapt to sea level rise. The strategy describes the city's history with flooding, how sea level rise and flooding will present significant challenges for the future, and what actions the city is already taking to address flooding, including policies and improvements to the city's stormwater management infrastructures. A sample page showing some of the city's completed and planned drainage improvement projects is shown in Figure 3. The strategy also describes the sea level rise scenarios (and the time horizon they are based on) the city will use in making decisions. Using a 50-year horizon, the city will use 1.5 feet of sea level rise for shorter term or less critical projects and 2.5 feet of sea level rise for long term or more critical investments.

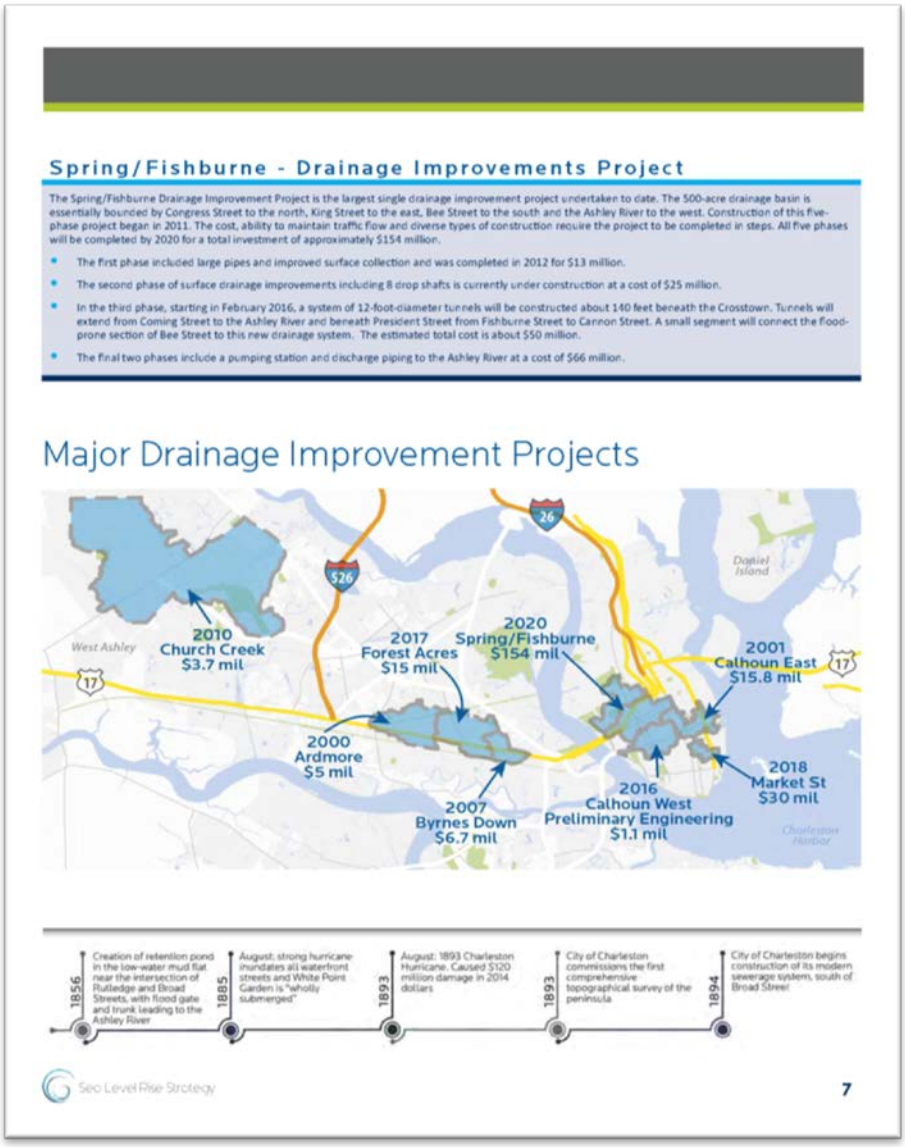
The main feature of the strategy is a list of over seventy-five recommended actions the city can undertake to become more resilient to flooding.[17] These recommendations are divided into three categories: reinvest, respond, and ready. "Reinvest" actions include construction of projects or implementation of policies to reduce the impacts of flooding on the built environment. This category emphasizes public buildings and infrastructure. Examples include raising the elevation of primary streets and considering additional freeboard for long-term investments and critical facilities. Actions in the "Respond" category focus on addressing flooding events when they occur. Example actions include installing flood gauges and developing a flood parking plan. The "Ready" category includes actions designed to improve the city's overall resilience by educating residents and setting policies for the city as a whole. Examples include updating the city's zoning ordinance and comprehensive plan and hiring staff to focus on resilience and floodplain management.

In addition to adopting the Sea Level Rise Strategy, Charleston is also a dedicated participant in the CRS program. During the city's last verification visit in 2014 it achieve a Class 6 Rating, which entitles NFIP policy holders in the city to a 20% reduction on flood insurance premiums. The city scored points in fifteen different categories, earning a significant number of points for its outreach efforts (Activity 330 – 250 points), higher regulatory standards (Activity 430 – 291 points), stormwater management (Activity 450 – 216 points), floodplain management planning (Activity 510 – 256 points), and flood warning and response (Activity 610 – 263 points).[18] For

[16] Charleston. "Sea Level Rise Strategy." Charleston, South Carolina. 2015. http://www.charleston-sc.gov/index.aspx?NID=1576 (accessed 2017).
[17] Charleston Sea Level Rise Stategy
[18] City of Charleston Community Rating System Verification Report (November 4, 2014)

example, outreach efforts included flood brochures, pages on the city's website[19] [20], slideshows available for download that describe what the city is doing to combat flooding and sea level rise, and an interactive GIS-based sea level rise viewer.[21] The viewer shows half-foot increments of sea level rise from 0 feet to 3 feet.

Figure 3: Charleston Sea Level Rise Strategy Sample Page



Source: City of Charleston Sea Level Rise Strategy, 2015

[19] Charleston Sea Level Rise Strategy
[20] City of Charleston Public Service Department. Why Does It Seem Like Charleston Always Floods When It Rains? n.d. http://www.charleston-sc.gov/index.aspx?nid=588 (accessed 2017).
[21] Charleston, SC. Charleston Sea Level Rise Viewer. n.d. http://gis.charleston-sc.gov/interactive/slr/ (accessed 2017).

Adopting higher regulatory standards for development in floodplains is an effective way for communities to both increase their resilience to flooding and to earn CRS points. Although some higher standards, such as freeboard, are relatively common, standards that add cumulative tracking to substantial damage or improvement regulations are significantly less so. Charleston has made both regulations apply cumulatively over a rolling five-year period. In other words, a series of smaller damaging events or improvements to a structure can trigger the same legal requirements to upgrade to current standards as a single major occurrence. The specific language from Charleston's City Code is included below.

> "*Substantial damage* means damage of any origin sustained by a structure whereby the cumulative cost of restoring and/or repairing the structure to its before damaged condition would exceed fifty (50) percent of the market value of the structure before the damage occurred. **The reconstruction and repairs are counted cumulatively for five (5) years.**" [22]

> "*Substantial improvement* means any repair, reconstruction, improvement or addition to an existing structure, **the cumulative cost counted for a five-year period** equals or exceeds fifty (50) percent of the market value of the structure, either (1) before the improvement or repair is started, or (2) if the structure has been damaged and is being restored, before the damage occurred. For the purposes of this definition, "substantial improvement" is considered to occur when the first alteration of any wall, ceiling, floor, or other structural part of the building commences, whether or not that alteration affects the external dimensions of the structure." [23]

The city also requires one foot of freeboard in all Special Flood Hazard Areas.[24]

3.1.2. Key Points

- Charleston residents benefit directly from the city's participation in the CRS program. As a Class 6 community, individuals purchasing flood insurance for properties located within Special Flood Hazard Areas (A or V zones) receive a 20% reduction on their flood insurance premiums.
- Public outreach and education is a major component of the city's CRS program and resiliency goals.

[22] Charleston City Code Sec. 27-103
[23] Charleston City Code Sec. 27-103
[24] Charleston City Code Sec. 27-117

- ❖ The development of a standalone Sea Level Rise Strategy has focused the city's efforts and created a roadmap for future projects.
- ❖ Charleston has higher development standards that will help it become a more flood-resilient city over time as new development and redevelopment occur.

3.1.3. Applications for Hampton Roads Communities

Charleston is an example for Hampton Roads communities in two ways. First, it is a coastal city with many of the same infrastructure and development issues as those found in Hampton Roads. Even so, it has been successful in implementing the CRS program to a significant extent. Second, the development of a standalone plan has focused attention on the city's challenge with sea level rise and provided a framework for moving forward in terms of both project construction and policy development. A similar approach could work for Hampton Roads communities, particularly if they are between updates of comprehensive or hazard mitigation plans.

3.2. Charleston County, South Carolina
CRS Program and Floodplain Management Ordinance

3.2.1. Summary

Charleston County, South Carolina, located on the state's Atlantic coast, is the third most populous county in South Carolina, with a population of nearly 390,000. Charleston County is part of the Charleston-North Charleston Metropolitan Statistical Area, the county's 78th-largest, along with Berkeley County and Dorchester Counties. Charleston County includes sixteen municipalities, four cities (Charleston, Folly Beach, Isle of Palms, and North Charleston) and twelve towns (Awendaw, Hollywood, James Island, Kiawah Island, Lincolnville, McClellanville, Meggett, Mount Pleasant, Ravenel, Rockville, Seabrook Island, and Sullivan's Island).[25] The county's total area is over 900 square miles. The county's unincorporated area is approximately 714 square miles, of which 35 square miles are considered urbanized.

[25] Charleston County, SC. Municipalities. n.d. https://www.charlestoncounty.org/municipalities.php (accessed 2017).

Like its largest city, Charleston County participates in the CRS program. In addition to the unincorporated parts of the county, the county's staff manages the programs for nine of the county's towns.[26] As of October 2016, the county had a CRS class rating of 4, which provides a reduction of 30% on residents' flood insurance premiums, while the nine town programs ranged from 5 to 7. Earning a class 4 rating requires meeting certain prerequisites in addition to earning enough points. These prerequisites include earning points for specific activities or implementing certain programs. Charleston County's program received points from fifteen separate categories, with over 100 points in nine categories. The county earned the greatest number of points from outreach projects (Activity 330 – 296 points), higher regulatory standards (Activity 430 – 1,024 points), stormwater management (Activity 450 – 414 points), floodplain management planning (Activity 510 – 310 points), and drainage system maintenance (Activity 540 – 270 points). Charleston County and its incorporated communities, including the City of Charleston, also benefit from a county growth adjustment (CGA) of 1.12, which multiplies the points earned in the 400 series of activities. The CGA resulted in an addition 190 points.[27]

As part of its outreach efforts, Charleston County has published a series of brochures targeted at specific groups such as current residents, prospective homebuyers, and tourists. The county conducts or has conducted over forty separate activities as part of its program for public information (PPI), including committee meetings, educational talks for contractors and design professionals, training for staff, participation at public events, and publications.

Charleston County earns points for higher regulatory standards that are similar to those in the City of Charleston. The county defines substantial improvement to include cumulative improvements over a five-year period and to include substantially damaged structures.

> "*Substantial improvement* means any reconstruction, rehabilitation, addition or other improvement of a structure, taking place during any five consecutive years in the life of a building, the cumulative cost of which equals or exceeds 50 percent of the market value of the existing structure at the date of "start of construction" of the improvement as determined by the building official. This term includes structures which have incurred "substantial damage," regardless of the actual repair work performed." [28]

[26] Charleston County, SC. Charleston Regional Hazard Mitigation Plan 2016 Update. Charleston County, SC, 2016. https://www.charlestoncounty.org/departments/building-inspection-services/files/hazard-mitigation-plan.pdf
[27] Charleston County Community Rating System Verification Report (March 27, 2012)
[28] Charleston County Code of Ordinances Sec. 9-10

Figure 4: Charleston County Flood Risk Brochure for Prospective Homebuyers

Source: Charleston County Building Inspection Services

All communities with floodplain ordinances have substantial improvement and damage regulations. What sets Charleston County and similar communities apart is the cumulative application of these requirements. By tallying improvements made to a property over several years, many more structures can potentially end up meeting the 50% threshold, thus requiring the whole structure to be brought into compliance with current standards. This can significantly increase the speed by which a community makes its older building stock more resilient to flooding.

The county has also adopted a freeboard requirement of two feet for new construction and substantial improvements in the special flood hazard area.[29] In addition, new construction and substantial improvements are required to be constructed with Class 4 or 5 materials resistant

[29] Charleston County Code of Ordinances Sec. 9-40

to flood damage in all areas below the design flood elevation (the county's term for the base flood elevation plus freeboard). The county also receives points for staff education and floodplain manager certification.[30]

3.2.2. Key Points

- Charleston County residents benefit directly from the city's participation in the CRS program. As a Class 4 community, residents receive a 30% reduction on their flood insurance premiums.
- Public outreach and education is a major component of the city's CRS program and resiliency goals.
- Charleston County has implemented several development requirements that apply to new and substantially improved construction, including a cumulative standard for substantial improvement.

3.2.3. Applications for Hampton Roads Communities

Charleston County provides an example of a growing coastal community that has been able to implement the CRS program to a significant extent, earning a class 4 rating. However, since that rating only covers the county's unincorporated areas, it is uncertain how much of an example Charleston County would actually be for Hampton Roads communities, either counties or cities. The county's implementation of cumulative improvement and damage requirements presents a specific model for Virginia communities to follow if that is desirable.

3.3. Hampton, Virginia
Local Floodplain Management Ordinance

3.3.1. Summary

Hampton, Virginia, is an independent city with a population of nearly 140,000 residents, located in the Hampton Roads region of Virginia. According to the most recent population estimates, Hampton is Virginia's seventh largest city and its fourteenth largest county-equivalent locality.[31]

[30] Charleston County Community Rating System Verification Report
[31] Weldon Cooper Center for Public Service. Virginia Population Estimates. 2017. http://demographics.coopercenter.org/virginia-population-estimates/ (accessed 2017).

Situated along the main stem of the Chesapeake Bay, the city's low-lying coastal geography makes it vulnerable to both tidal flooding and sea level rise. The city's long history, like Charleston's, makes it that much more vulnerable, as aging infrastructure and long-term development increase the city's exposure to flooding.

Hampton has adopted a number of policies to help reduce its risk. The city participates in the National Flood Insurance Program and the CRS program, with a class rating of 8 as of October 2016.[32] In addition, the city has taken advantage of some opportunities built into Virginia's model floodplain management ordinance to improve its resiliency to flooding. As stated above, the model ordinance maintained by the Virginia Department of Conservation and Recreation (DCR) allows localities to establish freeboard requirements for properties located within designated flood zones. In most cases, these standards apply to the 1% annual chance flood hazard zones – A, AE, V, VE, etc. Hampton has established a freeboard requirement of three feet for all special flood hazard areas.[33]

In addition to allowing for freeboard requirements, the model floodplain management ordinance also contains a provision, based on federal regulations, allowing localities to establish regulations for other, non-regulatory floodplains:

> "The {community} may identify and regulate local flood hazard or ponding areas that are not delineated on the FIRM. These areas may be delineated on a "Local Flood Hazard Map" using best available topographic data and locally derived information such as flood of record, historic high water marks, or approximate study methodologies." [34]

Similarly, the Code of Virginia allows localities to designate areas as floodplains as part of their powers to create comprehensive plans and zoning ordinances.

> "The comprehensive plan, with the accompanying maps, plats, charts, and descriptive matter, shall show the locality's long-range recommendations for the general development of the territory covered by the plan. It may include, but need not be limited to:
> 1. The designation of areas for various types of public and private development and use, such as different kinds of residential, including age-restricted, housing; business; industrial; agricultural; mineral resources; conservation; active and passive recreation; public service; **flood plain and drainage**; and other areas;" [35]

[32] Federal Emergency Management Agency
[33] City of Hampton Zoning Ordinance Sec. 9-34 (2)(a)
[34] Virginia Department of Conservation and Recreation
[35] Code of Virginia §15.2-2223 (C)(1)

> "Any locality may, by ordinance, classify the territory under its jurisdiction or any substantial portion thereof into districts of such number, shape and size as it may deem best suited to carry out the purposes of this article, and in each district it may regulate, restrict, permit, prohibit, and determine the following::
> 1. The use of land, buildings, structures and other premises for agricultural, business, industrial, residential, **flood plain** and other specific uses;" [36]

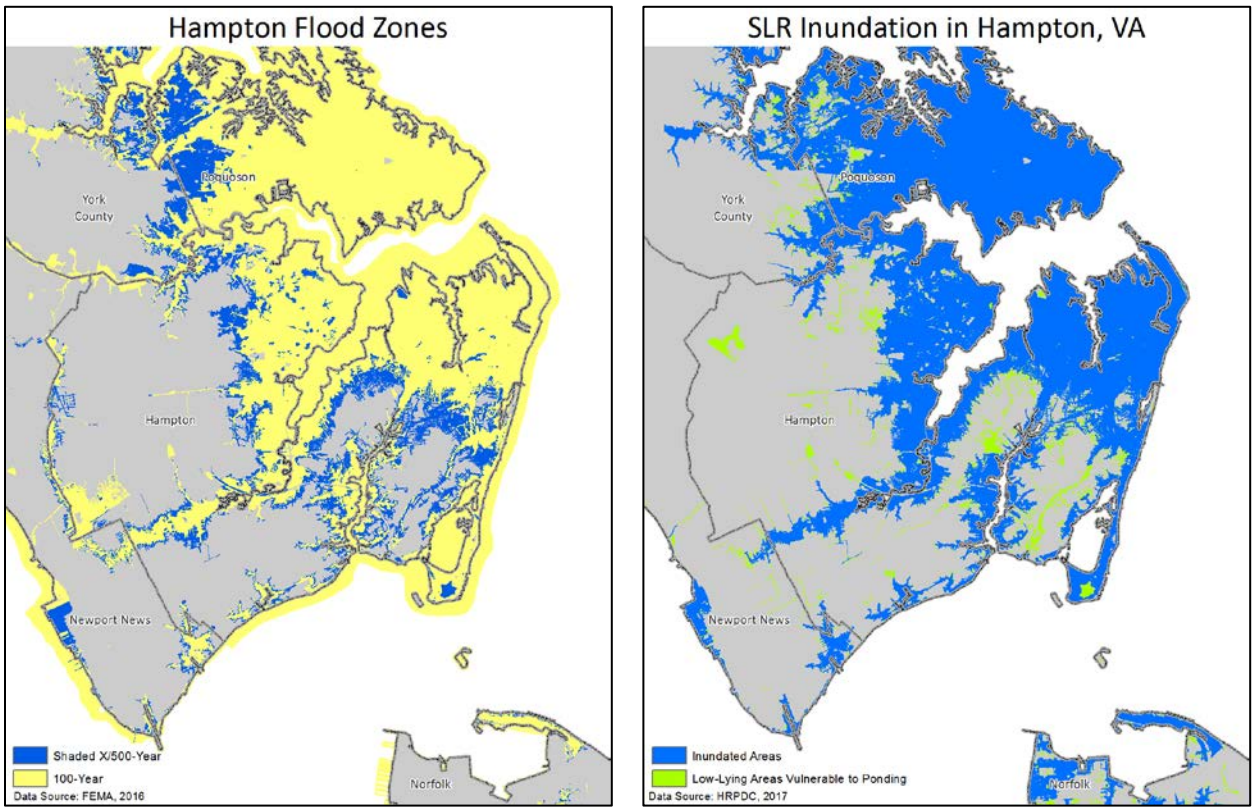
Hampton has taken advantage of these powers by applying some floodplain management regulations to the shaded (X) or 0.2% annual chance flood hazard area, otherwise known as the 500-year floodplain. Typically, local floodplain management ordinances do not apply to these areas. However, as Hampton demonstrates, doing so can have significant benefits in terms of long-term community resilience to sea level rise and flooding (see Figure 5 for a comparison of the areas Hampton's ordinances applies to and areas potentially vulnerable to sea level rise). Hampton's ordinance defines "other flood areas" as the X (shaded) or X500 areas on the city's Flood Insurance Rate Map and requires new construction in those areas to meet to be constructed a minimum elevation above grade:

> "Other flood areas shall be those areas identified as X (Shaded) or X500 on the FIRM for which there is a one-fifth percent (0.2%) annual chance of flooding.
> (i) All new construction as of September 10, 2014 shall have the lowest floor, including basement, elevated or flood-proofed to one and one-half (1.5) feet above the highest grade immediately adjacent to the structure except as described below:
> (aa) When fill is placed to raise a structure at least one and one-half (1.5) feet above the highest existing grade immediately adjacent to the structure, as shown on a development plan prepared and stamped by a certified land surveyor or professional engineer." [37]

The net effect of these ordinance provisions is to raise buildings currently vulnerable to flooding and that will be vulnerable to flooding in the future out of the floodplain. In addition to protecting a larger area of the city from flooding now, the additional requirements will also improve the city's resilience in the future as flooding frequency increases as a result of sea level rise.

[36] Code of Virginia §15.2-2280 (1)
[37] City of Hampton Zoning Ordinance Sec. 9-33 (1)(h)

Figure 5: Comparison of Designated Flood Zones and Potential Inundation with 7 feet of Sea Level Rise in Hampton, Virginia



Sources: FEMA, HRPDC

3.3.2. Key Points

- Hampton has incorporated two provisions in its floodplain management ordinance to protect properties from flooding: a freeboard requirement in the 1% annual chance flood hazard area and a height-above-grade requirement in the 0.2% annual chance flood hazard area.
- Requiring buildings to be built above grade in the present 0.2% annual chance flood hazard area will help protect the city as flooding becomes more frequent and affects more areas as a result of sea level rise.

3.3.3. Applications for Hampton Roads Communities

Hampton's floodplain management ordinance provides a model for communities wishing to address the increasing frequency of flooding due to sea level rise through their local regulations. The floodplain management ordinance, which is guided by federal regulations and

explicitly authorized by the General Assembly, is an ideal opportunity for localities to adopt policies that will have near-term impacts. Hampton's inclusion of the 500-year floodplain enforces adaptation in private development in areas that will flood more frequently in the future. By using the floodplain and not a specific elevation, the requirement will also apply to addition areas as the 500-year floodplain expands as a result of sea level rise.

3.4. Middle Peninsula Planning District Commission Regional Hazard Mitigation Plan

3.4.1. Summary

The Middle Peninsula Planning District Commission (MPPDC) is the regional planning agency for Virginia's Middle Peninsula, which is located just north of Hampton Roads along the Chesapeake Bay. The MPPDC counts nine local governments as members: six counties (Essex, Gloucester, King and Queen, King William, Mathews, and Middlesex) and three towns (Tappahannock, Urbanna, and West Point).[38] The total population of the region is approximately 91,000. The largest county is Gloucester, with a population of about 37,000, while King and Queen County is the smallest, with a population of about 7,200.[39]

Like many planning districts in Virginia, the MPPDC coordinates a regional all-hazards mitigation plan on behalf of its local governments to help them satisfy federal regulatory and eligibility requirements. The MPPDC most recently completed an update to the hazard mitigation plan in 2016.[40] The plan includes several major sections:

1) A community profile for the region as a whole and each locality
2) A broad identification of hazards and a risk assessment for each, including prioritizing which hazards are considered critical (winter storms (ice), coastal flooding, lightning, hurricanes, and summer storms)
3) An analysis of the region's exposure to flooding and sea level rise using FEMA's Hazus program[41]

[38] MPPDC. About MPPDC. n.d. http://www.mppdc.com/index.php/pdcinfo/mppdc (accessed 2017).
[39] Weldon Cooper Center
[40] MPPDC. Middle Peninsula All Hazards Mitigation Plan 2016. Saluda, VA: Middle Peninsula Planning District Commission, 2016. http://www.mppdc.com/articles/reports/AHMP_2016_FEMA_Approved_RED.pdf
[41] Federal Emergency Management Agency. Hazus. n.d. https://www.fema.gov/hazus (accessed 2017).

4) A capability assessment for each locality
5) A review of the status of strategies from the previous regional hazard mitigation plan
6) New mitigation goals, objectives, and strategies for each locality
7) An implementation plan

While the plan covers several categories of hazards, flooding is a major focus of both the hazard assessment and analysis. Several of the Middle Peninsula's communities, including Gloucester, Mathew, and Middlesex, share a similar vulnerability to flooding as the eastern communities on the Peninsula and in South Hampton Roads. These areas, located east of the Suffolk Scarp, are low-lying, flat, and directly adjacent to the Chesapeake Bay. As a result, the plan includes an extensive assessment of the region's exposure to flooding, with maps showing the 100-year and 500-year floodplains for each locality and the approximate locations of structures located within those floodplains. In addition to the assessment, the plan includes a detailed analysis, using GIS and HAZUS-MH, of the region's vulnerability to flooding in terms of total annualized losses. This analysis is provided for each locality by building type and use with accompanying maps.

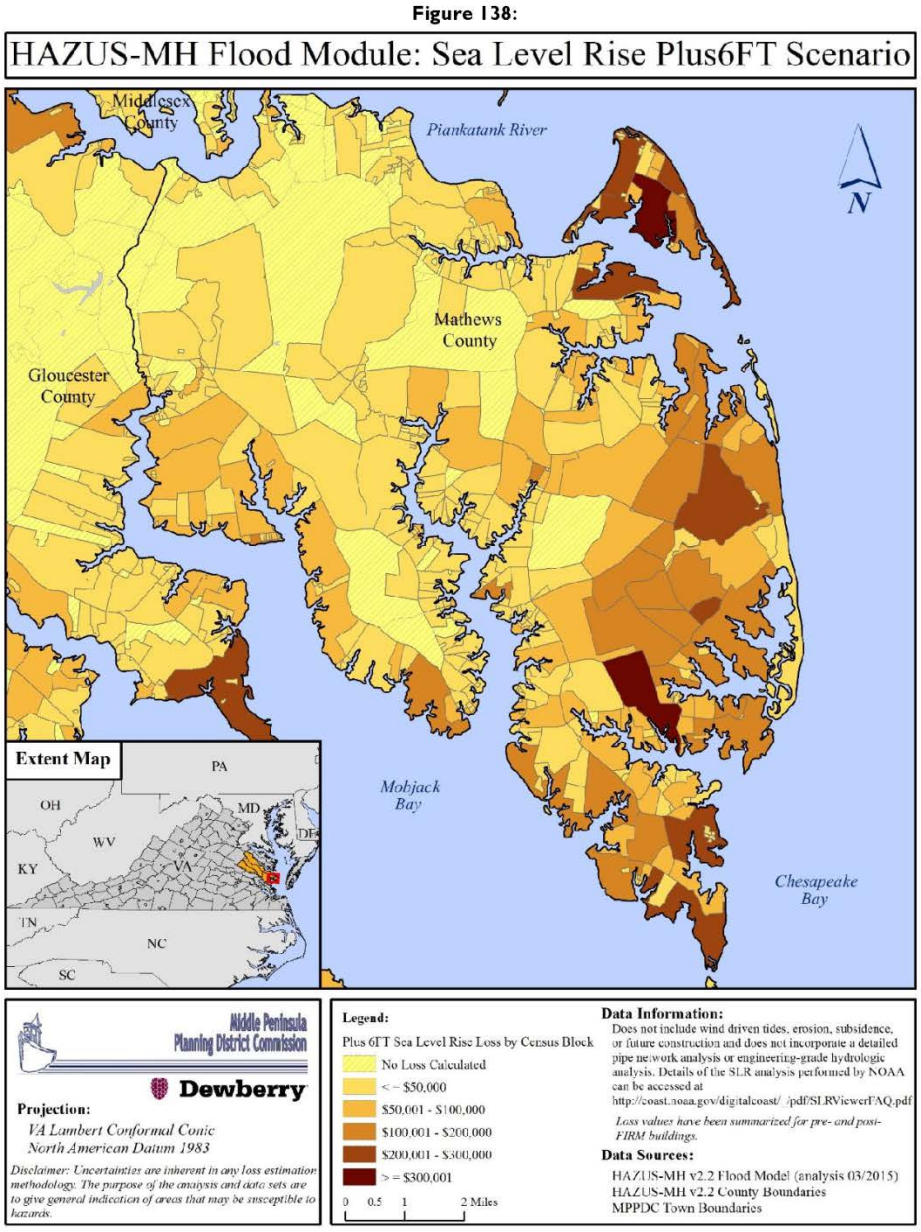
HAZUS-MH is a commonly used tool for estimating losses from flooding or other natural hazards. What sets the MPPDC's plan apart is the inclusion sea level rise as a major component of the plan and of a HAZUS-MH analysis using sea level rise as the hazard instead of only present-day flooding. The plan includes an extensive discussion of sea level rise in general and identifies mitigation strategies to address it. One example of this is Strategy 3.1.7:

> "Develop public information and inform property owners about the long range effects that sea level rise will have on low-lying property that they own."[42]

The HAZUS-MH analysis uses the same input datasets as the flooding analysis to estimate the region's exposure to flooding under a present day scenario (mean higher high water) and with six feet of sea level rise. Maps are also included for this analysis (see Figure 6). The plan also recommends performing a combined sea level rise plus flooding analysis as part of a future update.[43]

[42] Middle Peninsula All Hazards Mitigation Plan 2016 (319)
[43] Middle Peninsula All Hazards Mitigation Plan 2016 (265)

Figure 6: MPPDC HAZUS Analysis with Sea Level Rise



Source: Middle Peninsula All Hazards Mitigation Plan 2016 (MPPDC)

3.4.2. Key Points

- The Middle Peninsula PDC has adopted a regional hazard mitigation plan, which includes sea level rise as a separate hazard and amplifier for flooding.

- The plan includes separate exposure analyses for flooding and sea level rise, which provides a better assessment of the region's immediate and long-term risk from flooding.
- The plan identifies specific mitigation actions which localities can take to reduce the impacts of sea level rise and identifies specific next steps that can be made in future plan updates.

3.4.3. Applications for Hampton Roads Communities

The Middle Peninsula PDC provides an example for Hampton Roads and other coastal communities in how to incorporate sea level rise into a regional hazard mitigation plan. A regional approach can help provide a baseline level of information for a group of communities without requiring each to put forth redundant resources. Addressing coastal hazards such as sea level rise through the hazard mitigation plan, with its emergency management and response focus, can also potentially reduce the risk of political differences impeding planning or action.

3.5. Southeast Florida Regional Climate Change Compact

Regional Coordination and Implementation

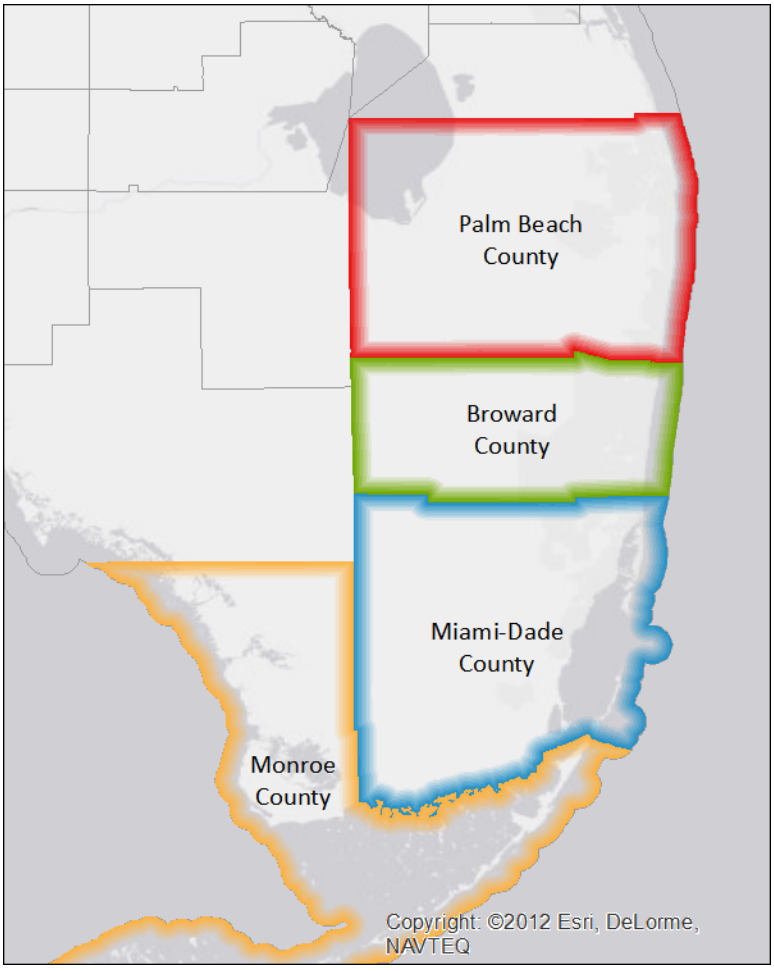
3.5.1. Summary

The Southeast Florida Regional Climate Change Compact is a regional organization specifically created, by its member localities, to address the challenges of climate change at a regional scale.[44] The region is comprised of four counties (Broward, Miami-Dade, Monroe, and Palm Beach – see Figure 7) and the 108 municipal governments located within those counties. The total population of the region is approximately 6 million residents, about thirty percent of Florida's total population. The region also represents about thirty percent of the state's gross domestic product.[45] The four-county region is divided into two separate state planning districts

[44] Southeast Florida Regional Climate Change Compact. Southeast Florida Regional Climate Change Compact. n.d. http://southeastfloridaclimatecompact.org/ (accessed 2017).
[45] Southeast Florida Regional Climate Change Compact. A Region Responds to a Changing Climate: Southeast Florida Regional Climate Change Compact Counties Regional Climate Action Plan. Southeast Florida Regional Climate Change Compact Counties, 2012.

(Palm Beach County is part of the Treasure Coast Regional Planning Council;[46] the rest comprise the South Florida Regional Planning Council[47]). As a large urban area, the region is also broken into several metropolitan planning organizations, including separate MPOs for Broward County, Miami-Dade County, and Palm Beach County. Monroe County is not part of a metropolitan planning organization.

Figure 7: Southeast Florida Regional Climate Change Compact Counties



The Compact was initially developed out of separate attempts by the participating counties to advocate for federal climate policies. Seeing the advantage in working together on this issue, the four counties came together in 2009 at the first Southeast Florida Regional Climate Change

[46] TCRPC. Treasure Coast Regional Planning Council. n.d. http://www.tcrpc.org/ (accessed 2017).
[47] SFRC. South Florida Regional Council. n.d. http://sfregionalcouncil.org/overview/history (accessed 2017).

Summit to create the Compact. The Compact itself is a resolution signed by each of the four counties between December 2009 and January 2010. It commits the group to seven tasks:[48]

1) Develop a joint policy committee for federal support for climate adaptation
2) Develop a joint policy for federal legislation on climate change
3) Develop joint policy positions for state legislation for the (then upcoming) 2010 legislative session
4) Commit to developing joint policy positions for future state legislation
5) Appropriate county staff resources and expertise for a Regional Climate Team
6) Develop a Southeast Florida Regional Climate Change Action Plan
7) Host a second summit in 2010

In addition to the agreement and the summits, the Compact has completed several key deliverables to help move its localities from discussion to action. These include unified sea level rise projections, a regional climate action plan, guidance documents to help individual localities implement the plan, and follow-up efforts to track implementation. Other projects by the Compact have focused on reducing risk, addressing stormwater management challenges, and integrating climate change into the area's water supply planning. The Compact also maintains a website with resources, a calendar, news, and information about the summits.

Figure 8: Southeast Florida Regional Climate Change Compact Reporting Database

Source: Southeast Florida Regional Climate Change Compact

[48] Southeast Florida Regional Climate Change Compact. "Southeast Florida Regional Climate Change Compact Document." 2010.

The Regional Climate Action Plan is the centerpiece of the Compact's collaborative efforts. Originally finalized in 2012, the action plan was officially adopted by each of the four participating counties. The plan includes 110 specific recommendations for the counties and their municipalities in eight categories:[49] Although adopted by the counties and many of the participating municipalities, the plan is not a binding document. Each of the communities pledges to implement the plan locally according to its own preferences. Because it is implemented locally, creating the plan required incorporating broad policy goals that each of the counties could agree to support.

1) Sustainable Communities and Transportation (33 recommendations)
2) Water Supply (18)
3) Natural Systems (14)
4) Agriculture (6)
5) Energy and Fuel (8)
6) Risk Reduction and Emergency Management (7)
7) Outreach (11)
8) Public Policy (13)

Of these categories, adaptation for coastal resilience and hazards are addressed in all but agriculture and energy. In addition to the recommendations, the Compact communities have also developed support and guidance documents to help local governments implement the recommendations. Examples of specific recommendations are listed below. Additional recommendations related to coastal resilience and hazards are listed in Appendix B.

In addition to setting out these recommendations in the Regional Climate Action Plan, the Compact has also support continued attention and implementation by localities and other interested stakeholders (universities, non-governmental organizations, state agencies, the public, etc.) by continuing the annual summits and by conducting municipal implementation surveys. The summits provide an annual opportunity for the region to focus its attention on climate adaptation and renew momentum. The ninth summit is scheduled to be held in December 2017.[50] The Compact website also maintains presentations and other information from previous summits as a resource.

[49] Southeast Florida Regional Climate Change Compact Counties Regional Climate Action Plan
[50] The Summit. n.d. http://www.southeastfloridaclimatecompact.org/the-summit/ (accessed 2017).

Table 3: Southeast Florida Regional Climate Change Compact Recommendations

Category	Sample Recommendation
Sustainable Communities and Transportation	"Develop sea level rise scenario maps to be considered for inclusion in appropriate Comprehensive Plans and/or regional planning documents as determined by the appropriate local government to guide municipal and county government climate adaptation planning efforts and continue to update regional and local planning efforts as more data becomes available and scientific projections are refined." (SP-7)
Water Supply	"Evaluate the impacts of rising sea and groundwater levels on soil storage, infiltration rates and inflow to stormwater and wastewater collection and conveyance systems; consider longer-term influences on water quality; and develop strategies for implementing reclaimed water and stormwater reuse projects that account for current and future conditions." (WS-4)
Natural Systems	"Support regulatory requirements that provide for ecologically beneficial uses of clean, dredged materials." (NS-11)
Risk Reduction and Emergency Management	"Continue to implement and enforce strong building codes that require new construction and substantial improvements to existing structures to mitigate against the impacts of flooding, severe winds, and sea level rise, and which are consistent with Climate Change Adaptation policy." (RR-7)

The municipal implementation surveys, conducted in 2014 and 2016, provide a way for the Compact counties to encourage and track implementation of the Regional Climate Action Plan's recommendations. The voluntary survey is distributed by the Compact to each of the four counties' local governments. The initial survey was completed by 55 of the region's municipalities.[51] The highest rate of implementation was from Coconut Creek in Broward County, which implemented 66 of the recommendations (the 2014 survey did not assess county governments' implementation rates). The lowest rate of implementation by a community which responded to the survey was from Golf in Palm Beach County, which implemented five of the recommendations. The most implemented recommendation was to maintain or restore urban tree canopy (NS-14). Three of the recommendations, concerning green rating systems for roads (SP-25), agricultural purchase of development rights (AG-2), and truck parking (EF-8), were not implemented by any communities that responded to the survey. The 2016 survey had an overall response rate of 66 out of 112 local governments (counties were included). Miami-Dade

[51] Institute for Sustainable Communities. Southeast Florida Regional Climate Change Compact 2014 Municipal Implementation Survey Report. Southeast Florida Regional Climate Change Compact, 2015. http://www.southeastfloridaclimatecompact.org/wp-content/uploads/2015/02/RCAP-IGD-2014-Survey-Report-2-26-15-FINAL.pdf

County had the highest overall implementation rate, with 89 recommendations implemented. Restoring or maintaining urban tree canopy was again the most implemented recommendation. Other commonly implemented recommendations were developing local climate policies (SP-2 – implemented by 47 communities), evaluating impacts of sea level rise on water infrastructure (WS-4 – 47 communities), facilitating energy efficient projects and renewable energy (EF-5 – 51 communities), and integrating climate change impacts into operations, plans, policies, and programs (PP-4 – 42 communities).

3.5.2. Key Points

- The Southeast Florida Regional Climate Change Compact is a regional organization comprised of four counties and over one hundred municipal governments that have agreed as a region on a set of recommendations for climate change adaptation.
- The Regional Climate Action Plan contains over one hundred recommendations in eight categories for local governments to implement. Many of these recommendations directly related to coastal resilience and mitigating the risks from coastal hazards.
- The Compact encourages and facilitates implementation of the recommendations through annual summits, guidance documents, and municipal implementation surveys.

3.5.3. Applications for Hampton Roads Communities

The Southeast Florida Regional Climate Change Compact is an example of a regional approach to developing recommendations focused on local implementation. The combination of developing specific recommendations and guidance on how to implement those recommendations removes some obstacles to municipal governments while also establishing a baseline of political support. The implementation survey and annual summits are two practices which can help maintain attention on and support for a long-term process.

3.6. Miami-Dade County, Florida
Local Comprehensive Plan

3.6.1. Summary

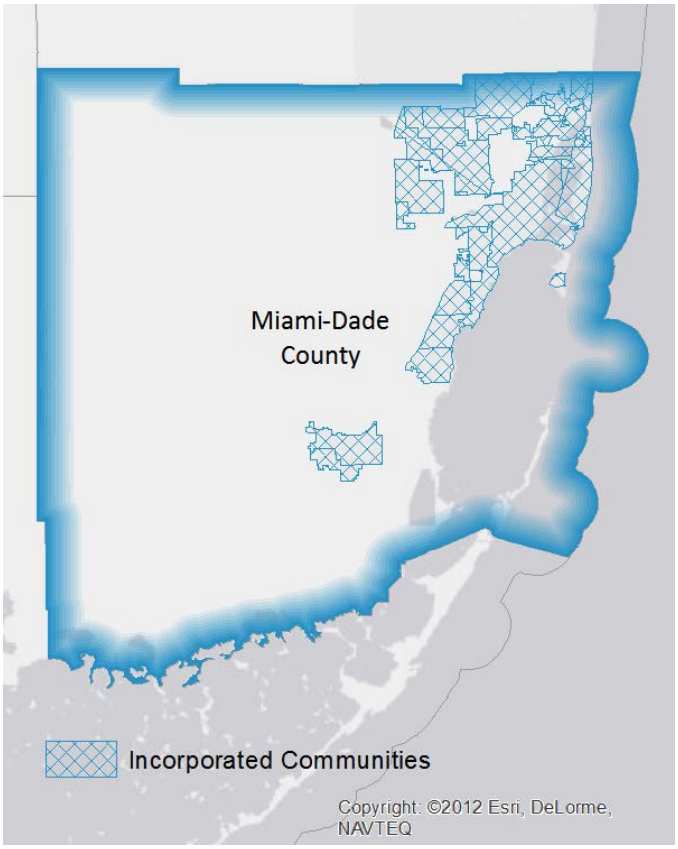
Miami-Dade County is located on Southeast Florida's Atlantic Coast. It is Florida's largest county, with a population of approximately 2.7 million residents, and, along with Broward

County and Palm Beach County, forms the Miami-Fort Lauderdale-Pompano Beach Metropolitan Statistical Area, the nation's eighth-largest.[52]The county's total area is nearly 1,900 square miles and includes thirty-four municipalities, including eighteen cities, six towns, and ten villages. The largest municipalities in the county are the cities of Miami (approximately 454,000 residents in 2016), Hialeah (236,000), and Miami Gardens (113,000). The population of unincorporated Miami-Dade County is over 1,000,000.[53]

Miami-Dade County has implemented several policies to improve its resilience to flooding. The county participates in the CRS program, and as of October 2016 had a Class 5 rating for its unincorporated areas. Twenty-one of the county's municipalities also participate in the program. Their rankings range from 5 to 8. The county is also a major participant in the Southeast Florida Regional Climate Compact. As of 2016, the county had implemented 89 of the 110 recommendations contained in the Regional Climate Action Plan.[54] The county addresses coastal hazards such as flooding and hurricanes in several places on its website and publishes brochures to educate the public.[55] The county maintains a dedicated webpage for its climate change adaptation activities, including its participation in the climate compact, its sea level rise task force, and its implementation of adaptation action areas.[56] Another page on the website focuses on hazard mitigation and emergency management.[57]

[52] U.S. Census Bureau. Metropolitan and Micropolitan Statistical Areas: 2010-2016. 2017. https://www.census.gov/data/tables/2016/demo/popest/total-metro-and-micro-statistical-areas.html (accessed 2017).
[53] Miami-Dade County. "Miami-Dade County At-A-Glance." Miami-Dade County. n.d. http://www.miamidade.gov/information/library/at-a-glance.pdf (accessed 2017).
[54] Institute for Sustainable Communities. 2016 Regional Climate Action Plan Municipal Implementation Survey Report. Southeast Florida Regional Climate Change Compact, 2017. http://www.southeastfloridaclimatecompact.org/wp-content/uploads/2017/03/2016-Regional-Climate-Action-Plan-Municipal-Implementation-Survey-Report_Final.pdf
[55] Miami-Dade County. Do You Know Your Flood Zone? Miami, FL: Miami-Dade County, 2017. https://www.miamidade.gov/environment/library/brochures/flood-zones.pdf
[56] Miami-Dade County. Climate Change. n.d. https://www.miamidade.gov/green/climate-change.asp (accessed 2017).
[57] —. Projects that Protect. n.d. http://www.miamidade.gov/fire/mitigation.asp (accessed 2017).

Figure 9: Miami-Dade County and Incorporated Communities



In July 2013, the county formed a Sea Level Rise Task Force to help the county plan for adaptation.[58] The task force was assigned two tasks. First, it was to review relevant data and studies regarding how sea level rise would affect public and private property and natural resources. The second was to provide an assessment of the likely impacts of sea level rise and storm surge into the future, with the goal of incorporating those findings into the county's comprehensive development master plan. In July 2014, the task force finalized its six recommendations in a report. Recommendations included coordinating with other government partners and the insurance industry and implementing Adaptation Action Areas as allowed for by state law.[59] The county followed up on several of these recommendations through feasibility

[58] —. Sea Level Rise Task Force. n.d. http://www.miamidade.gov/planning/boards-sea-level-rise.asp (accessed 2017).
[59] Miami-Dade Sea Level Rise Task Force. Miami-Dade Sea Level Rise Task Force Report and Recommendations. Miami, FL: Miami-Dade County, 2014. http://www.miamidade.gov/planning/library/reports/sea-level-rise-report-recommendations.pdf

studies and more detailed assessments on adaptation action areas,[60] environmentally endangered lands,[61] capital planning,[62] salt water intrusion,[63] insurance and risk management,[64] and the county's climate change advisory task force.[65]

A major component of Miami-Dade County's efforts to address coastal hazards is the county's comprehensive development master plan, which was most recently adopted in October 2013.[66] Of the plan's twelve elements, half devote significant attention to coastal hazards. The sections that address coastal hazards are:

1) Land use
2) Coastal management
3) Conservation, aquifer recharge and drainage
4) Transportation
5) Water, sewer and solid waste
6) Capital improvements

Each of these elements contains specific objectives and policies related to coastal hazards. Examples of these policies are listed in the table below. Additional recommendations related to coastal resilience and hazards are listed in Appendix C.

[60] Miami-Dade County. Adaptation Action Areas: Feasibility Assessment. Miami, FL: Miami-Dade County, 2015. http://www.miamidade.gov/green/library/sea-level-rise-adaptation-action-areas.pdf
[61] —. Strategic Implementation of the Environmentally Endangered Lands Program. Miami, FL: Miami-Dade County, 2016. http://www.miamidade.gov/green/library/sea-level-rise-environmentally-endangered-lands.pdf
[62] —. Recommendations for an Enhanced Capital Plan. Miami, FL: Miami-Dade County, 2016. http://www.miamidade.gov/green/library/sea-level-rise-capital-plan.pdf
[63] —. Report on Flooding and Salt Water Intrusion. Miami, FL: Miami-Dade County, 2016. http://www.miamidade.gov/green/library/sea-level-rise-flooding-saltwater-intrusion.pdf
[64] —. Final Status Reports In Response to Multiple Resolutions Pertaining to Recommendations by the Sea Level Rise Task Force. Miami, FL: Miami-Dade County, 2016. http://www.miamidade.gov/mayor-memo/284999-Final-Status-Report-Response-Multiple-Resolutions-Pertaining-to-Recommendations-Sea-Level-Task-Force.pdf
[65] —. 2016. Miami, FL: Miami-Dade County, Climate Change Advisory Task Force. http://www.miamidade.gov/green/library/sea-level-rise-climate-change-advisory-task-force.pdf
[66] Miami-Dade County. Comprehensive Development Master Plan (CDMP) Adopted Components. n.d. http://www.miamidade.gov/planning/cdmp-adopted.asp.

Table 4: Miami-Dade County Sample Coastal Hazard Policies

Element	Policy
Land Use	"Miami-Dade County shall, by 2017, analyze and identify public infrastructure vulnerable to sea level rise and other climate change-related impacts." (Policy LU-3G)
Coastal Management	"Rise in sea level projected by the federal government, and refined by the Southeast Florida Regional Climate Change Compact, shall be taken into consideration in all future decisions regarding the design, location, and development of infrastructure and public facilities in the County." (Policy CM-9H)
Transportation	"The County shall avoid transportation improvements which encourage or subsidize increased development in coastal high hazard areas…" (Policy TC-6A)
Capital Improvements	"Replacement of infrastructure in coastal high hazard areas will be at or below existing service capacity except where such replacement will improve hurricane evacuation time, mitigate storm damage, or meet regulatory requirements." (Policy CIE-2B)

Source: Miami Comprehensive Development Master Plan[67]

In 2014, Miami-Dade County partly implemented Policy CM-9H, listed above, through a resolution by the county board of commissioners. This resolution, R-451-14, directs the mayor to require that all county infrastructure projects consider the impacts of sea level rise as part of their planning, design and construction. It also requires the mayor to establish priorities for adapting existing infrastructure located in areas vulnerable to flooding.

> "Section 1. It is the policy of Miami-Dade County that all County infrastructure projects, including but not limited to County building elevation projects, County installation of mechanical and electrical systems, County infrastructure modifications, and County infrastructure renovations, initiated from the effective date of this resolution shall consider sea level rise projections and potential impacts as best estimated at the time of the project, using the regionally consistent unified sea level rise projections, during all project phases including but not limited to planning, design, and construction, in order to ensure that infrastructure projects will function properly for fifty (50) years or the design life of the project, whichever is greater.
>
> Section 2. This Board directs the Mayor or designee to establish recommended priorities for adapting existing County infrastructure located in areas at increased risk of flooding and tidal inundation with increases in sea level to the degree opportunity and resources allow, and shall present such recommended priorities to the Board for approval,

[67] Miami-Dade County Comprehensive Development Master Plan

including committee review, within one-hundred-twenty (120) days of the effective date of this resolution."[68]

3.6.2. Key Points

- Miami-Dade County has incorporated coastal hazards and resilience into several elements of its comprehensive master development plan, including land use, coastal management, transportation, and capital improvements.
- Each of the elements has specific objectives and policies for the county to undertake that address coastal hazards and resilience.

- The county has also established a local policy to address sea level rise in the planning, design, and construction of county infrastructure and other construction projects.

3.6.3. Applications for Hampton Roads Communities

Miami-Dade County is an example of a locality that has incorporated climate adaptation in its local policies through its comprehensive plan. The county's plan includes numerous specific recommendations and policies that directly relate to hazard mitigation and climate adaptation. These recommendations provide the county with a path forward for specific next steps. One of these steps is the county's policy for addressing sea level rise in public infrastructure and facility planning, design, and construction.

3.7. The Netherlands
Multiple Benefits Approach to Floodplain Management

3.7.1. Summary

The Netherlands has a long history with flooding. As a nation with a significant amount of its area under sea level or located in floodplains, the risk of flooding is a constant presence and one that the country takes very seriously. Events such as the 1953 floods drove the country to

[68] Miami-Dade County Commission. Resolution R-451-14: Sea Level Rise Infrastructure. Miami, FL, May 6, 2014. https://www.miamidade.gov/govaction/matter.asp?matter=140804&file=true&yearFolder=Y2014

devise and implement a number of projects to reduce its risk. In the latter half of the 20th century, this resulted in the Delta Plan and Delta Works, whose main approach was to raise dykes higher.[69] However, more recent events such as the 1993 and 1995 high river levels, which nearly caused significant flooding, signaled that the older approaches were no longer working. The greater risk was a result of several factors. Additional precipitation and snowmelt in the European countries that drain to the Netherlands was one factor.[70] Pumping and additional development in polders – low-lying areas surrounded by dykes – was causing land subsidence, further increasing the potential consequences of flooding. Looking ahead, the Dutch also determined that climate change would only make things worse, by further increasing river discharges.

In response to these newer concerns, the Dutch adopted a different approach. Rather than building bigger and taller dykes, they would instead increase the size and capacities of the rivers and floodplains. This approach, called "Room for the River," eventually became a plan for specific improvements at nearly 40 locations throughout the country along four major rivers: the IJssel, Rhine, Lek, and Waal.[71] Overall, the program, with a total budget of 2.3 billion euros, will improve the discharge capacity of the rivers to 16,000 cubic meters per second from 15,000 cubic meters per second. The projects, planned for construction between 2006 and 2015, were developed through a collaborative process between national, state, and local authorities. The Rijkswaterstaat, the national public works agency, led the process. The projects fall into nine categories:

1) Lowering floodplains
2) Relocating dykes away from rivers
3) Depoldering some areas by lowering dykes
4) Deepening riverbeds
5) Reinforcing dykes with stronger materials
6) Lowering groins in rivers to improve flow
7) Removing obstacles from riverbeds and floodplains
8) Water storage
9) Creating high water channels that temporarily divert water during flood events

Of these techniques, lowering floodplains is considered the preferred approach.[72]

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[69] Ruimte voor de Rivier. Room for the River. Utrecht, NL: Rijkswaterstaat, 2012. https://issuu.com/ruimtevoorderivier/docs/rvdr_corp_brochure_eng__def._

[70] Ruimte voor de Rivier

[71] Ruimte voor de Rivier

[72] Meyer, Han, Inge Bobbink, and Steffen Nijhuis. Delta Urbanism: The Netherlands. Chicago: American Planning Association, 2010.

Figure 10: Locations of Room for the River Projects

Source: Room for the River

One key difference between the Room for the Rivers program and previous flood control measures is the application of a broader planning perspective to the project selection process. The national government and communities involved have used a multiple benefits approach that will reduce flood risk while also providing recreational facilities, access to nature, and other quality of life improvements to communities.[73]

One example of the overall approach is the relocation of a dike in the community of Nijmegen. Nijmegen is located along the Waal River across from the city of Lent. At this location the river turns sharply and narrows, resulting in a bottleneck.[74] Prior to the Room for the Rivers program, the communities were protected from riverine flooding by dykes, but these dykes were nearly overtopped in the early and mid-1990s. As a result, the Room for the Rivers program specified increasing the river's capacity by moving the dyke on the northern side of

[73] Ruimte voor de Rivier

[74] Government of the Netherlands. Room for the Waal project reduces flood risk in the Nijmegen area. March 12, 2015. https://www.government.nl/latest/news/2015/12/03/room-for-the-waal-project-reduces-flood-risk-in-the-nijmegen-area (accessed 2017).

the river inland and digging an ancillary channel. In addition to improving flood protection in the area, this will create an island with opportunities for recreation, enjoyment of nature, and economic development.

3.7.2. Key Points

- Room for the River is a national program to significantly increase the Netherlands' ability to avoid floods through comprehensive planning that includes governments and stakeholders at the national, state, and local levels.
- The program uses several techniques to reduce flood risk. Which techniques are used depend on the location, flood risk, and other community needs.
- The program directors and government agencies have intentionally adopted a multiple benefits approach to improve quality of life and local economies, in addition to protecting areas from flooding.
- The Room for the River program is focused on constructing flood mitigation projects, not changes to regulations or policies.

3.7.3. Applications for Hampton Roads Communities

The Room for the River program in the Netherlands is an example of a cooperative effort between national, regional, and local authorities to address flood mitigation and provide other community benefits simultaneously. For Hampton Roads communities, the program serves as an example of a potential type of program to advocate for with the Commonwealth and federal government, including components such as cost-sharing, priorities, and standards. The projects implemented through the program provide examples of implementing a multiple benefits approach.

4. Best Practices for Addressing Coastal Hazards in Local Policies

One of the main goals of this project has been to identify general practices that promote coastal resilience and specific examples of those practices being implemented, with an emphasis on local governments. The assessment of current policies and case study analysis have identified several success stories that communities in Hampton Roads and the rest of coastal Virginia can consider as they adopt new plans, policies, and regulations to address coastal hazards. Some of the broad findings from these reviews are summarized below.

Outreach and Communication

Public outreach is critical to educating the general public and decision makers and to developing political support for action. Communities should develop a communications plan for any major policies they want to pursue and should develop education materials for specific audiences.

Coordination

Internal and external coordination is vital for successfully implementing new plans and policies. Internal coordination between departments can improve the end result and help avoid conflicts between new and existing policies. At a minimum, localities should consider bringing together departments such as planning, public works, emergency management, and economic development. External coordination can help ensure that local decisions align with state and federal policies and requirements.

Planning

Local comprehensive plans and regional hazard mitigation plans are good opportunities for communities to begin discussing coastal resiliency as an input into policy decisions. These plans are appropriate places for vulnerability and exposure analyses, maps of vulnerable areas, and for general information about coastal issues. They are also the first places that localities introduce specific goals, objectives, and policies. As public planning processes, comprehensive and hazard mitigation plans are also opportunities to develop public support for new policies or identify opposition.

Special plans, such as sustainability or adaptation plans, are better for focusing attention on specific issues. They are also useful for developing new policies when a locality is in between

regularly scheduled updates of its comprehensive or hazard mitigation plan, which usually take place every five years.

Regional plans, particularly in places where they lack enforceability, can be used as sources of ideas for local decision makers to consider.

Public Facilities

Local capital improvement programs and related local policies are an opportunity for localities to begin on-the-ground adaptation. Specific options for implementation include selecting which projects to fund and construct, where to build them, and what design standards to use.

Local Ordinances

Local ordinances, including subdivision, zoning, and floodplain management ordinances, are another example of how localities can implement on-the-ground changes. Freeboard requirements are one method for requiring the private sector to address the risk of flooding. Freeboard requirements significantly above the base flood elevation can also help address long-term flooding risks. Similarly, establishing development standards for areas outside the 1% annual chance flood hazard zone can also help mitigate the risk of sea level rise amplifying flooding a community in the future.

National and State Programs

State model ordinances and enabling legislation play an important role in local planning, particularly in Dillon Rule states. They can provide opportunities for localities to enact local regulations and programs for statutory purposes in addition to related purposes beyond the original intent of the enabling legislation. In Virginia, the state model floodplain management ordinance leaves some flexibility for localities to implement more stringent requirements (e.g. freeboard requirements and non-regulatory floodplains), while the enabling legislation for land use planning and zoning allows planning for both flooding and sea level rise in broad terms.

At the national level, the CRS program provides a significant incentive for communities to adopt floodplain management regulations and policies beyond those minimally required for participation in the National Flood Insurance Program. Specifically, adopting higher standards such as freeboard requirements and applying higher standards to areas outside the standard zones (such as applying V-zone standards to Coastal A-zones or applying standards in X (shaded) zones) can provide significant points for members and improve community resiliency. However, it is difficult for coastal communities with large floodplains or significant development within floodplains to score many points for most of the top scoring activities. These activities, including open space preservation, acquisition and relocation of buildings, and retrofitting

buildings, all use either the entire area of the special flood hazard area or the total number of buildings in the SFHA as the main driver of value. This makes it significantly more difficult for coastal communities with large storm-surge driven floodplains compared to riverine communities with narrower floodplains.

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5. Education and Training

Educational opportunities are a vital component of disseminating lessons learned from research efforts to potential users. Since most policies related to coastal hazards are decided upon and implemented at the local level, it is important to provide opportunities for local staff to learn the material in a practical manner. Throughout this project, the HRPDC staff briefed the Regional Environmental and Coastal Resiliency Committees on the initial findings and lessons learned. HRPDC staff members also presented on the project at the 2017 Environment Virginia Symposium held at the Virginia Military Institute in Lexington, Virginia.

The major educational component of this project was a workshop for local staff and other interested professionals developed and delivered by the HRPDC staff. The primary goal of the workshop was to summarize the research findings of this project and present the key findings to attendees. A secondary goal was to help locality staff maintain professional certifications, specifically as certified planners (AICP) and floodplain managers (CFM). The workshop, which was held on May 9, 2017, provided 1.5 hours of educational time for both groups. The HRPDC worked with the Virginia Chapter of the American Planning Association to provide CM credits to certified planners. Mr. Benjamin McFarlane, Senior Regional Planner, and Ms. Jill Sunderland, Water Resources Planner, conducted the workshop. Thirty-one (31) individuals participated in the workshop, including local staff, state agency representatives, and other interested parties.

The workshop was divided into two sections. The first section introduced the topic and geographic area of focus (coastal Virginia), relevant laws and regulations (state and federal), and the assessment of existing plans from coastal Virginia localities. The assessment summarized the HRPDC staff review of local comprehensive plans and floodplain management plans, regional hazard mitigation plans, and local floodplain management ordinances. This section also included an overview of the CRS program. The second half of the workshop focused on the case studies included in this report. The presentation ended with a summary of lessons learned and best practices.

The slide deck used for the workshop is included in Appendix D.

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6. Conclusions and Next Steps

This report documents the results of a grant project from the Virginia Coastal Zone Management Program. It builds on previous efforts by the Hampton Roads Planning District Commission and others that have looked at how sea level rise could affect communities in Hampton Roads and at possible strategies local governments could use to mitigate negative impacts. This study has focused on assessing the current state of resiliency planning in coastal Virginia and on identifying examples of successful planning or implementation. This has been accomplished through a thorough review of existing local plans, policies, and ordinances from across Tidewater Virginia and by looking to other areas of the country and world for appropriate case studies.

The goal of this study is to provide specific ideas for local governments in coastal Virginia who are considering incorporating coastal resiliency into their plans, policies, and ordinances. The findings and results described in this report will be used by the HRPDC staff in discussions with the HRPDC's Coastal Resiliency Committee about potential local and regional policies or implementation strategies. In addition, the HRPDC will consider ways to improve the workshop for future offerings and how to maintain and add to the assessment of local activities so that it remains current.

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Appendix A: Detailed Assessment of Coastal Hazards in Current Local Plans and Policies in Virginia

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Accomack County

When was the Comprehensive Plan adopted? Amended?	2008; 2016	**When was the Hazard Mitigation Plan adopted? Amended?**	2010; not yet
When was the floodplain ordinance last adopted?	2015	**Freeboard**	3’
When was the Floodplain Management Plan adopted?	Not a separate plan	**Coastal A Zone/LiMWA**	Yes
		CRS class	8
How are sea level rise, storm events, and floodplain management addressed in the Comprehensive Plan?	The County is evaluating coastal management strategies to allow tidal wetlands to migrate inland over time. A history of the major storms to hit the area since it was settled is included in Chapter 2: The Natural Environment. The County Floodplain Management Plan is a comprehensive examination of sources of flooding, flooding history, and existing flood protection programs to determine what further measures, if any, are needed to adequately protect against flood hazards. The County updated their Flood Insurance Study in 2015.		
How are sea level rise, storm events, and floodplain management addressed in the Hazards Mitigation Plan?	Accomack County is included in the Eastern Shore of Virginia Hazard Mitigation Plan. A chronology of hazard events on the Eastern Shore is presented and dates back to 1564. Chapters 4 and 5 are dedicated to coastal flooding and stormwater flooding, respectively. Flooding, high winds, and coastal erosion present the high priority hazards on the Shore. Detailed discussions on vulnerability and damages are included. Sea level rise is identified as a continuous threat to the Shore; however, the greater threat of sea level rise is the magnification of erosion and storm surge. Some of Accomack County’s flood mitigation strategies include: 1)develop programs to encourage conservation of barrier islands, marsh lands, forested areas, and creek corridors, 2) produce a comprehensive drainage plan, 3) mitigate flood prone properties, and 4)amend the zoning ordinance to direct high density development away from critically eroding shorelines.		

Alexandria

When was the Comprehensive Plan adopted? Amended?	Each small area plan has a unique date	**When was the Hazard Mitigation Plan adopted? Amended?**	2010; 2017
When was the floodplain ordinance adopted?	2011	**Freeboard**	1’
When was the Floodplain Management Plan adopted?	Not a separate plan	**Coastal A Zone/LiMWA**	No
		CRS class	6
How are sea level rise, storm events, and floodplain management addressed in the Comprehensive Plan?	The City’s Comprehensive Plan is divided into 18 small area plans. The most recently updated chapters include sections on environmental sustainability and climate change. The potential impacts of climate change in the mid-Atlantic region are summarized, including sea level rise, shoreline loss, water inundation, higher air and water temperatures, and precipitation changes. The primary strategies to address these impacts include: green roofs, native plants, open space networks, water conservations, and sustainability measures like green buildings, stormwater management, and improving energy efficiency.		
How are sea level rise, storm events, and floodplain management addressed in the Hazards Mitigation Plan?	The City of Alexandria is part of the Northern Virginia Hazard Mitigation Plan. As part of the 2016 plan update, the flood hazard was reexamined and a new analysis performed. This new analysis included, but was not limited to: 1) refreshing the hazard profile; 2) updating the previous occurrences; 3) determining number of hazard events and losses by jurisdiction using NCDC and other data sources where available; 4) updating the assessment of risk by jurisdiction based on new data; and 5) ranking of the hazard by jurisdiction using the methodology described in detail in the HIRA Introduction section. An extensive discussion of past flood events from 1950 to 2015 is included. The number of flood events per jurisdiction is presented, along with annual property and crop damage estimates. The plan also includes the NFIP policy and claim statistics for each jurisdiction.		

	Riverine HAZUS^{MH} analysis was completed for the 2016 revision using 100-year scenarios. Information for the HAZUS^{MH} identified critical facilities in the flood zones is available in Appendix D, as is information regarding the potential flood risk for locally-identified critical assets for each jurisdiction. There is a brief discussion of the areas in Northern Virginia that are at risk for sea level rise inundation. The Northern Virginia Regional Commission completed a study in 2010 that produced high resolution sea level rise and storm surge mapping, quantified elements vulnerable elements, and developed strategies for managing the risks. The storm event hazards were examined in detail. It includes hurricanes, winter storms, tornadoes, high winds, etc. For each type of storm, the plan includes: a description, geographic location/extent, previous occurrences, the probability of future occurrences, impact, and risk.

Arlington County

When was the Comprehensive Plan adopted? Amended?	2014; not yet	**When was the Hazard Mitigation Plan adopted? Amended?**	2010; not yet
When was the floodplain ordinance adopted?	2013	**Freeboard**	1’
When was the Floodplain Management Plan adopted?	Not a separate plan	**Coastal A Zone/LiMWA**	No
		CRS class	8
How are sea level rise, storm events, and floodplain management addressed in the Comprehensive Plan?	The Stormwater Master Plan is an element of the Comprehensive Plan. There is a section to explain why the County will work with partners to increase the region’s resiliency. Sea level rise, coupled with surges from more intense and more frequent storms, may cause significant flooding in low-lying areas, and could affect critical infrastructure like the Water Pollution Control Plant, the airport, and the metro Blue Line.		
How are sea level rise, storm events, and floodplain management addressed in the Hazards Mitigation Plan?	The County is included in the Northern Virginia Hazard Mitigation Plan. As part of the 2016 plan update, the flood hazard was reexamined and a new analysis performed. This new analysis included, but was not limited to: 1) refreshing the hazard profile; 2) updating the previous occurrences; 3) determining number of hazard events and losses by jurisdiction using NCDC and other data sources where available; 4) updating the assessment of risk by jurisdiction based on new data; and 5) ranking of the hazard by jurisdiction using the methodology described in detail in the HIRA Introduction section. An extensive discussion of past flood events from 1950 to 2015 is included. The number of flood events per jurisdiction is presented, along with annual property and crop damage estimates. The plan also includes the NFIP policy and claim statistics for each jurisdiction. Riverine HAZUS^{MH} analysis was completed for the 2016 revision using 100-year scenarios. Information for the HAZUS^{MH} identified critical facilities in the flood		

	zones is available in Appendix D, as is information regarding the potential flood risk for locally-identified critical assets for each jurisdiction. There is a brief discussion of the areas in Northern Virginia that are at risk for sea level rise inundation. The Northern Virginia Regional Commission completed a study in 2010 that produced high resolution sea level rise and storm surge mapping, quantified elements vulnerable elements, and developed strategies for managing the risks. The storm event hazards were examined in detail. It includes hurricanes, winter storms, tornadoes, high winds, etc. For each type of storm, the plan includes: a description, geographic location/extent, previous occurrences, the probability of future occurrences, impact, and risk.

Caroline County

When was the Comprehensive Plan adopted? Amended?	2010	**When was the Hazard Mitigation Plan adopted? Amended?**	2012; not yet
When was the floodplain ordinance adopted?	2009	**Freeboard**	3’
When was the Floodplain Management Plan adopted?	Not a separate plan	**Coastal A Zone/LiMWA**	No
		CRS class	NA
How are sea level rise, storm events, and floodplain management addressed in the Comprehensive Plan?	Chapter 4 of the Comprehensive Plan is dedicated to natural resources. There is a brief discussion on the beneficial uses of floodplains. A link to the most recent flood hazards maps is also provided.		
How are sea level rise, storm events, and floodplain management addressed in the Hazards Mitigation Plan?	The County is included in the George Washington Regional Commission Hazard Mitigation Plan. An extensive history of the significant storms to hit the region is included. Winter storms, Nor’easters, hurricanes, flooding events, etc. are all summarized. County-specific hazards are also described. It is scheduled to be updated in 2017.		

Charles City County

When was the Comprehensive Plan adopted? Amended?	2014	**When was the Hazard Mitigation Plan adopted? Amended?**	2011; not yet
When was the floodplain ordinance adopted?	NA	**Freeboard**	NA
When was the Floodplain Management Plan adopted?	NA	**Coastal A Zone/LiMWA**	Yes
		CRS class	NA
How are sea level rise, storm events, and floodplain management addressed in the Comprehensive Plan?	A brief discussion of floodplains and the 100-year flooding frequency map are included in the natural resources chapter of the comprehensive plan.		
How are sea level rise, storm events, and floodplain management addressed in the Hazards Mitigation Plan?	The County is included in the Richmond-Crater Multi-Regional Hazard Mitigation Plan. It contains a detailed history of storm events and damages associated with those events, going back to the late 1700s. Appendix G highlights the effects of the region's top ten hazards on each jurisdiction. Charles City listed the following mitigation actions to address flooding: 1) check the VDEM/DCR repetitive loss properties list annually; 2) public education initiatives; 3) install flood level markers; and 4) annually review the floodplain ordinance.		

Chesapeake

When was the Comprehensive Plan adopted? Amended?	2014; 2016	**When was the Hazard Mitigation Plan adopted? Amended?**	2011; 2017
When was the floodplain ordinance adopted?	2014	**Freeboard**	1.5’
When was the Floodplain Management Plan adopted?	Not a separate plan	**Coastal A Zone/LiMWA**	No
		CRS class	8
How are sea level rise, storm events, and floodplain management addressed in the Comprehensive Plan?	A description of the floodplains in the City is included in the Comprehensive Plan. The plan’s Natural Resources chapter also includes several objectives and action strategies related to flooding and sea level rise. These address the city’s floodplain management ordinance, participation in the CRS program, and policies to reduce risk (including buyouts, directing growth towards higher ground, and community engagement). The City has a separate dedicated Sustainability Plan that was approved in December 2009 and updated in 2011.		
How are sea level rise, storm events, and floodplain management addressed in the Hazards Mitigation Plan?	The City is included in the Hampton Roads Hazards Mitigation Plan. Flooding, sea level rise and land subsidence, coastal storms, and shoreline erosion are considered the most significant hazards that threaten Hampton Roads. The background and causes of local flooding are explained. Regional-scale FEMA rate insurance maps are included, along with the links to each locality’s mapping viewers. Some of the notable flood events to impact the area, as far back as 1749, are listed. The consequences of continuing sea level rise are outlined, including increased coastal erosion, inundation of normally dry lands, coastal flooding, and salt water intrusion.		

	A detailed listing of significant storm events to impact the region since 1871 is included. Section 7 of the Plan includes descriptions of mitigation actions by locality. There is a strong emphasis on integrating mitigation measures into community life. The City of Chesapeake includes strategies such as: 1)participation in the NFIP and the CRS, 2) flood protection improvement projects, 3) implement measures to minimize the vulnerabilities of manufactured homes, 4) improve stormwater management infrastructure, etc.

Chesterfield County

When was the Comprehensive Plan adopted? Amended?	2012; 2015	**When was the Hazard Mitigation Plan adopted? Amended?**	2012; not yet
When was the floodplain ordinance adopted?	NA	**Freeboard**	NA
When was the Floodplain Management Plan adopted?	NA	**Coastal A Zone/LiMWA**	No
		CRS class	NA
How are sea level rise, storm events, and floodplain management addressed in the Comprehensive Plan?	A brief discussion defining floodplains is included in Chapter 9: Environment.		
How are sea level rise, storm events, and floodplain management addressed in the Hazards Mitigation Plan?	Weather events, flash floods, and hazardous materials incidents are the primary hazards facing Chesterfield County. There is a suggestion to coordinate federal Flood insurance operations and integrate mitigation with other program efforts.		

Colonial Heights

When was the Comprehensive Plan adopted? Amended?	2015; not yet	**When was the Hazard Mitigation Plan adopted? Amended?**	2011; not yet
When was the floodplain ordinance adopted?	2012	**Freeboard**	1’
When was the Floodplain Management Plan adopted?	Not a separate plan	**Coastal A Zone/LiMWA**	No
		CRS class	NA
How are sea level rise, storm events, and floodplain management addressed in the Comprehensive Plan?	The City presents a brief discussion on floodplains in the Environmental Features section of the Comprehensive Plan.		
How are sea level rise, storm events, and floodplain management addressed in the Hazards Mitigation Plan?	The City is included in the Richmond-Crater Multi-Regional Hazard Mitigation Plan. It contains a detailed history of storm events and damages associated with those events, going back to the late 1700s. Appendix G highlights the effects of the region’s top ten hazards on each jurisdiction. Flooding is listed as a significant threat to the region. Some of the flood mitigation strategies identified by the City include: 1) support mitigation of priority structures through promotion of acquisition/demolition, elevation, flood proofing and other mitigation projects, 2) install flood warning sign at railroad bridge crossing, 3) conduct annual review of repetitive loss and severe repetitive loss property list, and 4) conduct an annual review of the floodplain ordinance.		

Essex County

When was the Comprehensive Plan adopted? Amended?	2015; not yet	**When was the Hazard Mitigation Plan adopted? Amended?**	2016; not yet
When was the floodplain ordinance adopted?	2015	**Freeboard**	1’
When was the Floodplain Management Plan adopted?	Not a separate plan	**Coastal A Zone/LiMWA**	Yes
		CRS class	NA
How are sea level rise, storm events, and floodplain management addressed in the Comprehensive Plan?	The County references the sea level rise modeling completed by the Middle Peninsula PDC. Flooding is usually not a problem in the County, except for a few specific waterfront areas, many of which are undeveloped. A map of general floodplain locations is provided in the Comprehensive Plan. The County includes a list of action items to meet its environmental goals and exploring obtaining a CRS designation is listed. There is also an interest in collaborating with the Middle Peninsula PDC and the Virginia Institute of Marine Science to develop a shoreline management plan.		
How are sea level rise, storm events, and floodplain management addressed in the Hazards Mitigation Plan?	Essex County is included in the Middle Peninsula Hazard Mitigation Plan. Chapter 5 of the Plan presents an extensive risk assessment analysis for flooding, hurricanes, and sea level rise using the HAZUS Models. Maps are provided that identify floodplains, essential facilities, potential wind speeds, and sea level rise scenarios. Flood mitigation strategies are also included. Some examples are as follows: 1) protect public buildings and public infrastructure from 100-year flood storm events, 2) when applicable, use FEMA grant funds to purchase and convert flood prone land to non-residential use, and 3) conduct biannual review of Floodplain Ordinances.		

Fairfax

When was the Comprehensive Plan adopted? Amended?	2012; 2015	**When was the Hazard Mitigation Plan adopted? Amended?**	2010; 2017
When was the floodplain ordinance adopted?	2015	**Freeboard**	1.5’
When was the Floodplain Management Plan adopted?	NA	**Coastal A Zone/LiMWA**	No
		CRS class	NA
How are sea level rise, storm events, and floodplain management addressed in the Comprehensive Plan?	The City of Fairfax includes a brief discussion of flood protection in the Comprehensive Plan. The City participates in the NFIP and intends to continue to protect floodplains through the floodplain zoning ordinance.		
How are sea level rise, storm events, and floodplain management addressed in the Hazards Mitigation Plan?	The City of Fairfax is included in the Northern Virginia Hazard Mitigation Plan. As part of the 2016 plan update, the flood hazard was reexamined and a new analysis performed. This new analysis included, but was not limited to: 1) refreshing the hazard profile; 2) updating the previous occurrences; 3) determining number of hazard events and losses by jurisdiction using NCDC and other data sources where available; 4) updating the assessment of risk by jurisdiction based on new data; and 5) ranking of the hazard by jurisdiction using the methodology described in detail in the HIRA Introduction section. An extensive discussion of past flood events from 1950 to 2015 is included. The number of flood events per jurisdiction is presented, along with annual property and crop damage estimates. The plan also includes the NFIP policy and claim statistics for each jurisdiction. Riverine HAZUS^{MH} analysis was completed for the 2016 revision using 100-year scenarios. Information for the HAZUS^{MH} identified critical facilities in the flood zones is available in Appendix D, as is information regarding the potential flood risk for locally-identified critical assets for each jurisdiction.		

	There is a brief discussion of the areas in Northern Virginia that are at risk for sea level rise inundation. The Northern Virginia Regional Commission completed a study in 2010 that produced high resolution sea level rise and storm surge mapping, quantified elements vulnerable elements, and developed strategies for managing the risks. The storm event hazards were examined in detail. It includes hurricanes, winter storms, tornadoes, high winds, etc. For each type of storm, the plan includes: a description, geographic location/extent, previous occurrences, the probability of future occurrences, impact, and risk.

Fairfax County

When was the Comprehensive Plan adopted? Amended?	2013; 2014	**When was the Hazard Mitigation Plan adopted? Amended?**	2010; 2017 (pending)
When was the floodplain ordinance adopted?	2010	**Freeboard**	1’
When was the Floodplain Management Plan adopted?	Not a separate plan	**Coastal A Zone/LiMWA**	No
		CRS class	6
How are sea level rise, storm events, and floodplain management addressed in the Comprehensive Plan?	The County identified an integrated network of ecologically valuable land and surface waters, referred to as the Environmental Quality Corridor (EQC). The 100-year floodplains are included in the stream valley component. The County intends to prohibit new residential structures within flood impact hazard areas.		
How are sea level rise, storm events, and floodplain management addressed in the Hazards Mitigation Plan?	Fairfax County is included in the Northern Virginia Hazard Mitigation Plan. Each jurisdiction participating in the regional Plan is responsible for implementing specific actions as prescribed in their locally-adopted mitigation action plan. In each mitigation action plan, every proposed action is assigned to a specific local department or agency for responsibility and accountability. The County prepares an annual progress report on the implementation of flood mitigation actions to submit to FEMA. As part of the 2016 plan update, the flood hazard was reexamined and a new analysis performed. This new analysis included, but was not limited to: 1) refreshing the hazard profile; 2) updating the previous occurrences; 3) determining number of hazard events and losses by jurisdiction using NCDC and other data sources where available; 4) updating the assessment of risk by jurisdiction based on new data; and 5) ranking of the hazard by jurisdiction using the methodology described in detail in the HIRA Introduction section. An extensive discussion of past flood events from 1950 to 2015 is included. The number of flood events per jurisdiction is presented, along with annual property and crop damage estimates. The plan also includes the NFIP policy and claim		

	statistics for each jurisdiction. Riverine HAZUSMH analysis was completed for the 2016 revision using 100-year scenarios. Information for the HAZUSMH identified critical facilities in the flood zones is available in Appendix D, as is information regarding the potential flood risk for locally-identified critical assets for each jurisdiction. The Northern Virginia Regional Commission completed a study in 2010 that produced high resolution sea level rise and storm surge mapping, quantified elements vulnerable elements, and developed strategies for managing the risks. The storm event hazards were examined in detail. It includes hurricanes, winter storms, tornadoes, high winds, etc. For each type of storm, the plan includes: a description, geographic location/extent, previous occurrences, the probability of future occurrences, impact, and risk.

Falls Church

When was the Comprehensive Plan adopted? Amended?	1997; 2005	**When was the Hazard Mitigation Plan adopted? Amended?**	2010; 2017
When was the floodplain ordinance adopted?	2004	**Freeboard**	1’
When was the Floodplain Management Plan adopted?	Not a separate plan	**Coastal A Zone/LiMWA**	No
		CRS class	6
How are sea level rise, storm events, and floodplain management addressed in the Comprehensive Plan?	Chapter 5 of the Comprehensive Plan is dedicated to natural resources and the environment. Two floodplain studies are mentioned: 1) the 1981 study conducted by FEMA as part of the NFIP, and 2) a second study, of Tripps Run, which was conducted in 2003. A map of the 100-year floodplain is included. In the Goals section, the City has strategies for protecting water quality and controlling flooding.		
How are sea level rise, storm events, and floodplain management addressed in the Hazards Mitigation Plan?	The City of Falls Church is included in the Northern Virginia Hazard Mitigation Plan. As part of the 2016 plan update, the flood hazard was reexamined and a new analysis performed. This new analysis included, but was not limited to: 1) refreshing the hazard profile; 2) updating the previous occurrences; 3) determining number of hazard events and losses by jurisdiction using NCDC and other data sources where available; 4) updating the assessment of risk by jurisdiction based on new data; and 5) ranking of the hazard by jurisdiction using the methodology described in detail in the HIRA Introduction section. An extensive discussion of past flood events from 1950 to 2015 is included. The number of flood events per jurisdiction is presented, along with annual property and crop damage estimates. The plan also includes the NFIP policy and claim statistics for each jurisdiction. Riverine HAZUS^{MH} analysis was completed for the 2016 revision using 100-year scenarios. Information for the HAZUS^{MH} identified critical facilities in the flood		

	zones is available in Appendix D, as is information regarding the potential flood risk for locally-identified critical assets for each jurisdiction. There is a brief discussion of the areas in Northern Virginia that are at risk for sea level rise inundation. The Northern Virginia Regional Commission completed a study in 2010 that produced high resolution sea level rise and storm surge mapping, quantified elements vulnerable elements, and developed strategies for managing the risks. The storm event hazards were examined in detail. It includes hurricanes, winter storms, tornadoes, high winds, etc. For each type of storm, the plan includes: a description, geographic location/extent, previous occurrences, the probability of future occurrences, impact, and risk.

Fredericksburg

When was the Comprehensive Plan adopted? Amended?	2015; not yet	**When was the Hazard Mitigation Plan adopted? Amended?**	2012; 2017
When was the floodplain ordinance adopted?	Date not listed	**Freeboard**	1.5’
When was the Floodplain Management Plan adopted?	NA	**Coastal A Zone/LiMWA**	No
		CRS class	NA
How are sea level rise, storm events, and floodplain management addressed in the Comprehensive Plan?	In 2012, the University of Mary Washington initiated a planning process to examine the region’s ability to adapt to changing weather patterns as well as its ability to recover from natural disasters. The process resulted in the Climate, Environment, and Readiness (CLEAR) Plan. A description of storm events that have impacted the area is included in the Plan. Flood control and sea level rise adaptations are also mentioned. The CLEAR Plan is referenced in the Comprehensive Plan.		
How are sea level rise, storm events, and floodplain management addressed in the Hazards Mitigation Plan?	The City is included in the George Washington Regional Commission Hazard Mitigation Plan. An extensive history of the significant storms to hit the region is included. Winter storms, Nor’easters, hurricanes, flooding events, etc. are all summarized. City-specific hazards and mitigation actions are also described. The City included the following flood mitigation strategies : 1)study the feasibility of constructing barriers or structures to reduce impacts of flooding, 2) conduct annual outreach to the owners of repetitive loss properties to assist them in reducing their flood risk, and 3)annual review of the Floodplain Ordinance.		

Gloucester County

When was the Comprehensive Plan adopted? Amended?	2016; not yet	**When was the Hazard Mitigation Plan adopted? Amended?**	2016; not yet
When was the floodplain ordinance adopted?	2014	**Freeboard**	2’
When was the Floodplain Management Plan adopted? Amended?	2009; 2014	**Coastal A Zone/LiMWA**	Yes
		CRS class	6
How are sea level rise, storm events, and floodplain management addressed in the Comprehensive Plan?	The County Comprehensive Plan includes a brief history of significant weather events, maps of flood prone areas, and a section on storm surge and potential sea level rise. The County has prepared a separate Floodplain Management Plan, which analyzes coastal flooding causes, identifies vulnerabilities, evaluates existing flood management practices, and discusses mitigation strategies. A sixteen member committee consisting of citizens and County staff monitors implementation, reviews progress, and recommends plan revisions every five years.		
How are sea level rise, storm events, and floodplain management addressed in the Hazards Mitigation Plan?	Gloucester County is included in the Middle Peninsula Hazard Mitigation Plan. Chapter 5 of the Plan presents an extensive risk assessment analysis for flooding, hurricanes, and sea level rise using the Hazus Models. Maps are provided that identify floodplains, essential facilities, potential wind speeds, and sea level rise scenarios. Flood mitigation strategies are also included. Some examples are as follows: 1) protect public buildings and public infrastructure from 100-year flood storm events, 2) when applicable, use FEMA grant funds to purchase and convert flood prone land to non-residential use, and 3) conduct biannual review of Floodplain Ordinances.		

Hampton

When was the Comprehensive Plan adopted? Amended?	2006; 2016	**When was the Hazard Mitigation Plan adopted? Amended?**	2011; 2017
When was the floodplain ordinance adopted?	2015	**Freeboard**	3
When was the Floodplain Management Plan adopted?	Not a separate plan	**Coastal A Zone/LiMWA**	Yes
		CRS class	8
How are sea level rise, storm events, and floodplain management addressed in the Comprehensive Plan?	The City of Hampton emphasizes environmental stewardship in Section 7 of the Comprehensive Plan. There is a brief discussion of the City's vulnerability to coastal storms. Protecting streams, wetlands, and floodplains from the impacts of new development are all part of the city-wide policies.		
How are sea level rise, storm events, and floodplain management addressed in the Hazards Mitigation Plan?	The City of Hampton is included in the Hampton Roads Hazards Mitigation Plan. Flooding, sea level rise and land subsidence, coastal storms, and shoreline erosion are considered the most significant hazards that threaten Hampton Roads. The background and causes of local flooding are explained. Regional-scale FEMA rate insurance maps are included, along with the links to each locality's mapping viewers. Some of the notable flood events to impact the area, as far back as 1749, are listed. The consequences of continuing sea level rise are outlined, including increased coastal erosion, inundation of normally dry lands, coastal flooding, and salt water intrusion. A detailed listing of significant storm events to impact the region since 1871 is included. Section 7 of the Plan includes descriptions of mitigation actions by locality. There		

	is a strong emphasis on integrating mitigation measures into community life. The City of Hampton includes strategies such as: 1) continuing to participate in the NFIP and the CRS, 2) protect structures in flood prone areas, 3) purchase repetitive loss properties, 4) adopt and implement a holistic watershed plan, etc.

Hanover County

When was the Comprehensive Plan adopted? Amended?	2013; not yet	**When was the Hazard Mitigation Plan adopted? Amended?**	2011; not yet
When was the floodplain ordinance adopted?	2014	**Freeboard**	0’
When was the Floodplain Management Plan adopted?	Not a separate plan	**Coastal A Zone/LiMWA**	No
		CRS class	NA
How are sea level rise, storm events, and floodplain management addressed in the Comprehensive Plan?	Chapter 5 of the Comprehensive Plan is dedicated to environmental quality. There are references to the Comprehensive Coastal Resource Management Portal that was prepared by VIMs to guide regulation and policy decisions regarding shoreline erosion control. The County also provides a brief description of FIRMS and where to locate them. The Hanover County Soil Water Conservation District operates the Springfield lake Dam which provides watershed protection and flood prevention.		
How are sea level rise, storm events, and floodplain management addressed in the Hazards Mitigation Plan?	The County is included in the Richmond-Crater Multi-Regional Hazard Mitigation Plan. It contains a detailed history of storm events and damages associated with those events, going back to the late 1700s. Appendix G highlights the effects of the region’s top ten hazards on each jurisdiction. Flooding is listed as a significant threat to the region. Hanover County has identified the following flood mitigation actions: 1)implement the “Turn Around; Don’t Drown” public education campaign, 2)annual review of the repetitive loss and severe repetitive loss inventory, 3) promote mitigation of priority structures where feasible using FEMA HMA programs, etc., and 4) conduct annual preparedness days for hazards to include flood, wind, and earthquake.		

Henrico County

When was the Comprehensive Plan adopted? Amended?	2009; not yet	**When was the Hazard Mitigation Plan adopted? Amended?**	2011; not yet
When was the floodplain ordinance adopted?	2007	**Freeboard**	1’
When was the Floodplain Management Plan adopted?	Not a separate plan	**Coastal A Zone/LiMWA**	No
		CRS class	NA
How are sea level rise, storm events, and floodplain management addressed in the Comprehensive Plan?	The County dedicated Chapter 8 of the Comprehensive Plan to Natural Resources. The Chapter includes a discussion of physical constraints to development, one of which is flood-prone areas. The two most vulnerable areas in the County, which are associated with the Chickahominy and James Rivers. There is also reference to the *Henrico County Environmental Program Manual*, which provides guidance on watershed plans and stormwater management measures required to determine the impact on erosion control, flood control, and water quality.		
How are sea level rise, storm events, and floodplain management addressed in the Hazards Mitigation Plan?	The County is included in the Richmond-Crater Multi-Regional Hazard Mitigation Plan. It contains a detailed history of storm events and damages associated with those events, going back to the late 1700s. Appendix G highlights the effects of the region’s top ten hazards on each jurisdiction. Flooding is listed as a significant threat to the region. Henrico County has identified the following flood mitigation actions: 1) target repetitive loss properties for specialized outreach, 2) continue to implement channel maintenance program, and 3) ensure stormwater system remains adequate for flood hazards.		

Hopewell

When was the Comprehensive Plan adopted? Amended?	2001; 2016	**When was the Hazard Mitigation Plan adopted? Amended?**	2011; not yet
When was the floodplain ordinance adopted?	2011	**Freeboard**	2’
When was the Floodplain Management Plan adopted?	NA	**Coastal A Zone/LiMWA**	Yes
		CRS class	NA
How are sea level rise, storm events, and floodplain management addressed in the Comprehensive Plan?	The Comprehensive Plan includes a brief section on floodplains. A map of the 100-year floodplain is also provided.		
How are sea level rise, storm events, and floodplain management addressed in the Hazards Mitigation Plan?	The City of Hopewell is included in the Richmond-Crater Multi-Regional Hazard Mitigation Plan. Flooding is considered the most significant hazard threat to the region. A detailed history of flood events and damages since 1771 is provided. FIRMs that identify flood zones throughout the region are also included. The vulnerability analysis includes risk and potential losses to structures, risk to critical facilities, and jurisdictional risk based on census blocks. Appendix G of the Plan includes a breakdown of the effect of the region’s top ten hazards on each jurisdiction. Flooding is listed as a significant threat to the region. Some of the flood mitigation strategies identified by the City include: 1) target FEMA’s repetitive loss properties for specialized outreach, 2) clear debris from the stormwater system, 3) conduct annual review of the floodplain ordinance, and 4)c considering participating in the CRS.		

Isle of Wight County

When was the Comprehensive Plan adopted? Amended?	2008; not yet	**When was the Hazard Mitigation Plan adopted? Amended?**	2011; 2017
When was the floodplain ordinance adopted?	2015	**Freeboard**	1.5’
When was the Floodplain Management Plan adopted?	Not a separate plan	**Coastal A Zone/LiMWA**	Yes
		CRS class	NA
How are sea level rise, storm events, and floodplain management addressed in the Comprehensive Plan?	Chapter 2 of the Comprehensive Plan is dedicated to Natural Resources and Environmental Quality. There is a detailed discussion of floodplains, which highlights the coastal flooding that resulted from Hurricane Floyd (1999) and Hurricane Isabel (2013). The County is currently administering a Hazard Mitigation Grant Program acquisition project. This project combines federal, state and county funds for the County to use to purchase property from willing home and business owners whose structures were affected by prior flooding from severe storm events.		
How are sea level rise, storm events, and floodplain management addressed in the Hazards Mitigation Plan?	Isle of Wight is included in the Hampton Roads Hazards Mitigation Plan. Flooding, sea level rise and land subsidence, coastal storms, and shoreline erosion are considered the most significant hazards that threaten Hampton Roads. The background and causes of local flooding are explained. Regional-scale FEMA rate insurance maps are included, along with the links to each locality’s mapping viewers. Some of the notable flood events to impact the area, as far back as 1749, are listed. The consequences of continuing sea level rise are outlined, including increased coastal erosion, inundation of normally dry lands, coastal flooding, and salt water intrusion.		

	A detailed listing of significant storm events to impact the region since 1871 is included. Section 7 of the Plan includes descriptions of mitigation actions by locality. There is a strong emphasis on integrating mitigation measures into community life. The actions listed by Isle of Wight include: 1) acquire, elevate, relocate, or retrofit structures that have suffered repetitive flood damage, 2) works towards joining the CRS, 3) implement strategy to guide development in areas most vulnerable to sea level rise, 4) obtain StormReady designation through NOAA, etc.

James City County

When was the Comprehensive Plan adopted? Amended?	2015; not yet	**When was the Hazard Mitigation Plan adopted? Amended?**	2011; 2017
When was the floodplain ordinance adopted?	2015	**Freeboard**	2’
When was the Floodplain Management Plan adopted?	Not a separate plan	**Coastal A Zone/LiMWA**	Yes
		CRS class	7
How are sea level rise, storm events, and floodplain management addressed in the Comprehensive Plan?	The County dedicated a chapter of the Comprehensive Plan to the Environment. There is a section included that details the importance of floodplains in reducing the impact of flooding by slowing and temporarily storing floodwaters during large storm events. The County uses the Zoning Ordinance to ensure floodplains are protected from activities that would degrade their usefulness. The County has experienced some localized flooding as a result of inadequate or failed drainage systems. As funding permits, the Stormwater Division works to improve the maintenance and operation of the County’s drainage infrastructure. The County has taken actions to address climate change by reducing energy consumption in buildings and the fleet. There is a reference to the HRPDC report, *Coastal Resiliency: Adapting to Climate Change in Hampton Roads 2013.*		
How are sea level rise, storm events, and floodplain management addressed in the Hazards Mitigation Plan?	James City County is included in the Hampton Roads Hazards Mitigation Plan. Flooding, sea level rise and land subsidence, coastal storms, and shoreline erosion are considered the most significant hazards that threaten Hampton Roads. The background and causes of local flooding are explained. Regional-scale FEMA rate insurance maps are included, along with the links to each locality’s mapping viewers. Some of the notable flood events to impact the area, as far back as 1749, are listed. The consequences of continuing sea level rise are outlined, including increased		

	coastal erosion, inundation of normally dry lands, coastal flooding, and salt water intrusion. A detailed listing of significant storm events to impact the region since 1871 is included. Section 7 of the Plan includes descriptions of mitigation actions by locality. There is a strong emphasis on integrating mitigation measures into community life. The actions listed by James City County include: 1) elevate, acquire, relocate, retrofit, or flood proof structures located in flood-prone areas, 2) strengthen the County's Floodplain Management Program, and 3) mitigate the flooding problems identified in the flood studies performed for Powhatan Creek watershed.

King and Queen County

When was the Comprehensive Plan adopted? Amended?	2006	**When was the Hazard Mitigation Plan adopted? Amended?**	2016; not yet
When was the floodplain ordinance adopted?	2009	**Freeboard**	0
When was the Floodplain Management Plan adopted?	Not a separate plan	**Coastal A Zone/LiMWA**	Yes
		CRS class	NA
How are sea level rise, storm events, and floodplain management addressed in the Comprehensive Plan?	Appendix A of the Comprehensive Plan presents an analysis of the physical conditions affecting development in King and Queen County. A map of the flood prone areas is included. It is stated in the Plan that most development that might occur in the County should not be prevented because the floodplain makes up a limited area. However, when development does fall within a floodplain, it is recommended that the first floor structural elements be elevated above the potential flood line.		
How are sea level rise, storm events, and floodplain management addressed in the Hazards Mitigation Plan?	King and Queen County is included in the Middle Peninsula Hazard Mitigation Plan. Chapter 5 of the Plan presents an extensive risk assessment analysis for flooding, hurricanes, and sea level rise using the HAZUS Models. Maps are provided that identify floodplains, essential facilities, potential wind speeds, and sea level rise scenarios. Flood mitigation strategies are also included. Some examples are as follows: 1) protect public buildings and public infrastructure from 100-year flood storm events, 2) when applicable, use FEMA grant funds to purchase and convert flood prone land to non-residential use, and 3) conduct biannual review of Floodplain Ordinances.		

King George County

When was the Comprehensive Plan adopted? Amended?	2013; not yet	**When was the Hazard Mitigation Plan adopted? Amended?**	2012; 2017
When was the floodplain ordinance adopted?	2009	**Freeboard**	0’
When was the Floodplain Management Plan adopted?	Not a separate plan	**Coastal A Zone/LiMWA**	No
		CRS class	NA
How are sea level rise, storm events, and floodplain management addressed in the Comprehensive Plan?	Section H of the Comprehensive Plan is dedicated to Natural Resources. There are a few paragraphs covering floodplains. A map and a description of the 100-year floodplains are included. The County discourages the alternation of land use within floodplains.		
How are sea level rise, storm events, and floodplain management addressed in the Hazards Mitigation Plan?	The County is included in the George Washington Regional Commission Hazard Mitigation Plan. An extensive history of the significant storms to hit the region is included. Winter storms, Nor’easters, hurricanes, flooding events, etc. are all summarized. County-specific hazards and mitigation actions are also described. Some of the flood mitigation actions included for King George County are as follows: 1) annually review the Floodplain Ordinance, 2) support the mitigation of flood-prone structures through the promotion of acquisition/demolition, elevation, flood proofing, and minor localized flood control projects, and 3)improve County Codes to reduce or eliminate the impacts of known natural hazards.		

King William County

When was the Comprehensive Plan adopted? Amended?	2003; 2016	**When was the Hazard Mitigation Plan adopted? Amended?**	2016; not yet
When was the floodplain ordinance adopted?	2015	**Freeboard**	1.5’
When was the Floodplain Management Plan adopted?	Not a separate plan	**Coastal A Zone/LiMWA**	No
		CRS class	NA
How are sea level rise, storm events, and floodplain management addressed in the Comprehensive Plan?	Chapter II of the Comprehensive Plan is titled, *Natural Conditions*. A map and description of the 100-year floodplains are provided.		
How are sea level rise, storm events, and floodplain management addressed in the Hazards Mitigation Plan?	King William County is included in the Middle Peninsula Hazard Mitigation Plan. Chapter 5 of the Plan presents an extensive risk assessment analysis for flooding, hurricanes, and sea level rise using the HAZUS Models. Maps are provided that identify floodplains, essential facilities, potential wind speeds, and sea level rise scenarios. Flood mitigation strategies are also included. Some examples are as follows: 1) protect public buildings and public infrastructure from 100-year flood storm events, 2) when applicable, use FEMA grant funds to purchase and convert flood prone land to non-residential use, and 3) conduct biannual review of Floodplain Ordinances.		

Lancaster County

When was the Comprehensive Plan adopted? Amended?	2013; not yet	**When was the Hazard Mitigation Plan adopted? Amended?**	2006; 2011
When was the floodplain ordinance adopted?	2014	**Freeboard**	1.5’
When was the Floodplain Management Plan adopted?	Not a separate plan	**Coastal A Zone/LiMWA**	Yes
		CRS class	NA
How are sea level rise, storm events, and floodplain management addressed in the Comprehensive Plan?	Chapter 2 of the Comprehensive Plan, *Suitability of Land for Development*, focuses on physical factors that influence of constrain development such as areas that are flood prone or have poor septic suitability. There are several discussions throughout the Plan that extoll the multiple benefits of wetlands. The Lancaster County Shoreline Protection Study is referenced throughout the Comprehensive Plan.		
How are sea level rise, storm events, and floodplain management addressed in the Hazards Mitigation Plan?	Lancaster County is included in the Northern Neck Regional Hazard Mitigation Plan. Section 5.0 of the Plan is dedicated to hazard identification and risk assessment. Hurricanes are listed as a significant hazard, while flooding and severe wind storms are both considered moderate hazards. FEMA flood zone maps, a list of repetitive loss properties, and the results of the vulnerability analysis to show actual losses from flooding are included for the region and each locality. The Plan was written to fulfill the CRS planning requirements should any of the jurisdictions decide to enter. Section 7.0 includes mitigation strategies by County. A few examples of the strategies presented by Lancaster County are as follows: 1)consider using permanent easement to prevent development in the highest priority undeveloped floodplains, 2)identify existing flood-prone structures that may benefit from mitigation measures such as elevation, and 3) work with VDOT to evaluate at-risk roads and implement mitigation measures.		

Mathews County

When was the Comprehensive Plan adopted? Amended?	2011; not yet	**When was the Hazard Mitigation Plan adopted? Amended?**	2016; not yet
When was the floodplain ordinance adopted?	2014	**Freeboard**	0
When was the Floodplain Management Plan adopted?	Not a separate plan	**Coastal A Zone/LiMWA**	Yes
		CRS class	NA
How are sea level rise, storm events, and floodplain management addressed in the Comprehensive Plan?	Mathews County established a goal for 2030 to lead planning efforts to mitigate the effects of coastal erosion, flooding, and potential sea level rise. The County stresses the importance of long-term planning to adapt to a changing coastline. Since the Comprehensive Plan was adopted, the County established a floodplain overlay district.		
How are sea level rise, storm events, and floodplain management addressed in the Hazards Mitigation Plan?	Mathews County is included in the Middle Peninsula Hazard Mitigation Plan. Chapter 5 of the Plan presents an extensive risk assessment analysis for flooding, hurricanes, and sea level rise using the HAZUS Models. Maps are provided that identify floodplains, essential facilities, potential wind speeds, and sea level rise scenarios. Flood mitigation strategies are also included. Some examples are as follows: 1) protect public buildings and public infrastructure from 100-year flood storm events, 2) when applicable, use FEMA grant funds to purchase and convert flood prone land to non-residential use, and 3) conduct biannual review of Floodplain Ordinances.		

Middlesex County

When was the Comprehensive Plan adopted? Amended?	2009; not yet	**When was the Hazard Mitigation Plan adopted? Amended?**	2016; not yet
When was the floodplain ordinance adopted?	2015	**Freeboard**	2’
When was the Floodplain Management Plan adopted?	Not a separate plan	**Coastal A Zone/LiMWA**	Yes
		CRS class	NA
How are sea level rise, storm events, and floodplain management addressed in the Comprehensive Plan?	Chapter 2 is dedicated to natural and cultural resources and includes a section on the development restrictions in floodplains. There is a discussion of the highest tides ever recorded in the County, which was 7 feet during the hurricane of 1933.		
How are sea level rise, storm events, and floodplain management addressed in the Hazards Mitigation Plan?	Middlesex County is included in the Middle Peninsula Hazard Mitigation Plan. Chapter 5 of the Plan presents an extensive risk assessment analysis for flooding, hurricanes, and sea level rise using the HAZUS Models. Maps are provided that identify floodplains, essential facilities, potential wind speeds, and sea level rise scenarios. Flood mitigation strategies are also included. Some examples are as follows: 1) protect public buildings and public infrastructure from 100-year flood storm events, 2) when applicable, use FEMA grant funds to purchase and convert flood prone land to non-residential use, and 3) conduct biannual review of Floodplain Ordinances.		

New Kent County

When was the Comprehensive Plan adopted? Amended?	2012; not yet	**When was the Hazard Mitigation Plan adopted? Amended?**	2011; not yet
When was the floodplain ordinance adopted?	2009	**Freeboard**	1.5’
When was the Floodplain Management Plan adopted?	Not a separate plan	**Coastal A Zone/LiMWA**	Yes
		CRS class	NA
How are sea level rise, storm events, and floodplain management addressed in the Comprehensive Plan?	The County includes a chapter on natural resources in the Comprehensive Plan. A 100-year floodplain map is included. The County is committed to maintaining flood protection ordinances and policies that allow participation in the NFIP and CRS.		
How are sea level rise, storm events, and floodplain management addressed in the Hazards Mitigation Plan?	The County is included in the Richmond-Crater Multi-Regional Hazard Mitigation Plan. It contains a detailed history of storm events and damages associated with those events, going back to the late 1700s. Appendix G highlights the effects of the region’s top ten hazards on each jurisdiction. Flooding is listed as a significant threat to the region. New Kent County has identified the following flood mitigation actions: 1) conduct an annual review of repetitive loss and severe loss property list, 2) conduct an annual review of the Floodplain Ordinance, 3) use fee simple and/or permanent easement to prevent development in the highest priority floodplain areas, and 4) mitigate the road in Fannies Creek.		

Newport News

When was the Comprehensive Plan adopted? Amended?	2006; 2016	**When was the Hazard Mitigation Plan adopted? Amended?**	2011; 2017
When was the floodplain ordinance adopted?	Date not listed	**Freeboard**	2’
When was the Floodplain Management Plan adopted?	NA	**Coastal A Zone/LiMWA**	Yes
		CRS class	NA
How are sea level rise, storm events, and floodplain management addressed in the Comprehensive Plan?	There is some discussion on climate change and the potential impacts of sea level rise. The City set a goal to evaluate participation in the CRS. The Comprehensive Plan also includes references to the Hazard Mitigation Plan for additional information related to flooding.		
How are sea level rise, storm events, and floodplain management addressed in the Hazards Mitigation Plan?	The City of Newport News is included in the Hampton Roads Hazards Mitigation Plan. Flooding, sea level rise and land subsidence, coastal storms, and shoreline erosion are considered the most significant hazards that threaten Hampton Roads. The background and causes of local flooding are explained. Regional-scale FEMA rate insurance maps are included, along with the links to each locality’s mapping viewers. Some of the notable flood events to impact the area, as far back as 1749, are listed. The consequences of continuing sea level rise are outlined, including increased coastal erosion, inundation of normally dry lands, coastal flooding, and salt water intrusion. A detailed listing of significant storm events to impact the region since 1871 is included. Section 7 of the Plan includes descriptions of mitigation actions by locality. There		

	is a strong emphasis on integrating mitigation measures into community life. The City of Newport News presented several actions that will help mitigate flooding, sea level rise, and coastal storm hazards, such as: 1) enroll in the CRS, 2) elevate or retrofit structures, 3)strengthen dams, 4) raising roads, and 5) drainage improvement projects.

Norfolk

When was the Comprehensive Plan adopted? Amended?	2013; 2016	**When was the Hazard Mitigation Plan adopted? Amended?**	2011; 2017
When was the floodplain ordinance adopted?	2014	**Freeboard**	3’
When was the Floodplain Management Plan adopted?	Not a separate plan	**Coastal A Zone/LiMWA**	Yes
		CRS class	8
How are sea level rise, storm events, and floodplain management addressed in the Comprehensive Plan?	Chapter 6 is dedicated to environmental sustainability. Preparing for the consequences of natural hazards is covered in detail. The City intends to increase resiliency by revising the development regulations and developing stormwater master plans that include considerations for water volumes and rates of discharge. Another aspect of their strategy is to implement wetland design changes that allow for the landward migration of wetlands. The City is also working towards improving their rating in the CRS.		
How are sea level rise, storm events, and floodplain management addressed in the Hazards Mitigation Plan?	The City of Norfolk is included in the Hampton Roads Hazards Mitigation Plan. Flooding, sea level rise and land subsidence, coastal storms, and shoreline erosion are considered the most significant hazards that threaten Hampton Roads. The background and causes of local flooding are explained. Regional-scale FEMA rate insurance maps are included, along with the links to each locality’s mapping viewers. Some of the notable flood events to impact the area, as far back as 1749, are listed. The consequences of continuing sea level rise are outlined, including increased coastal erosion, inundation of normally dry lands, coastal flooding, and salt water intrusion. A detailed listing of significant storm events to impact the region since 1871 is		

	included. Section 7 of the Plan includes descriptions of mitigation actions by locality. There is a strong emphasis on integrating mitigation measures into community life. The City of Norfolk outlined several actions to mitigate flooding and sea level rise, such as: 1) protecting the beaches, 2) improve communications to residents to increase vulnerability awareness, 3) implement stormwater capital improvement projects to improve out-of-date infrastructure, 4) minimize flood impacts to critical facilities, etc.

Northampton County

When was the Comprehensive Plan adopted? Amended?	2009; not yet	**When was the Hazard Mitigation Plan adopted? Amended?**	2010; 2011
When was the floodplain ordinance adopted?	2015	**Freeboard**	1’
When was the Floodplain Management Plan adopted?	Not a separate plan	**Coastal A Zone/LiMWA**	Yes
		CRS class	NA
How are sea level rise, storm events, and floodplain management addressed in the Comprehensive Plan?	Natural features are important to the County as a significant influence on the economy and quality of life. The conservation areas have significant environmental sensitivity and are protected from development. Examples of these areas include tidal wetlands, freshwater wetlands, salt marsh, and floodplains. A brief history of storms is presented, with a particular emphasis on the Eastern Shore’s vulnerability to hurricanes. A detailed discussion of the County’s Chesapeake Preservation areas is included.		
How are sea level rise, storm events, and floodplain management addressed in the Hazards Mitigation Plan?	Northampton County is included in the Eastern Shore of Virginia Hazard Mitigation Plan. A chronology of hazard events on the Eastern Shore is presented and dates back to 1564. Chapters 4 and 5 are dedicated to coastal flooding and stormwater flooding, respectively. Flooding, high winds, and coastal erosion present the high priority hazards on the Shore. Detailed discussions on vulnerability and damages are included. Sea level rise is identified as a continuous threat to the Shore; however, the greater threat of sea level rise is the magnification of erosion and storm surge. Some of Northampton County’s flood mitigation strategies include: 1) incorporate the Hazard Mitigation Plan into the Comprehensive Plan, 2) mitigate flood prone properties, 3)maintain a conservation preservation zoning district including coastal areas, and 4)educate residents about available flood insurance.		

Northumberland County

When was the Comprehensive Plan adopted? Amended?	2006; not yet	**When was the Hazard Mitigation Plan adopted? Amended?**	2006; 2011
When was the floodplain ordinance adopted?	2014	**Freeboard**	2’
When was the Floodplain Management Plan adopted?	Not a separate plan	**Coastal A Zone/LiMWA**	Yes
		CRS class	NA
How are sea level rise, storm events, and floodplain management addressed in the Comprehensive Plan?	The County presents a section on flood prone areas as part of the chapter addressing physical factors that influence or constrain development. Protecting floodplains is included in the list of planning principles. The map indicating the FEMA 100 and 500 year floodplains is included.		
How are sea level rise, storm events, and floodplain management addressed in the Hazards Mitigation Plan?	The County is included in the Northern Neck Regional Hazard Mitigation Plan. Section 5.0 of the Plan is dedicated to hazard identification and risk assessment. Hurricanes are listed as a significant hazard, while flooding and severe wind storms are both considered moderate hazards. FEMA flood zone maps, a list of repetitive loss properties, and the results of the vulnerability analysis to show actual losses from flooding are included for the region and each locality. The Plan was written to fulfill the CRS planning requirements should any of the jurisdictions decide to enter. Section 7.0 includes mitigation strategies by County. Some of Northumberland County’s flood mitigation strategies include: 1) incorporate hazard mitigation techniques into new community facilities, 2)provide incentives for property owners to implement mitigation measures, 3) consider using fee simple and/or permanent easement to prevent development in the highest priority undeveloped floodplain, and 4) identify existing flood-prone structures that may benefit from mitigation measures.		

Petersburg

When was the Comprehensive Plan adopted? Amended?	2015; not yet	**When was the Hazard Mitigation Plan adopted? Amended?**	2011; not yet
When was the floodplain ordinance adopted?	2011	**Freeboard**	0; though 1' is recommended
When was the Floodplain Management Plan adopted?	Not a separate plan	**Coastal A Zone/LiMWA**	No
		CRS class	NA
How are sea level rise, storm events, and floodplain management addressed in the Comprehensive Plan?	The 100-yr floodplain map is included. There is some discussion of the ways in which development and increases in impervious area can contribute to localized flooding. The City plans to examine zoning codes to better protect the environment and open space, noting that not all open space is appropriate for development.		
How are sea level rise, storm events, and floodplain management addressed in the Hazards Mitigation Plan?	The City of is included in the Richmond-Crater Multi-Regional Hazard Mitigation Plan. Flooding is considered the most significant hazard threat to the region. A detailed history of flood events and damages since 1771 is provided. FIRMs that identify flood zones throughout the region are also included. The vulnerability analysis includes risk and potential losses to structures, risk to critical facilities, and jurisdictional risk based on census blocks. Appendix G of the Plan includes a breakdown of the effect of the region's top ten hazards on each jurisdiction.		

Poquoson

When was the Comprehensive Plan adopted? Amended?	2008; 2017 (pending)	**When was the Hazard Mitigation Plan adopted? Amended?**	2015; 2017
When was the floodplain ordinance adopted?	2014	**Freeboard**	3’
When was the Floodplain Management Plan adopted?	Not a separate plan	**Coastal A Zone/LiMWA**	Yes
		CRS class	8
How are sea level rise, storm events, and floodplain management addressed in the Comprehensive Plan?	Chapter 5 is dedicated to Environmental Management. The Plan includes a description of the report developed by Governor Kaine’s Commission on Climate Change titled, *A Climate Change Action Plan*. The City sates their commitment to closely monitoring the rates of seas level rise and incorporating those rates into future planning efforts. The flood prone areas in the City were developed prior to the creation of federal and state floodplain protection areas. The FEMA FIRM map is included.		
How are sea level rise, storm events, and floodplain management addressed in the Hazards Mitigation Plan?	The City of Poquoson is included in the Hampton Roads Hazards Mitigation Plan. Flooding, sea level rise and land subsidence, coastal storms, and shoreline erosion are considered the most significant hazards that threaten Hampton Roads. The background and causes of local flooding are explained. Regional-scale FEMA rate insurance maps are included, along with the links to each locality’s mapping viewers. Some of the notable flood events to impact the area, as far back as 1749, are listed. The consequences of continuing sea level rise are outlined, including increased coastal erosion, inundation of normally dry lands, coastal flooding, and salt water intrusion. A detailed listing of significant storm events to impact the region since 1871 is		

	included. Section 7 of the Plan includes descriptions of mitigation actions by locality. There is a strong emphasis on integrating mitigation measures into community life. The City of Poquoson outlined several actions to mitigate flooding and sea level rise, such as: 1) study the feasibility of implementing additional floodplain management ordinance changes, 2) elevate, relocate, retrofit, or flood proof structures in hurricane prone areas, 3) implement the Shoreline Management Plan developed by VIMS, and 4) continue to increase flood and wind protection for critical facilities and infrastructure.

Portsmouth

When was the Comprehensive Plan adopted? Amended?	2005; not yet	**When was the Hazard Mitigation Plan adopted? Amended?**	2001; 2017
When was the floodplain ordinance adopted?	2015	**Freeboard**	3’
When was the Floodplain Management Plan adopted?	2015	**Coastal A Zone/LiMWA**	Yes
		CRS class	7
How are sea level rise, storm events, and floodplain management addressed in the Comprehensive Plan?	The City briefly mentions floodplain management and includes a map of floodplain areas in the Comprehensive Plan. Sea level rise, storm events, and floodplains are covered in detail in the separate 2015 Floodplain Management and Repetitive Loss Plan Update. The City closely followed the CRS steps for developing such a plan. The City brought together a variety of stakeholders, including citizens, public schools, federal and state agencies, and staffs from Departments across the City for form a Task Force. Because of this plan, which includes new mapping, a proposed new floodplain ordinance, outreach efforts, etc., the City raised their rating from 9 to 7.		
How are sea level rise, storm events, and floodplain management addressed in the Hazards Mitigation Plan?	The City of Poquoson is included in the Hampton Roads Hazards Mitigation Plan. Flooding, sea level rise and land subsidence, coastal storms, and shoreline erosion are considered the most significant hazards that threaten Hampton Roads. The background and causes of local flooding are explained. Regional-scale FEMA rate insurance maps are included, along with the links to each locality’s mapping viewers. Some of the notable flood events to impact the area, as far back as 1749, are listed. The consequences of continuing sea level rise are outlined, including increased coastal erosion, inundation of normally dry lands, coastal flooding, and salt water intrusion.		

	A detailed listing of significant storm events to impact the region since 1871 is included. Section 7 of the Plan includes descriptions of mitigation actions by locality. There is a strong emphasis on integrating mitigation measures into community life. The City of Portsmouth intends to: 1) implement additional tide monitoring stations, 2) drainage improvement projects, 3) mitigate flood-prone and repetitive loss structures, and 4) implement green infrastructure for flood and stormwater abatement, etc.

Prince George County

When was the Comprehensive Plan adopted? Amended?	2014; not yet	**When was the Hazard Mitigation Plan adopted? Amended?**	2011; not yet
When was the floodplain ordinance adopted?	2012	**Freeboard**	1’
When was the Floodplain Management Plan adopted?	Not a separate plan	**Coastal A Zone/LiMWA**	Yes
		CRS class	NA
How are sea level rise, storm events, and floodplain management addressed in the Comprehensive Plan?	Chapter 6 of the Comprehensive Plan is dedicated to the environment. The County has restricted land development in the flood hazard areas. New FIRMs were adopted in 2012. The map indicating the 100 and 500 year storms is included. The County set a goal to protect and enhance the natural environment. The strategies towards meeting that goal include evaluating all new development partially on the basis of its impact on water resources and adopting ordinance provisions that enhance the protection of wetlands and floodplains.		
How are sea level rise, storm events, and floodplain management addressed in the Hazards Mitigation Plan?	The County is included in the Richmond-Crater Multi-Regional Hazard Mitigation Plan. It contains a detailed history of storm events and damages associated with those events, going back to the late 1700s. Appendix G highlights the effects of the region’s top ten hazards on each jurisdiction. Flooding is listed as a significant threat to the region. Prince George County has identified the following flood mitigation actions: 1) support mitigation of priority structures through acquisition/ demolition, elevation, flood proofing, and other projects, 2) target FEMA’s repetitive loss properties for specialized outreach and mitigation activities, 3) conduct an annual review of repetitive loss and severe repetitive loss property list to ensure accuracy, and 4) conduct an annual review of the floodplain ordinance.		

Prince William County

When was the Comprehensive Plan adopted? Amended?	2008; not yet	**When was the Hazard Mitigation Plan adopted? Amended?**	2010; 2016
When was the floodplain ordinance adopted?	2015	**Freeboard**	0’
When was the Floodplain Management Plan adopted?	Not a separate plan	**Coastal A Zone/LiMWA**	Yes
		CRS class	8
How are sea level rise, storm events, and floodplain management addressed in the Comprehensive Plan?	The Environmental Plan, a component of the Comprehensive Plan, was updated in 2010. The County established a policy to protect and manage the soils and natural landscape to retain and enhance their associated economic, aesthetic and ecosystem benefits. The County plans to address issues of sea level rise along shorelines and incorporate sea level rise into County policy. The County committed to using a comprehensive watershed management planning-based approach.		
How are sea level rise, storm events, and floodplain management addressed in the Hazards Mitigation Plan?	Prince William County is included in the Northern Virginia Hazard Mitigation Plan. Each jurisdiction participating in the regional Plan is responsible for implementing specific actions as prescribed in their locally-adopted mitigation action plan. In each mitigation action plan, every proposed action is assigned to a specific local department or agency for responsibility and accountability. The County prepares an annual progress report on the implementation of flood mitigation actions to submit to FEMA. As part of the 2016 plan update, the flood hazard was reexamined and a new analysis performed. This new analysis included, but was not limited to: 1) refreshing the hazard profile; 2) updating the previous occurrences; 3) determining number of hazard events and losses by jurisdiction using NCDC and other data sources where available; 4) updating the assessment of risk by jurisdiction based on new data; and 5) ranking of the hazard by jurisdiction using the methodology described in detail in the HIRA Introduction section.		

	An extensive discussion of past flood events from 1950 to 2015 is included. The number of flood events per jurisdiction is presented, along with annual property and crop damage estimates. The plan also includes the NFIP policy and claim statistics for each jurisdiction. Riverine HAZUSMH analysis was completed for the 2016 revision using 100-year scenarios. Information for the HAZUSMH identified critical facilities in the flood zones is available in Appendix D, as is information regarding the potential flood risk for locally-identified critical assets for each jurisdiction. The Northern Virginia Regional Commission completed a study in 2010 that produced high resolution sea level rise and storm surge mapping, quantified elements vulnerable elements, and developed strategies for managing the risks. The storm event hazards were examined in detail. It includes hurricanes, winter storms, tornadoes, high winds, etc. For each type of storm, the plan includes: a description, geographic location/extent, previous occurrences, the probability of future occurrences, impact, and risk.

Richmond

When was the Comprehensive Plan adopted? Amended?	Varies; each neighborhood has a separate plan	**When was the Hazard Mitigation Plan adopted? Amended?**	2011; not yet
When was the floodplain ordinance adopted?	2014	**Freeboard**	1’
When was the Floodplain Management Plan adopted?	Not a separate plan	**Coastal A Zone/LiMWA**	No
		CRS class	8
How are sea level rise, storm events, and floodplain management addressed in the Comprehensive Plan?	Chapter 6 of the City’s Master Plan is dedicated to Natural Resources. It includes a brief section on floodplain management and specifically discourages development in those sensitive areas.		
How are sea level rise, storm events, and floodplain management addressed in the Hazards Mitigation Plan?	The City is included in the Richmond-Crater Multi-Regional Hazard Mitigation Plan. It contains a detailed history of storm events and damages associated with those events, going back to the late 1700s. Appendix G highlights the effects of the region’s top ten hazards on each jurisdiction. Flooding is listed as a significant threat to the region. Some of the flood mitigation actions the City of Richmond listed are as follows: 1)implement the “Turn Around; Don’t Drown” public education campaign, 2)annual review of the repetitive loss and severe repetitive loss inventory, 3)consider participating in the CRS, 4) promote mitigation of priority structures where feasible using FEMA HMA programs, etc.		

Richmond County

When was the Comprehensive Plan adopted? Amended?	2013; not yet	**When was the Hazard Mitigation Plan adopted? Amended?**	2006; 2011
When was the floodplain ordinance adopted?	2008	**Freeboard**	0’
When was the Floodplain Management Plan adopted?	Not a separate plan	**Coastal A Zone/LiMWA**	No
		CRS class	NA
How are sea level rise, storm events, and floodplain management addressed in the Comprehensive Plan?	The County addresses floodplains in the Comprehensive Plan, even though most of the County is unaffected by the flood-prone areas. The most vulnerable areas are along the shoreline of the major creeks that flow into the Rappahannock River. The County includes the FEMA map indicating the 100 and 500 year floodplains.		
How are sea level rise, storm events, and floodplain management addressed in the Hazards Mitigation Plan?	The County is included in the Northern Neck Regional Hazard Mitigation Plan. Section 5.0 of the Plan is dedicated to hazard identification and risk assessment. Hurricanes are listed as a significant hazard, while flooding and severe wind storms are both considered moderate hazards. FEMA flood zone maps, a list of repetitive loss properties, and the results of the vulnerability analysis to show actual losses from flooding are included for the region and each locality. The Plan was written to fulfill the CRS planning requirements should any of the jurisdictions decide to enter. Section 7.0 includes mitigation strategies by County. Some of Richmond County’s flood mitigation strategies are as follows: 1) avoid establishing public service facilities and utilities within or near the floodplain, 2) consider using fee simple and/or permanent easement to prevent development in the undeveloped floodplain, 3) work with VDOT to evaluate at-risk roads and implement mitigation measures, and 4)consider participating in the CRS.		

Smithfield

When was the Comprehensive Plan adopted? Amended?	2009: not yet	**When was the Hazard Mitigation Plan adopted? Amended?**	2011; 2017
When was the floodplain ordinance adopted?	2015	**Freeboard**	0
When was the Floodplain Management Plan adopted?	Not a separate plan	**Coastal A Zone/LiMWA**	Yes
		CRS class	NA
How are sea level rise, storm events, and floodplain management addressed in the Comprehensive Plan?	Floodplain areas are considered Primary Environmentally Sensitive Areas. Most flood prone areas are undeveloped and bordered by steep slopes. The Town adopted the goal of protecting the Town's critical environmental resources while allocating growth to land possessing attributes most conducive to urban use.		
How are sea level rise, storm events, and floodplain management addressed in the Hazards Mitigation Plan?	The Town of Smithfield is included in the Hampton Roads Hazards Mitigation Plan. Flooding, sea level rise and land subsidence, coastal storms, and shoreline erosion are considered the most significant hazards that threaten Hampton Roads. The background and causes of local flooding are explained. Regional-scale FEMA rate insurance maps are included, along with the links to each locality's mapping viewers. Some of the notable flood events to impact the area, as far back as 1749, are listed. The consequences of continuing sea level rise are outlined, including increased coastal erosion, inundation of normally dry lands, coastal flooding, and salt water intrusion. A detailed listing of significant storm events to impact the region since 1871 is included. Section 7 of the Plan includes descriptions of mitigation actions by locality. There		

	is a strong emphasis on integrating mitigation measures into community life. The actions listed by the Town include: 1) provide training for members of Town staff to become Certified Floodplain Managers, 2) review information required on the Zoning Permit Application to ensure continued compliance with the NFIP, 3) verify the location of each NFIP repetitive loss property and determine if that property has been mitigated and if so, by what means, and 4) purchase variable message roadway signs primarily for traffic control during flood events.

Spotsylvania County

When was the Comprehensive Plan adopted? Amended?	2013; 2016	**When was the Hazard Mitigation Plan adopted? Amended?**	2012; 2017
When was the floodplain ordinance adopted?	2001	**Freeboard**	1’
When was the Floodplain Management Plan adopted?	Not a separate plan	**Coastal A Zone/LiMWA**	No
		CRS class	NA
How are sea level rise, storm events, and floodplain management addressed in the Comprehensive Plan?	The County references the Comprehensive Coastal Resource Management guidance that was prepared by the Virginia Institute of Marine Science (VIMS) in 2011. The guidance covers the impact of development in coastal areas on coastal ecosystems and emphasizes the loss of wetlands due to sea level rise. In several places throughout the Comprehensive Plan, the water quality improvement and flood mitigation benefits of wetlands are explained. The 100 year floodplain FEMA map is included.		
How are sea level rise, storm events, and floodplain management addressed in the Hazards Mitigation Plan?	The County is included in the George Washington Regional Commission Hazard Mitigation Plan. An extensive history of the significant storms to hit the region is included. Winter storms, Nor’easters, hurricanes, flooding events, etc. are all summarized. County-specific hazards and mitigation actions are also described. Some of the flood mitigation actions included for Spotsylvania County are as follows: 1)promote structural mitigation to assure redundancy of critical facilities, 2) annually review the floodplain ordinance, 3)conduct annual outreach to each repetitive loss and severe repetitive loss property owner, and 4)support mitigation of priority flood-prone structures though promotion of acquisition/demolition, elevation, flood proofing, minor localized flood control projects, and mitigation reconstruction.		

Stafford County

When was the Comprehensive Plan adopted? Amended?	2010; 2015	**When was the Hazard Mitigation Plan adopted? Amended?**	2012; 2017
When was the floodplain ordinance adopted?	2014	**Freeboard**	3’
When was the Floodplain Management Plan adopted?	Not a separate plan	**Coastal A Zone/LiMWA**	Yes
		CRS class	8
How are sea level rise, storm events, and floodplain management addressed in the Comprehensive Plan?	The Comprehensive Plan includes detailed descriptions of the natural resources in Stafford County. The County established the goal of protecting the ecological integrity of streams. They are also trying to minimize the potential impacts of flood hazards, storm surges, and high water levels. One strategy is to create awareness of local waters that may be susceptible to a rise in tidal waters and storm surge. Within Stafford County, 12% of the land is within a 100-year floodplain.		
How are sea level rise, storm events, and floodplain management addressed in the Hazards Mitigation Plan?	The County is included in the George Washington Regional Commission Hazard Mitigation Plan. An extensive history of the significant storms to hit the region is included. Winter storms, Nor’easters, hurricanes, flooding events, etc. are all summarized. County-specific hazards and mitigation actions are also described. Some of the flood mitigation actions included for Stafford County are as follows: 1) conduct annual outreach to each repetitive loss and severe repetitive loss property owner, 2) ensure proper elevation through retrofit and anchoring of mobile homes located in the floodplain, 3) support mitigation of priority flood-prone structures though promotion of acquisition/demolition, elevation, flood proofing, minor localized flood control projects, and mitigation reconstruction, and 4) annually review the floodplain ordinance.		

Suffolk

When was the Comprehensive Plan adopted? Amended?	2015; not yet	**When was the Hazard Mitigation Plan adopted? Amended?**	2011; 2017
When was the floodplain ordinance adopted?	NA	**Freeboard**	0
When was the Floodplain Management Plan adopted?	Not a separate plan	**Coastal A Zone/LiMWA**	Yes
		CRS class	NA
How are sea level rise, storm events, and floodplain management addressed in the Comprehensive Plan?	Chapter 7 of the Comprehensive Plan is dedicated to Natural and Cultural Resources. There is a brief section on floodplains and a link to the City's floodplain maps on the FEMA website. The City manages development in the Coastal High Hazard Area to minimize flood and tidal impacts.		
How are sea level rise, storm events, and floodplain management addressed in the Hazards Mitigation Plan?	The City of Suffolk is included in the Hampton Roads Hazards Mitigation Plan. Flooding, sea level rise and land subsidence, coastal storms, and shoreline erosion are considered the most significant hazards that threaten Hampton Roads. The background and causes of local flooding are explained. Regional-scale FEMA rate insurance maps are included, along with the links to each locality's mapping viewers. Some of the notable flood events to impact the area, as far back as 1749, are listed. The consequences of continuing sea level rise are outlined, including increased coastal erosion, inundation of normally dry lands, coastal flooding, and salt water intrusion. A detailed listing of significant storm events to impact the region since 1871 is included. Section 7 of the Plan includes descriptions of mitigation actions by locality. There		

	is a strong emphasis on integrating mitigation measures into community life. The actions listed by the City of Suffolk include the following: 1) protect repetitively flooded infrastructure, 2) provide emergency power to critical infrastructure, critical facilities, and critical roadway intersections during extended power outages, 3) capital improvement projects to improve stormwater management, and 4) strengthen the City's Floodplain Management Program by adopting a 1 foot freeboard elevation requirement and providing specialized training for floodplain plan reviewers.

Surry County

When was the Comprehensive Plan adopted? Amended?	2000; not yet	**When was the Hazard Mitigation Plan adopted? Amended?**	2011; not yet
When was the floodplain ordinance adopted?	2012	**Freeboard**	0
When was the Floodplain Management Plan adopted?	Not a separate plan	**Coastal A Zone/LiMWA**	No
		CRS class	NA
How are sea level rise, storm events, and floodplain management addressed in the Comprehensive Plan?	Section IV of the Plan addresses the natural environment. Several areas in the County have been designated as flood-hazard areas, and development in the floodplain is restricted.		
How are sea level rise, storm events, and floodplain management addressed in the Hazards Mitigation Plan?	The County is included in the Richmond-Crater Multi-Regional Hazard Mitigation Plan. It contains a detailed history of storm events and damages associated with those events, going back to the late 1700s. Appendix G highlights the effects of the region's top ten hazards on each jurisdiction. Flooding is listed as a significant threat to the region. Surry County has identified the following flood mitigation actions: 1) work with VDOT to establish additional flood level markers, 2) review locality's compliance with the National Flood Insurance Program with an annual review of the floodplain ordinance, and 3) conduct annual review of repetitive loss and severe repetitive loss property list to ensure accuracy.		

Virginia Beach

When was the Comprehensive Plan adopted? Amended?	2016; not yet	**When was the Hazard Mitigation Plan adopted? Amended?**	2011; 2017
When was the floodplain ordinance adopted?	2013	**Freeboard**	2’
When was the Floodplain Management Plan adopted?	Not a separate plan	**Coastal A Zone/LiMWA**	No
		CRS class	NA
How are sea level rise, storm events, and floodplain management addressed in the Comprehensive Plan?	The Plan includes a chapter dedicated to Environmental Stewardship that presents a detailed discussion on sea level rise and recurrent flooding. There are descriptions of local, regional, and state planning efforts to address these challenges. The Council has directed that a separate *Comprehensive Sea Level Rise and Recurrent Flooding Response Pla*n be developed; it is expected to be completed by 2018. The City has selected 1.5 feet for the short term and 3 feet for the long term planning scenarios. The City is also working on a drainage study to develop solutions for the neighborhoods that most often experience flooding.		
How are sea level rise, storm events, and floodplain management addressed in the Hazards Mitigation Plan?	The City of Virginia Beach is included in the Hampton Roads Hazards Mitigation Plan. Flooding, sea level rise and land subsidence, coastal storms, and shoreline erosion are considered the most significant hazards that threaten Hampton Roads. The background and causes of local flooding are explained. Regional-scale FEMA rate insurance maps are included, along with the links to each locality’s mapping viewers. Some of the notable flood events to impact the area, as far back as 1749, are listed. The consequences of continuing sea level rise are outlined, including increased coastal erosion, inundation of normally dry lands, coastal flooding, and salt water intrusion.		

	A detailed listing of significant storm events to impact the region since 1871 is included. Section 7 of the Plan includes descriptions of mitigation actions by locality. There is a strong emphasis on integrating mitigation measures into community life. The actions listed by the City of Virginia Beach include: 1) retrofit public safety facilities that are vulnerable to wind or flooding damage, 2) provide educational outreach to residents to increase awareness focusing on hurricane preparedness, sea level rise, and flooding, 3) protect the Atlantic Ocean and Chesapeake Bay shorelines, 4) improve alert, warning, and notification capabilities, and 5) investigate coastal barrier technologies and tidal stream diversion techniques.

Westmoreland County

When was the Comprehensive Plan adopted? Amended?	2010; not yet	**When was the Hazard Mitigation Plan adopted? Amended?**	2006; 2011
When was the floodplain ordinance adopted?	1987	**Freeboard**	0
When was the Floodplain Management Plan adopted?	Not a separate plan	**Coastal A Zone/LiMWA**	Yes
		CRS class	NA
How are sea level rise, storm events, and floodplain management addressed in the Comprehensive Plan?	The County established a goal to investigate the FEMA CRS to determine whether flood insurance rates can be lowered for residents. Flooding and stormwater runoff are considered threats to natural resources. The County also set goals to utilize good design practices such as community retention ponds and to maintain ditches that are known to frequently clog to alleviate flooded roadways.		
How are sea level rise, storm events, and floodplain management addressed in the Hazards Mitigation Plan?	The County is included in the Northern Neck Regional Hazard Mitigation Plan. Section 5.0 of the Plan is dedicated to hazard identification and risk assessment. Hurricanes are listed as a significant hazard, while flooding and severe wind storms are both considered moderate hazards. FEMA flood zone maps, a list of repetitive loss properties, and the results of the vulnerability analysis to show actual losses from flooding are included for the region and each locality. The Plan was written to fulfill the CRS planning requirements should any of the jurisdictions decide to enter. Section 7.0 includes mitigation strategies by County. Some of Westmoreland County's strategies include: 1) consider using fee simple and/or permanent easement to prevent development in floodplain areas, 2) identify existing flood-prone structures that may benefit from mitigation measures, 3)evaluate FEMA's repetitive loss properties for possible relocation and/or buy-out, and 4) work with VDOT to evaluate at-risk roads and implement mitigation measures.		

Williamsburg

When was the Comprehensive Plan adopted? Amended?	2013; not yet	**When was the Hazard Mitigation Plan adopted? Amended?**	2011; 2017
When was the floodplain ordinance adopted?	2015	**Freeboard**	0’
When was the Floodplain Management Plan adopted?	Not a separate plan	**Coastal A Zone/LiMWA**	Yes
		CRS class	NA
How are sea level rise, storm events, and floodplain management addressed in the Comprehensive Plan?	The City includes environmental sustainability as one of eight identified goals and objectives. A priority for the City is to protect the Waller Mill reservoir from the potential adverse impacts of future development. Chapter 7 of the Comprehensive Plan is dedicated to Land Use Categories. The 100-year floodplains, tidal and non-tidal wetlands, resource protection areas, and resource management areas are all considered sensitive environmental areas. The 100-year floodplains are located within the resource protection area.		
How are sea level rise, storm events, and floodplain management addressed in the Hazards Mitigation Plan?	The City of Williamsburg is included in the Hampton Roads Hazards Mitigation Plan. Flooding, sea level rise and land subsidence, coastal storms, and shoreline erosion are considered the most significant hazards that threaten Hampton Roads. The background and causes of local flooding are explained. Regional-scale FEMA rate insurance maps are included, along with the links to each locality’s mapping viewers. Some of the notable flood events to impact the area, as far back as 1749, are listed. The consequences of continuing sea level rise are outlined, including increased coastal erosion, inundation of normally dry lands, coastal flooding, and salt water intrusion. A detailed listing of significant storm events to impact the region since 1871 is		

	included. Section 7 of the Plan includes descriptions of mitigation actions by locality. There is a strong emphasis on integrating mitigation measures into community life. The actions listed by the City of Williamsburg include: 1)improve drainage system maintenance to keep it clear of debris, 2)continue participation in the NFIP, 3)maintain StormReady designation, and 4)expand training for CERT groups to include mitigation and response.

York County

When was the Comprehensive Plan adopted? Amended?	2013; not yet	**When was the Hazard Mitigation Plan adopted? Amended?**	2011; 2017
When was the floodplain ordinance adopted?	2014	**Freeboard**	3' (4' in LiMWA)
When was the Floodplain Management Plan adopted?	Not a separate plan	**Coastal A Zone/LiMWA**	Yes
		CRS class	7
How are sea level rise, storm events, and floodplain management addressed in the Comprehensive Plan?	Flood zones are addressed in the Environment chapter of the Comprehensive Plan. Coastal flooding is a potential hazard, affecting approximately 7,000 acres of land close to coastal streams and creeks, especially with the added threat of sea-level rise. The Plan includes a map depicting the flood hazard areas.		
How are sea level rise, storm events, and floodplain management addressed in the Hazards Mitigation Plan?	York County is included in the Hampton Roads Hazards Mitigation Plan. Flooding, sea level rise and land subsidence, coastal storms, and shoreline erosion are considered the most significant hazards that threaten Hampton Roads. The background and causes of local flooding are explained. Regional-scale FEMA rate insurance maps are included, along with the links to each locality's mapping viewers. Some of the notable flood events to impact the area, as far back as 1749, are listed. The consequences of continuing sea level rise are outlined, including increased coastal erosion, inundation of normally dry lands, coastal flooding, and salt water intrusion. A detailed listing of significant storm events to impact the region since 1871 is included. Section 7 of the Plan includes descriptions of mitigation actions by locality. There is a strong emphasis on integrating mitigation measures into community life. The		

	actions listed by York County include: 1) strengthen the County's Floodplain Management Plan, 2) elevate, acquire, relocate, retrofit or flood proof structures in flood-prone areas, and 3) install high water marks signs and/or gages in flood-prone areas.

Appendix B: Policy Recommendations from the Southeast Florida Regional Climate Change Compact Regional Climate Action Plan[75]

[75] Southeast Florida Regional Climate Change Compact. A Region Responds to a Changing Climate: Southeast Florida Regional Climate Change Compact Counties Regional Climate Action Plan. Southeast Florida Regional Climate Change Compact Counties, 2012.

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The objectives and policies listed below are taken directly from the Southeast Florida Regional Climate Change Compact's Regional Climate Action Plan, published in October 2012.[76] The goals and recommendations listed below are those considered relevant to the HRPDC's focus on planning for coastal resilience, and are intended to serve as a starting point for developing local or regional policies in Hampton Roads.

Sustainable Communities and Transportation Planning

Goal

Reduce financial and physical losses in our building stock by reshaping where and how we build.

#	Recommendation
SP-1	Public funds will not be used to subsidize increased overall density or intensity of urban development in coastal high hazard areas. However, public beach, shoreline access, resource restoration, port facilities or similar projects may be constructed.
SP-2	Develop policies, strategies and standards that will serve as guidance for climate change related planning efforts. Municipal and county planning authorities are encouraged to develop policies to improve resilience to coastal and inland flooding, salt water intrusion, and other related impacts of climate change and sea level rise in their Comprehensive Plans, Sustainability Action Plans, Vision Plans, Stormwater Master Plans, Transit Development Plans, Long Range Transportation Plans, Adaptation Action Area Plans, Climate Change Plans and other green planning efforts.
SP-3	Incorporate "Adaption Action Area" definition (as provided for in Florida law) into municipal and/or county Comprehensive Plans, to provide a means to identify those areas deemed most vulnerable to sea level rise and other climate change impacts including but not limited to extreme high tides, heavy local rain events, and storm surge for the purpose of prioritized funding and adaptation planning.
SP-4	Develop criteria in collaboration with municipal and county planning authorities for the purpose of defining Adaptation Action Areas as well as other areas requiring adaptation improvements related to coastal flooding and sea level rise that may include, but not be limited to: • Areas below, at, or near mean higher high water; • Areas which have a hydrological connection to coastal waters; • Areas designated as evacuation zones for storm surge; and/or • Other areas impacted by climate related drainage/flood control issues.
SP-5	Conduct new or utilize existing vulnerability analysis and other technical tools as they are developed as a means for identifying Adaptation Action Areas as well as other areas requiring adaptation improvements related to coastal flooding and sea level rise, to provide guidance for adaptation planning efforts in areas especially at risk to

[76] http://isc.ksepartners.info/wp-content/uploads/2014/09/regional-climate-action-plan-final-ada-compliant.pdf

	sea level rise, tidal flooding and other related impacts of climate change.
SP-6	Develop policies, as provided for in Florida law and in collaboration with the appropriate municipal and county planning authorities, related to areas designated as Adaptation Action Areas or similarly vulnerable areas to improve resilience to coastal flooding, sea level rise and other climate related vulnerabilities and provide guidance for other adaptation planning efforts.
SP-7	Develop sea level rise scenario maps to be considered for inclusion in appropriate Comprehensive Plans and/or regional planning documents as determined by the appropriate local government to guide municipal and county government climate adaptation planning efforts and continue to update regional and local planning efforts as more data becomes available and scientific projections are refined.
SP-8	Identify locations within Adaptation Action Areas or similarly vulnerable areas where targeted infrastructure improvements, new infrastructure, or modified land use and/or development practices could reduce vulnerability and/or improve community resilience.
SP-9	Coordinate regionally across municipalities and county planning authorities on the development of projects and funding proposals to seek prioritized funding for identified infrastructure needs and specific adaptation improvements required within Adaptation Action Area or other related adaptation planning areas.
SP-10	Work with appropriate local, regional and state authorities to revise building codes and land development regulations to discourage new development or post-disaster redevelopment in vulnerable areas to reduce future risk and economic losses associated with sea level rise and flooding. In these areas, require vulnerability reduction measures for all new construction, redevelopment and infrastructure such as additional hardening, higher floor elevations or incorporation of natural infrastructure for increased resilience.
SP-11	Identify within Adaptation Action Areas and similarly impacted areas populations and communities most vulnerable or of special concern for the purpose of ensuring the proper consideration of individual needs and resources as part of local and regional planning activities.
SP-12	Develop new community flood maps reflective of a 100-year storm event under future sea level rise scenarios and use this information, in conjunction with similarly updated storm surge models for revising required elevations for new and redevelopment, and in the permitting/licensing of transportation projects, water management systems, and public infrastructure.
SP-13	Designate or otherwise recognize “Restoration Areas” to identify undeveloped areas that are vulnerable to climate change impacts for the purpose of environmental restoration, dune restoration, agriculture, conservation of natural resources or recreational open space, or as stormwater retention areas. Local governments and appropriate regional planning authorities should prioritize land acquisition in these areas. These areas could also be established or acquired through mitigation or transfer-of-development rights initiatives.
SP-14	Designate or otherwise recognize “Growth Areas” as areas outside of Adaptation

	Action Areas, or other areas subject to adaptation planning efforts, where growth is encouraged due to higher topographic elevation and the presence of existing infrastructure, such as transportation and water and sewer infrastructure. Growth Areas should be developed with Urban Design guidelines that address character of urban place and provide a high quality pedestrian experience through landscaping and the creation of public space.
SP-15	Modify or develop new design standards for transportation infrastructure located in identified vulnerable areas to include environmentally supportive road materials, bridge design, elevation, and stormwater management. Include different pitches combined with stormwater design to effectively remove water from the roadway; explore roadway materials that may be utilized in road construction that are more tolerant of extended periods of extreme temperatures.
SP-16	Develop policies to address new transportation infrastructure development in light of anticipated future climate impacts, such as consideration of future floodplain conditions and vulnerable areas which could require the rerouting of roads because of potential flooding and related damage.

Water Supply, Management, and Infrastructure

Goal

Advance water management strategies and infrastructure improvements needed to mitigate for adverse impacts of climate change and sea level rise on water supplies, water and wastewater infrastructure, and water management systems.

#	Recommendation
WS-2	Develop a regional saltwater intrusion baseline and utilize saltwater intrusion models to identify wellfields and underground infrastructure at risk of contamination/ infiltration by saltwater with increases in sea level.
WS-3	Utilize existing and refined inundation maps and stormwater management models to identify areas and infrastructure at increased risk of flooding and tidal inundation with increases in sea level, to be used as a basis for identifying and prioritizing adaptation needs and strategies.
WS-4	Evaluate the impacts of rising sea and groundwater levels on soil storage, infiltration rates and inflow to stormwater and wastewater collection and conveyance systems; consider longer-term influences on water quality; and develop strategies for implementing reclaimed water and stormwater reuse projects that account for current and future conditions.
WS-5	Develop and apply appropriate hydrologic and hydraulic models to further evaluate the efficacy of existing water management systems and flood control/ drainage infrastructure under variable climate conditions. Quantify the capacity and interconnectivity of the surface water control network and develop feasible adaptation strategies.

WS-6	Coordinate with the South Florida Water Management District, Drainage/Water Control Districts, and utilities/public works officials to identify flood control and stormwater management infrastructure already operating below the design capacity. Further examine water control structures to ensure that they can provide for inland or upstream migration of riparian species as freshwater habitats become more saline.
WS-8	Develop and test water management and drainage system adaptation improvements needed to maintain existing levels of service relating to drainage, flood control, and water supply, and use cost-benefit analyses to prioritize potential improvements.
WS-9	Incorporate and prioritize preferred climate adaptation improvement projects in capital improvement plans and pursue funding.
WS-10	Encourage, foster, and support investigative work and scientific research that improves the understanding of local and regional climate change impacts specific to Southeast Florida, including: • Improved down-scaling of global climate models for representation of precipitation at the regional/local scales • Identification and targeting of gaps in monitoring to improve quantification of the hydrologic system and its response to climate change, such as evapotranspiration, groundwater levels, and precipitation, and local sea level • Development of risk-based decision support tools and processes for application in analysis of infrastructure design, water resource management, natural systems management, and hazard mitigation alternatives. Tools should provide for consideration of potential economic costs of comparative planning scenarios, management decisions, and infrastructure investments and the evaluation of potential tradeoffs.
WS-11	Undertake efforts to fill identified data gaps through local program efforts, agency collaborations, and advocacy for additional state/federal resources, as needed.
WS-12	Foster the development and exchange of new information, methods and technical capabilities to address key questions of concern related to climate variability and sea level rise to support management decisions: • Assess impacts of observed and predicted climate variability and sea level rise on the frequency, duration, and intensity of flooding as a result of extreme tidal excursions, storm surge, and 100-year storm events, and where impacts are likely to be greatest. • Examine the effects of climate change on water availability and groundwater vulnerability due to sea level rise, and predicted changes in precipitation and evapotranspiration patterns and rates. • Establish a venue for a periodic exchange of ideas between resource managers, policy makers, and researchers.
WS-15	Monitor changes in rainfall patterns, temperature means and extremes and sea level rise through coordination with NOAA and other key organizations/partners to better predict future wet-season and dry-season rainfall. Monitor emerging science in order to assess the adequacy of regional climate models. Choose an annual conference or

	other venue at which such trends can be reviewed at regular intervals.

Natural Systems

Goal

Implement monitoring, management, and conservation programs designed to protect natural systems and improve their capacity for climate adaptation.

#	Recommendation
NS-2	Promote collaborative federal, state and local government conservation land acquisition programs. Explore fee simple and less-than-fee approaches which reflect regional acquisition priorities and result in conserving a diversity of natural areas including hot spots of biological diversity, protecting open space and buffer areas to create or maintain resilience and adaptive capacity of existing natural areas to transition inland/ upslope.
NS-7	Coordinate "living shorelines" objectives at regional scale to foster use of natural infrastructure (e.g. coral reefs, native vegetation and mangrove wetlands) instead of or in addition to grey infrastructure (e.g. bulkheads).
NS-10	Advocate for federal and state funding for applied monitoring and climate related science: • identify economic and physical linkages between marine systems (e.g. reefs and mangroves) and hazard risk/damage claim reduction • monitor coastal and freshwater marsh vegetation tolerance to changing salinity, depth and other climate variables • improve data on estuarine bathymetry and use appropriate models to help identify habitats at risk • develop refined climate projections, hydrologic and ecological models to aid in planning
NS-11	Support regulatory requirements that provide for ecologically beneficial uses of clean, dredged materials.

Risk Reduction and Emergency Management

Goal

Provide a more resilient natural and built physical environment in light of climate change.

#	Recommendation
RR-1	Perform vulnerability analysis to identify and quantify the economic value of regional infrastructure at risk under various sea level rise scenarios and other climate change scenarios utilizing inundation mapping, modeling, and other appropriate tools. While

	the initial regional vulnerability assessment completed by the Compact Counties for use in this Regional Climate Action Plan has yielded important new insights on regional risk, additional and ongoing analysis is required to further refine our current understanding and to monitor changes in Southeast Florida's risk profile over time.
RR-2	Evaluate and improve adaptation responses for communities at risk, to include: • Development and implementation of methodologies for the assessment and evaluation of evacuation and relocation options • Development of model evacuation policies and procedures for communities at increased risk of flooding • Development of model relocation policies for affected communities
RR-3	Incorporate climate change adaptation into the relevant Local Mitigation Strategy (LMS) to reduce or eliminate long-term risk to human life and property from disasters. Within the LMS, update local risk assessments to include climate change in the hazard analysis and vulnerability assessment section. Develop strategies for hazard mitigation and post-disaster redevelopment planning.
RR-4	Identify transportation infrastructure at risk from climate change in the region, and determine whether, when, where, and to whom projected impacts from climate change might be significant. Employ inundation mapping, modeling and other appropriate tools to assess the vulnerability of transportation infrastructure to the projected impacts of climate change under various sea level rise and other climate change scenarios. At a minimum, assess the vulnerability of the following transportation infrastructure: • local transportation networks of the Compact Counties • the Regional Transportation Network designated by the Southeast Florida Transportation Council composed of interconnected, strategic corridors (roadway, rail line, waterway), hubs (airports, seaports, intermodal terminals, freight terminals, passenger rail and intercity bus terminals) and connectors critical to the mobility of people and freight and the region's economic competitiveness and quality of life (map included in Appendix D); and evacuation routes adopted under the Statewide Regional Evacuation Corridor Program.
RR-5	Enforce Coastal Construction Control Line and build upon goals, objectives and policies related to Coastal High Hazard Area designations in Comprehensive Plans.
RR-6	Adopt consistent plans at all levels of regional government that adequately address and integrate mitigation, sea level rise and climate change adaptation. The following plans must all be consistent: disaster recovery and redevelopment plans, comprehensive plans, long-range transportation plans, comprehensive emergency management plans, capital improvement plans, economic development plans, Local Mitigation Strategy, Climate Change Action Plan, and Future Land Use Plan.
RR-7	Continue to implement and enforce strong building codes that require new construction and substantial improvements to existing structures to mitigate against the impacts of flooding, severe winds, and sea level rise, and which are consistent with Climate Change Adaptation policy.

Outreach

Goal

Communicate the risks related to climate change and the value of adapting policies and practices to achieve resilience throughout the region.

#	Recommendation
PO-1	Provide outreach to residents, stakeholders and elected officials on the importance of addressing climate change adaptation and preparedness and develop a program to educate specific interest groups about the Compact, Regional Climate Action Plan, and the benefits of Adaptation Action Area. Consider utilizing the Academy concept to educate elected leaders, academic interests and other decision makers.
PO-2	Collaborate among counties, municipalities and appropriate agencies to develop and carry out outreach/educational programs to increase public awareness about hazards exacerbated by climate change, mitigation efforts, and adaptation strategies to minimize damage and risk associated with climate change.
PO-5	Initiate a regional public education campaign to educate residents, business owners, and policy makers on the merits of preserving open land as an "insurance policy" for adaptation to sea level rise in Southeast Florida.
PO-6	Develop early warning systems and social media applications to both inform residents and visitors of extreme high-tide events and to raise overall awareness on sea level rise and climate change issues. Also consider roadway signage for tidal flooding zones.
PO-10	Coordinate outreach efforts with states, regions and counties that are subject to the impacts of climate change with special emphasis on coastal entities experiencing sea level rise and coastal flooding to create a national Climate Adaptation Coalition for the purpose of impacting public policy and influencing appropriations requests.

Public Policy

Goal

Guide and influence local, regional, state and federal climate change related policies and programs through collaboration and joint advocacy.

#	Recommendation
PP-1	Compact Partners will continue the support for the core Compact policies and the role of joint advocacy as provided for in Sections 1 – 4 of the Compact calling for changes to federal law that better recognize the unique vulnerabilities of Southeast Florida to climate change and for providing appropriations based on vulnerabilities,

	with special attention to funding infrastructure projects to adapt to sea level rise.
PP-2	Compact partners will continue to develop state and federal legislative programs on a yearly basis that will serve as guidance for advocacy in Tallahassee and Washington, D.C. Regional programs will be considered for inclusion into Compact partners' legislative packages and joint advocacy in Tallahassee and Washington, D.C., is encouraged when appropriate.
PP-3	Continue to seek the support of other municipal and county jurisdictions including the Leagues of Cities, Florida Association of Counties (FAC), etc. within Florida and the National Association of Counties (NACo) and other entities that influence national policy for the purpose of building coalitions, sharing resources, and influencing state and national policy on mutual climate related issues through joint advocacy.
PP-4	PP-4: Counties, municipalities, regional agencies and other appropriate government and private sector partners should integrate consideration of climate change impacts and adaptation strategies into existing and future systemwide planning, operations, policies, and programs. The guiding principles developed by the Interagency Task Force on Climate Change Adaptation6 for federal agencies should be incorporated by entities when designing and implementing adaptation strategies: • Prioritize the most vulnerable • Use best-available science • Build strong partnerships • Apply risk-management methods and tools • Apply ecosystem-based approaches • Maximize mutual benefits • Continuously evaluate performance
PP-6	Support federal actions to reform transportation models and enhance the National Environmental Policy Act (NEPA) processes to integrate climate change analysis. The essential purpose of NEPA is to ensure that environmental factors are weighted equally when compared to other factors in the decision making process. NEPA processes are central to highway and transit project investment analysis.
PP-9	Advocate to interests in Tallahassee for the preservation of the authority and resource capacity of the Water Management Districts in support of their continued participation in integrated water resource planning, particularly in Southeast Florida where climate change and sea level rise pose additional challenges to the complex issues of alternative water supply development, Everglades restoration, salt water abatement, and drainage and flood control operations.
PP-11	Urge Congress to provide recognition of an "Adaptation Action Area" designation in federal law for the purpose of prioritizing funding for infrastructure needs and adaptation planning, with special attention to modifications in law that enhance funding opportunities through USACE and EPA appropriations processes, as requested by members of Congress.
PP-12	Urge Congress to pass legislation that would create a permanent funding source to finance infrastructure projects to adapt to the impacts of climate change with emphasis on investments in areas such as water management, water supply,

	transportation and other projects that serve to reduce risks to urban infrastructure from extreme weather events and rising sea levels.

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Appendix C: Recommendations from the Miami-Dade County Comprehensive Development Master Plan[77]

[77] Miami-Dade County. Miami-Dade County Comprehensive Development Master Plan. Miami, FL: Miami-Dade County, 2015.

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The objectives and policies listed below are taken directly from the Miami-Dade County Comprehensive Development Master Plan as adopted by the Miami-Dade Board of County Commissioners. The plan was originally adopted on October 2, 2013, and, as reviewed, includes amendments through November 18, 2015.[78] The objectives and policies listed below are those considered relevant to the HRPDC's focus on planning for coastal resilience, and are intended to serve as a starting point for developing local or regional policies in Hampton Roads.

Capital Improvements

Objective CIE-2
Development in coastal high hazard areas will be retained at permitted levels, as of July 1, 1989.

Policy #	Policy Statement
CIE-2A	Public funds will not be used to subsidize increased overall density or intensity of urban development in coastal high hazard areas. However, public beach, shoreline access, resource restoration, port facilities or similar projects may be constructed.
CIE-2B	Replacement of infrastructure in coastal high hazard areas will be at or below existing service capacity except where such replacement will improve hurricane evacuation time, mitigate storm damage, or meet regulatory requirements.
CIE-2C	The Coastal High Hazard Area (CHHA) is defined as areas seaward of the elevation of the category 1 storm surge line, as established by a Sea, Lake and Overland Surges from Hurricanes (SLOSH) computerized storm surge model.

Coastal Management

Objective CM-8
The existing time period required to complete the evacuation of people from flood vulnerable Coastal Areas and mobile homes prior to the arrival of sustained tropical storm force winds shall be maintained or lowered. Shelter capacity within Miami-Dade County shall be increased as necessary to provide a safe haven for storm evacuees.

Policy #	Policy Statement
CM-8H	The Transportation Improvement Program shall include improvements to roadways that would eliminate severe congestion on major evacuation routes and critical links and intersections. All future improvements to evacuation routes shall include remedies for flooding. All local bridges shall be rated by the Florida Department of

[78] http://www.miamidade.gov/planning/cdmp-adopted.asp

	Transportation for structural and operational sufficiency. All State and local bridges with unsatisfactory sufficiency ratings shall be programmed for improvements, or where necessary, replacement.
CM-8M	Miami-Dade County shall examine the feasibility of requiring, or adding as an option for new residential construction, a structurally reinforced "safe room" for use as a private storm shelter. For existing residences, Miami-Dade County shall encourage retrofitting a safe room on a voluntary basis. Miami-Dade County shall also explore incentives and other measures to encourage the wind and/or flood hardening of structures.
CM-8N	No new mobile home parks shall be allowed in areas subject to coastal flooding and any new mobile home parks outside the areas subject to coastal flooding shall include one or more permanent structures in accordance with current and applicable building and construction codes for use as shelter during a hurricane. All mobile home park residents, regardless of their location, shall be advised to evacuate in the event of a hurricane.

Objective CM-9

Miami-Dade County shall continue to orient its planning, regulatory, and service programs to direct future population concentrations away from the Coastal High Hazard Area (CHHA) and FEMA “V” Zone. Infrastructure shall be available to serve the existing development and redevelopment proposed in the Land Use Element and population in the CHHA, but shall not be built, expanded, or oversized to promote increased population in the coastal high-risk area.

Policy #	Policy Statement
CM-9A	Development and redevelopment activities in the Coastal High Hazard Area (CHHA), Hurricane Evacuation Zone A, and the Hurricane Vulnerability Zone1 Hurricane Zone B shall be limited to those land uses that have acceptable risks to life and property. The basis for determining permitted activities shall include federal, State, and local laws, the pre-disaster study and analysis of the acceptability of various land uses reported in the County's Comprehensive Emergency Management Plan required by Policy CM-10A, when approved, and the following guidelines: i) Discourage development on the CHHA, including the barrier islands and shoreline areas susceptible to destructive storm surge; ii) Direct new development and redevelopment to high ground along the Atlantic Coastal Ridge and inland environmentally suitable lands; iii) Maintain, or reduce where possible, densities and intensities of new urban development and redevelopment within Hurricane Evacuation Zone A to that of surrounding existing development and zoning; iv) Prohibit construction of new mobile home parks and critical facilities in Hurricane Evacuation Zone A; v) Prohibit Land Use Plan map amendments or rezoning actions that would increase allowable residential density in the FEMA "V" Zone, the CHHA or on 1 According to 92.0256, F.A.C., Hurricane Vulnerability Zones are defined as areas delineated in the regional or local evacuation plan as requiring evacuation in the

	event of a 100-year or category three hurricane event. In Miami-Dade County, the Hurricane Vulnerability Zones are considered Hurricane Evacuation Zones A and B. VII - 15 land seaward of the Coastal Construction Control Line (CCCL) established pursuant to Chapter 161, F.S.; and, vi) Continue to closely monitor new development and redevelopment in areas subject to coastal flooding to implement requirements of the federal flood insurance program.
CM-9E	The construction or operation of new non-water dependent industrial or business facilities that would generate, use or handle more than 50 gallons of hazardous wastes or materials per year shall be prohibited in the Coastal High Hazard Area. Miami-Dade County shall seek funding to wind- and flood-harden existing public facilities of this type.
CM-9F	Public expenditures that subsidize new or expanded infrastructure that would encourage additional population growth in the Coastal High Hazard Areas shall be prohibited. New public facilities shall not be built in the Coastal High Hazard Area, unless they are necessary to protect the health and safety of the existing population or for the following exceptions: public parks, beach or shoreline access; resource protection or restoration; marinas or Ports; or roadways, causeways and bridges necessary to maintain or improve hurricane evacuation times. Potable water and sanitary sewer facilities shall not be oversized to subsidize additional development in the Coastal High Hazard Area.

Objective CM-10

Reduce the exposure of life and property in Miami-Dade County to hurricanes through the planning and implementation of pre-disaster hazard mitigation measures. Predisaster planning for post-disaster redevelopment shall direct population concentrations away from the undeveloped designated Coastal High Hazard Areas and away from identified high-risk areas during post-disaster redevelopment.

Policy #	Policy Statement
CM-10D	Applications for comprehensive plan amendments, rezoning, zoning variances or subdivision approvals for all new development in areas subject to coastal flooding shall be reviewed for emergency evacuation, sheltering, hazard mitigation, and postdisaster recovery and redevelopment.

Conservation, Aquifer Recharge, and Drainage

Objective CON-5

Miami-Dade County shall continue to develop and implement the Stormwater Master Plans comprised of basin plans for each of the sixteen primary hydrologic basins being addressed by the County, and cut and fill criteria as necessary to: provide adequate flood protection; correct

system deficiencies in County maintained drainage facilities; coordinate the extension of facilities to meet future demands throughout the unincorporated area; and maintain and improve water quality. Each of the basins' Master Plans is to be updated every five years, with the next update to be completed by 2017. The implementing actions recommended in each basin plan shall continue to commence immediately after the applicable plan is approved. Outside of the Urban Development Boundary the County shall not provide, or approve, additional drainage facilities that would impair flood protection to easterly developed areas of the County, exacerbate urban sprawl or reduce water storage.

Policy #	Policy Statement
CON-5A	The Stormwater Management (Drainage) Level of Service (LOS) Standards for Miami-Dade County contain both a Flood Protection (FPLOS) and Water Quality (WQLOS) component. The minimum acceptable Flood Protection Level of Service (FPLOS) standards for Miami-Dade County shall be protection from the degree of flooding that would result for a duration of one day from a ten-year storm, with exceptions in previously developed canal basins as provided below, where IV-8 additional development to this base standard would pose a risk to existing development. All structures shall be constructed at, or above, the minimum floor elevation specified in the federal Flood Insurance Rate Maps for Miami-Dade County, or as specified in Chapter 11-C of the Miami-Dade County Code, whichever is higher.
CON-5E	Miami-Dade County shall establish a priority listing of stormwater drainage and aquifer recharge improvements needed to correct existing system deficiencies and problems, and to provide for future drinking water needs. This shall include: - Drainage/stormwater sewer system improvements in developed urban areas with persistent drainage problems; - Canal and/or stormwater drainage improvements in developed urban areas that have less than one in ten year storm protection and where no roadway drainage improvements are planned or proposed, which would remedy the problems; - Hydrologic modifications that are needed to deliver water to public waterwells or to protect those waterwells from prospective contamination. This shall be based on such factors as: - Miles of canals with out-of-bank flow; - Miles of collector and local streets impassable during a 5 year storm; IV-10 - Miles of minor arterial streets impassable during a 10 year storm; - Miles of principal arterials, including major evacuation routes, that are impassable during a 100 year storm; and - Number or structures flooded by a 100-year storm.
CON-5H	Miami-Dade County shall periodically evaluate stormwater drainage criteria as outlined in the County Code to ensure proper flood protection is being provided to County residents.
CON-5I	When building, expanding or planning for new facilities such as water treatment

	plants, Miami-Dade County shall consider areas that will be impacted by sea level rise.

Land Use

Objective LU-3

The location, design and management practices of development and redevelopment in Miami-Dade County shall ensure the protection of natural resources and systems by recognizing, and sensitively responding to constraints posed by soil conditions, topography, water table level, vegetation type, wildlife habitat, and hurricane and other flood hazards, and by reflecting the management policies contained in resource planning and management plans prepared pursuant to Chapter 380, Florida Statutes, and approved by the Governor and Cabinet, or included in the Comprehensive Everglades Restoration Plan approved by Congress through the Water Resources Development Act of 2000.

Policy #	Policy Statement
LU-3E	By 2017, Miami-Dade County shall initiate an analysis on climate change and its impacts on the built environment addressing development standards and regulations related to investments in infrastructure, development/redevelopment and public facilities in hazard prone areas. The analysis shall consider and build on pertinent information, analysis and recommendations of the Regional Climate Change Action Plan for the Southeast Florida Regional Climate Change Compact Counties, and will include the following elements: a) an evaluation of property rights issues and municipal jurisdiction associated with the avoidance of areas at risk for climate hazards including sea level rise; b) an evaluation of the current land supply-demand methodology to consider and address, as appropriate, the risk associated with infrastructure investments in flood prone areas; and c) an evaluation of the CDMP long-term time horizon in relation to addressing projected long-range climate change impacts. Recommendations from the analysis shall address appropriate changes to land use designations and zoning of impacted properties, and development standards, among other relevant considerations.
LU-3F	By 2017, Miami-Dade County shall develop a Development Impact Tool or criteria to assess how proposed development and redevelopment project features including location, site design, land use types, density and intensity of uses, landscaping, and building design, will help mitigate climate impacts or may exacerbate climate related hazards. The tool would also assess each development's projected level of risk of exposure to climate change impacts, such as inland flooding.
LU-3G	Miami-Dade County shall, by 2017, analyze and identify public infrastructure vulnerable to sea level rise and other climate change-related impacts. This analysis

	shall include public buildings, water and waste water treatment plants, transmission lines and pump stations, stormwater systems, roads, rail, bridges, transit facilities and infrastructure, airport and seaport infrastructure, libraries, fire and police stations and facilities.
LU-3H	In order to address and adapt to the impacts of climate change, Miami-Dade County shall continue to improve analysis and mapping capabilities for identifying areas of the County vulnerable to sea level rise, tidal flooding and other impacts of climate change
LU-3K	By 2017, Miami-Dade County shall determine the feasibility of designating areas in the unincorporated area of the County as Adaptation Action Areas as provided by Section 163.3177(6)(g)(10), Florida Statute, in order to determine those areas vulnerable to coastal storm surge and sea level rise impacts for the purpose of developing policies for adaptation and enhance the funding potential of infrastructure adaptation projects.

Transportation

Objective TC-6

Plan and develop a transportation system that preserves environmentally sensitive areas, conserves energy and natural resources, addresses climate change impacts, and promotes community aesthetic values.

Policy #	Policy Statement
TC-6A	The County shall avoid transportation improvements which encourage or subsidize increased development in coastal high hazard areas, environmentally sensitive areas II-17 identified in the Coastal Management and Conservation, Aquifer Recharge and Drainage Elements, and areas of high risk of significant inland flooding.

Water, Sewer, and Solid Waste

Objective WS-3

The County will provide an adequate level of service for public facilities to meet both existing and projected needs as identified in this plan through implementation of those projects listed in the Capital Improvements Element. All improvements for replacement, expansion, or increase in capacity of facilities shall conform with the adopted policies of this Plan including level of service standards for the facilities.

Policy #	Policy Statement
WS-3F	The Miami-Dade County Water, Wastewater, and Reuse Integrated Master Plan, the primary vehicle for planning for water, sewer, and reuse facilities, shall continue to

	be updated on a regular basis. The integrated Master Plan shall include initiatives to address climate change and sea level rise that would impact the water and sewer infrastructure and drinking water supplies.

Objective WS-4

The County will provide an adequate level of service for public facilities to meet both existing and projected needs as identified in this plan through implementation of those projects listed in the Capital Improvements Element. All improvements for replacement, expansion, or increase in capacity of facilities shall conform with the adopted policies of this Plan including level of service standards for the facilities.

Policy #	Policy Statement
WS-4H	Miami-Dade County shall coordinate with municipalities and the State of Florida to monitor existing septic tanks that are currently at risk of malfunctioning due to high groundwater levels or flooding and shall develop and implement programs to abandon these systems and/or connect users to the public sewer system. The County shall also coordinate to identify which systems will be adversely impacted by projected sea level rise and additional storm surge associated with climate change and shall plan to target those systems to protect public health, natural resources, and the region's tourism industry.

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Appendix D: Slide Deck from May 9, 2017, Workshop

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Integrating Coastal Hazards Into Local Plans

HAMPTON ROADS PLANNING DISTRICT COMMISSION

MAY 9, 2017

Workshop Outline

I. Workshop Goals
II. Coastal Hazards and Hampton Roads
III. Virginia State Law and Coastal Hazards
IV. What's going on in Virginia?

Break

IV. Case Studies
V. Lessons Learned
VI. Recommendations for Hampton Roads and Coastal Virginia
VII. Q&A/Discussion

Goals

Discuss the existing legal and policy structure for addressing coastal hazards

Provide a status report on Hampton Roads and other coastal Virginia communities

Describe activities from communities outside Virginia

Summarize lessons learned and provide directions for moving forward

Key Points

Virginia's localities already have the authority to address coastal hazards through existing plans, policies, and ordinances.

Significant progress has been made throughout Coastal Virginia in assessing vulnerability to coastal hazards

Several communities throughout the country are working on similar issues – no need to reinvent the wheel

Coastal Virginia

"Tidewater" Virginia is comprised of the cities, counties, and towns that are adjacent to the Chesapeake Bay and its tidal tributaries

- 17 cities
- 29 counties
- 42 incorporated towns

Virginia Coastal Zone Management Program

Coastal Hazards and Hampton Roads

Tropical and Extra-Tropical Storms
- Storm surge
- Major erosion
- Significant flooding

Recurrent/Tidal flooding
- Nuisance flooding
- Minor erosion

Sea level rise
- Amplifies flooding from storms and tides
- Gradual permanent inundation

Source: Norfolk Public Library

Credit: City of Norfolk


Credit: City of Hampton

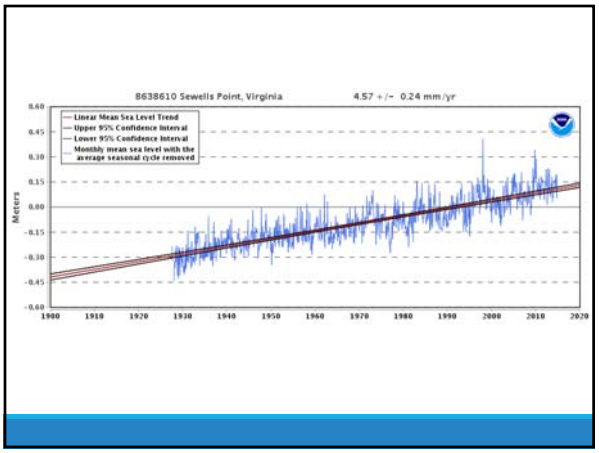
Sea Level Rise in Hampton Roads

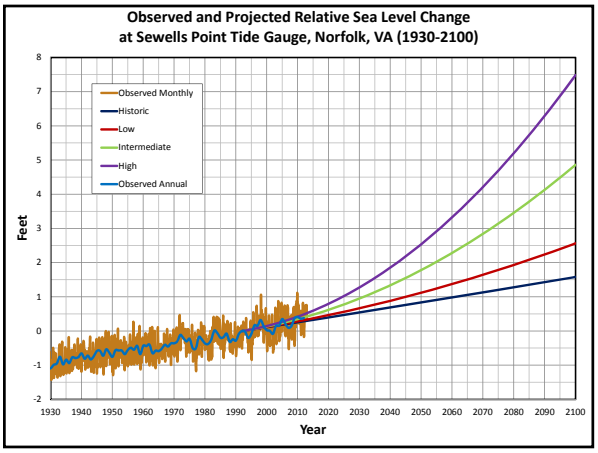
Global sea level rise occurs as a result of ice melt and thermal expansion of the oceans

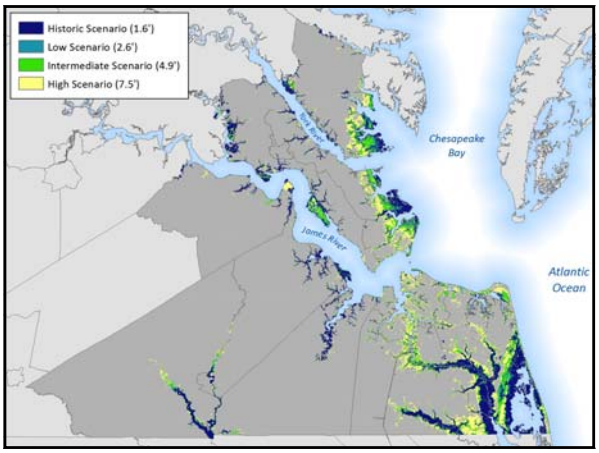
Local or relative sea level rise includes local influences:

- Ground subsidence (or uplift)
  - Glacial isostasy
  - Groundwater withdrawals
- Changes in ocean currents

In Hampton Roads, about half of the observed sea level rise is due to global sea level rise and half is due to subsidence







Coastal Hazards and Hampton Roads

Why do we keep talking about them?

- Continued development in vulnerable areas combined with sea level rise is increasing our vulnerability.
- Lack of federal and state leadership and resources means local governments must deal with these issues on their own as much as they can.
- Local planning and engineering is improving, but we're not there yet.

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Opportunities for Integration

Plans

- Comprehensive Plans
- Hazard Mitigation Plans

Policies

- Capital Improvement Programs
- Board/Council Resolutions

Ordinances

- Floodplain Management
- Subdivision
- Zoning

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State Law and Coastal Hazards

Virginia is a Dillon Rule state

- Named for Judge John Foster Dillon of Iowa
- First expressed in 1868 court cases, later in *Treatise on the Law of Municipal Corporations* (1872)
  - Municipal governments are created by and thus derive all of their powers and rights from state legislatures
  - Therefore, municipal governments only have the powers expressly granted to them by the legislature, are implied by an express grant of power, or powers inherent to the municipality achieving its purposes
  - Other powers are implicitly denied

What does this mean for local planning for coastal hazards?

- Virginia localities require enabling legislation to enact local ordinances and policies.
- The Code of Virginia both expressly allows and requires localities to plan for and address flooding and sea level rise.

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Comprehensive Plans in VA

Code of Virginia §15.2-2223

- The local planning commission **shall prepare and recommend a comprehensive plan for the physical development** of the territory within its jurisdiction and every governing body **shall adopt** a comprehensive plan for the territory under its jurisdiction.
- In the preparation of a comprehensive plan, the commission **shall make careful and comprehensive surveys and studies of the existing conditions and trends of growth, and of the probable future requirements** of its territory and inhabitants. The comprehensive plan shall be made with the purpose of guiding and accomplishing a coordinated, adjusted and harmonious development of the territory which will, in accordance with **present and probable future needs and resources**, best promote the health, safety, morals, order, convenience, prosperity and general welfare of the inhabitants, including the elderly and persons with disabilities.

17

Comprehensive Plans in VA

Code of Virginia §15.2-2223

- C. The comprehensive plan, with the accompanying maps, plats, charts, and descriptive matter, **shall show the locality's long-range recommendations for the general development** of the territory covered by the plan. It may include, but need not be limited to:
  - 1. The designation of areas for various types of public and private development and use, such as different kinds of residential, including age-restricted, housing; business; industrial; agricultural; mineral resources; conservation; active and passive recreation; public service; **flood plain and drainage**; and other areas

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Comprehensive Plans in VA

Code of Virginia §15.2-2223.2

- Beginning in 2013, any locality in Tidewater Virginia, as defined in § 62.1-44.15:68, shall incorporate the guidance developed by the Virginia Institute of Marine Science pursuant to subdivision 9 of § 28.2-1100 into the next scheduled review of its comprehensive plan. The Department of Conservation and Recreation, Virginia Marine Resources Commission, and the Virginia Institute of Marine Science shall provide technical assistance to any such locality upon request.
  - **"The continued armoring of shorelines and construction within the coastal areas will threaten the long-term sustainability of coastal ecosystems under current and projected sea level rise."**
  - **Localities should "consider preserving available open spaces adjacent to marsh lands to allow for inland retreat of the marshes under rising sea level."**

Comprehensive Plans in VA

Code of Virginia §15.2-2223.3

- Beginning July 1, 2015, any locality included in the Hampton Roads Planning District Commission **shall incorporate into the next scheduled and all subsequent reviews of its comprehensive plan strategies to combat projected relative sea-level rise and recurrent flooding**…Where federal regulations as effective July 1, 2015 require a local hazard mitigation plan for participation in the Federal Emergency Management Agency (FEMA) National Flood Insurance Program, such a plan may also be incorporated into the comprehensive plan. For a locality not participating in the FEMA Community Rating System, the comprehensive plan may include an action plan and time frame for such participation.

Zoning

Code of Virginia §15.2-2280

- Any locality **may, by ordinance, classify the territory under its jurisdiction** or any substantial portion thereof into districts of such number, shape and size as it may deem best suited to carry out the purposes of this article, and in each district it may regulate, restrict, permit, prohibit, and determine the following:
  - 1. The use of land, buildings, structures and other premises for agricultural, business, industrial, residential, **flood plain** and other specific uses;

Chesapeake Bay Preservation Act

Code of Virginia §§62.1-44.15:67 – 62.1-44.15:79

- Establishes cooperative state-local program to protect and improve the quality of state tidal waters
- Defines "Tidewater" as a geographic area
- Directs State Water Control Board to develop regulations to establish criteria to determine Chesapeake Bay Preservation Areas
- Grants localities authority to protect quality of state waters through police and zoning powers
- Directs localities to implement law and regulations
  - Determine extent of Chesapeake Bay Preservation Areas
  - Incorporate protection of state waters into comprehensive plans, zoning ordinances, and subdivision ordinances

CBPA Regulations

9VAC25-830-40

- "Floodplain" means all lands that would be inundated by flood water as a result of a storm event of a 100-year return interval.

9VAC25-830-90

- A. Resource Management Areas shall include land types that, if improperly used or developed, have a potential for causing significant water quality degradation or for diminishing the functional value of the Resource Protection Area.
- B. A Resource Management Area shall be provided contiguous to the entire inland boundary of the Resource Protection Area. The following land categories shall be considered for inclusion in the Resource Management Area and, where mapping resources indicate the presence of these land types contiguous to the Resource Protection Area, should be included in designations of Resource Management Areas:
  - **1. Floodplains**

Floodplain Management

Federal requirement for participating in the National Flood Insurance Program – NOT a state requirement

- 44 CFR §§ 60.1 – 60.8

DCR – Dam Safety and Floodplains is responsible for coordinating with the NFIP and working with localities to establish and enforce floodplain management programs

NFIP/CRS

The National Flood Insurance Program is a federal program administered through the Federal Emergency Management Agency that aims to reduce the impacts of flooding by providing flood insurance and encouraging communities to adopt and enforce floodplain management regulations.

The Community Rating System is a part of the NFIP that incentives communities to adopt more stringent floodplain management regulations by providing discounts on flood insurance policy premiums.

How does it all fit together?

Federal and state laws/regulations establish minimum requirements

Hazard mitigation plan and other studies inform the comprehensive plan and identify projects for capital improvements program

Comprehensive plan establishes vision for locality's future, leading to implementation through ordinances (zoning, subdivision, floodplain management, etc.) and projects (CIP)

Assessment of Current Plans

Survey of local plans and policies to determine how and if coastal hazards are addressed.

- Comprehensive plans
- Hazard mitigation plans
- Floodplain management plans
- Floodplain management ordinances

Assessment included 47 communities in Coastal Virginia

- 17 cities
- 29 counties
- 1 town (Smithfield)

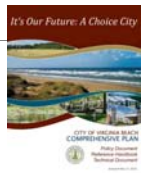
Virginia Coastal Zone Management Program

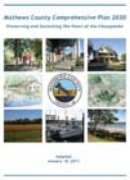
Comprehensive Plans

All 47 Comp Plans include floodplain protection

15 of 47 include evaluating potential impacts of SLR

- Proximity to coast
- How recently updated





Comprehensive Plans

8 of 15 established goals to address SLR

City of Virginia Example

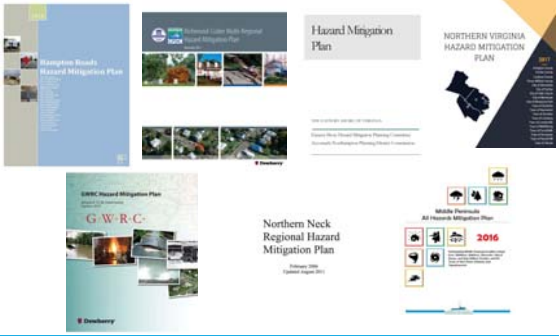
Sea Level Rise, Recurrent Flooding, and Hazard Mitigation	
2.2-28	Develop a program to educate the public on the beneficial functions and values of floodplains.
2.2-29	Complete the City *Comprehensive Response Plan to Sea Level Rise and Recurrent Flooding* for all areas of the City and implement the recommendations therein, subject to funding.
2.2-30	Preserve and enhance beaches and dunes along the City's Atlantic Ocean and Chesapeake Bay shorelines.
2.2-31	Implement the recommendations of the *Regional Hazard Mitigation Plan*.

City of Suffolk Example

Policy 5-4: Develop strategies to ensure that low-lying areas of the City located along the James and Nansemond Rivers and their associated tributaries are not adversely impacted by sea level rise.

- Action 5-4A: Conduct an evaluation of the impacts of sea level rise on those public and private resources and wetlands and other natural resources located in the affected area utilizing this information to develop mitigation strategies and actions. Also include an evaluation of the potential impacts on non-tidal rivers/streams.

7 Regional Hazard Mitigation Plans



Hazard Mitigation Plans

Extensive coverage of coastal hazards

Regional and community mitigation strategies

Eastern Shore HMP Example – Regional Mitigation Projects

- All counties and towns participating in the Hazard Mitigation Planning process incorporate the Eastern Shore of Virginia Hazard Mitigation Plan into the Comprehensive Plan for their respective locality.

Middle Peninsula HMP Example – Regional Strategy 1.1.19:

- Integrate mitigation strategies into locality plans, policies, codes, and programs across disciplines and departments.

Hampton Roads HMP Example – City of Hampton Mitigation Action 12

- Build resiliency into how the city addresses its social, economic and physical challenges.

Floodplain Management Plans

Why develop in addition to HMP?
Despite significant promotion efforts, a total of 57 people attended the 5 public meetings held for the HR HMP.

Floodplain Management Plan Objectives

Meet the goals and objectives of the community

Do not create conflicts with other activities

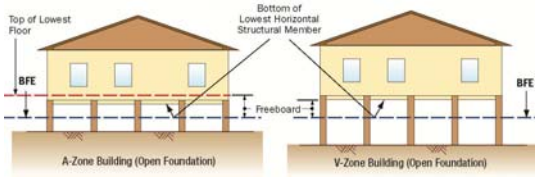
Build public and political support for projects that prevent new problems, reduce losses, and protect floodplains

Build a constituency that wants to see the Plan's recommendations implemented.

Portsmouth FMP Example –

Task Force members include City staff, media, 11 citizens from neighborhoods across the City, military representatives, Public Schools, Virginia Cooperative Extension, and Port of Virginia

Freeboard

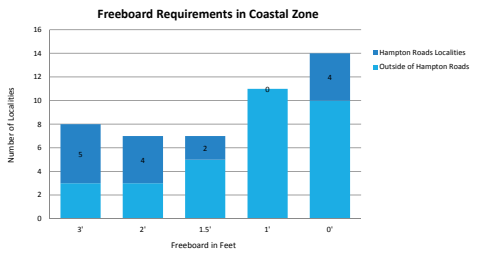


BFE – Base Flood Elevation

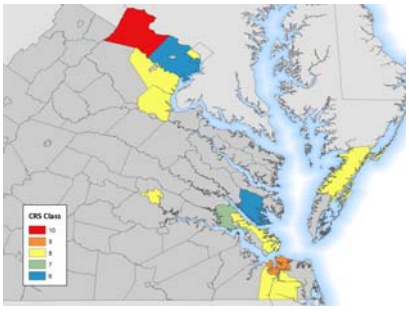
Image source: FEMA Home Builder's Guide to Coastal Construction Technical Fact Sheet No. 1.4, "Lowest Floor Elevation"

Freeboard Requirements

33/47 localities surveyed require freeboard above BFE



CRS Communities in Virginia



Source: October 2016 NFIP Flood Insurance Manual, Change Package

CRS Communities in Virginia

- 16/47 localities in Community Rating System program
  - 11 localities in program for more than a decade (10 localities > 20 years)
  - Recently added communities: Chesapeake (2015), Falls Church (2007), Hampton (2011), Richmond (2015), Stafford (2011)

CRS Class*	Localities
6	Alexandria, Fairfax County, Falls Church, and Gloucester County
7	James City County
8	Accomack County, Arlington County, Chesapeake, Hampton, Poquoson, Prince William County, City of Richmond, Stafford County, and York County
9	Norfolk and Portsmouth

*as of October 2016

Takeaways from CRS Program

The lower your CRS class, the greater the discount

The lowest rated communities are challenged by riverine flooding, and many of them have floodplains that encompass only a small portion of their locality.

Class 1:
- Roseville, CA

Class 2:
- Tulsa, OK,
- King County, WA, (near Seattle)
- Pierce County, WA (near Tacoma)

Common practices:
- Purchasing repetitive loss properties
- Construction of berms and flood walls
- Miles of river levees

The Disaster Resilience Network
http://tulsapartners.org/tpl/may-key-message/

Case Study: Hampton, Virginia

LOCAL FLOODPLAIN MANAGEMENT ORDINANCE

Hampton, VA

DCR – Floodplains maintains a model ordinance for localities to use when establishing or updating their floodplain management ordinances

Baseline standard is for the "floodplain" to include areas vulnerable to the 1% annual chance flood (A, AE, VE, etc.)

Localities have some flexibility when adopting a program:
- Freeboard
- Other floodplains
  - A community "may identify and regulate local flood hazard or ponding areas that are not delineated on the FIRM. These areas may be delineated on a "Local Flood Hazard Map" using best available topographic data and locally derived information such as flood of record, historic high water marks, or approximate study methodologies."

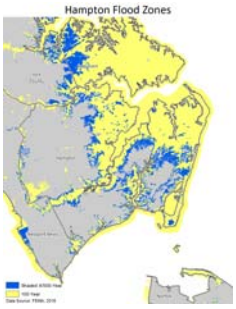
Hampton, VA

Zoning Ordinance, Chapter 9, Article IV – Flood Zone Overlay

Freeboard: (Sec. 9-34 (1) (a))
- The freeboard shall be three (3) feet. The freeboard, in addition to the base flood elevation, shall constitute the design flood elevation.

Other floodplains: (Sec. 9-33 (1) (h))
- Other flood areas shall be those areas identified as X (Shaded) or X500 on the FIRM for which there is a one-fifth percent (0.2%) annual chance of flooding.
  - (i) All new construction as of September 10, 2014 shall have the lowest floor, including basement, elevated or flood-proofed to one and one-half (1.5) feet above the highest grade immediately adjacent to the structure except as described below:
    - (aa) When fill is placed to raise a structure at least one and one-half (1.5) feet above the highest existing grade immediately adjacent to the structure, as shown on a development plan prepared and stamped by a certified land surveyor or professional engineer.

Hampton, VA



100-Year and 500-Year Floodplains

7 Feet of Sea Level Rise

Case Study: Middle Peninsula, Virginia

REGIONAL HAZARD MITIGATION PLAN

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MPPDC

MPPDC's Hazard Mitigation Plan addresses sea level rise

- Summary of impacts by sector
- Discussion of causes and extent
- Incorporation into risk assessment analysis
  - HAZUS analysis using 6' of SLR on top of MHHW
- **Recommended mitigation action – HAZUS of SLR + SS**
- Mitigation strategies:
  - 3.1.7: Develop public information and inform property owners about the long range affects that sea level rise will have on low-lying property that they own.

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Case Study: Southeast Florida Regional Climate Change Compact

REGIONAL COORDINATION AND IMPLEMENTATION

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Southeast Florida Regional Climate Change Compact

Four counties

108 municipalities

6 million residents

No existing regional organization for all four counties

- 3 Metropolitan Planning Organizations
- 2 State Regional Planning Councils
  - South Florida
  - Treasure Coast

Key Components:

- Compact Agreement
- Unified Sea Level Rise Projections
- Regional Climate Action Plan
  - Implementation Guidance
  - Municipal Implementation Survey Report

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Southeast Florida Regional Climate Change Compact

The Southeast Florida Regional Climate Change Compact is a consensus **statement of principles** and **commitment to action** by the four participating counties.

- Joint policy positions for federal and state legislation
- Appropriation of county staff resources and expertise for a Regional Climate Team
- Development of a Regional Climate Action Plan
- Hosting a regional climate change summit

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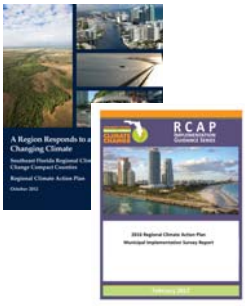
Southeast Florida Regional Climate Change Compact

Regional Climate Action Plan

- Adopted by each county
- 110 Specific recommendations for counties and municipalities
  - **Sustainable communities and transportation**
  - **Water supply**
  - **Natural systems**
  - Agriculture
  - Energy and fuel
  - **Risk reduction and emergency management**
  - **Outreach**
  - **Public policy**

Support and Guidance Documents

Municipal Implementation Survey



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Southeast Florida Regional Climate Change Compact

Example Recommendations

- **SP-7: Develop sea level rise scenario maps to be considered for inclusion in appropriate Comprehensive Plans** and/or regional planning documents as determined by the appropriate local government to guide municipal and county government climate adaptation planning efforts and continue to update regional and local planning efforts as more data becomes available and scientific projections are refined. (Completed by 17/112 local governments as of fall 2016)
- **SP-10: Work with appropriate local, regional and state authorities to revise building codes and land development regulations** to discourage new development or post-disaster redevelopment in vulnerable areas to reduce future risk and economic losses associated with sea level rise and flooding. In these areas, require vulnerability reduction measures for all new construction, redevelopment and infrastructure such as additional hardening, higher floor elevations or incorporation of natural infrastructure for increased resilience. (22/112)

Southeast Florida Regional Climate Change Compact

Example Recommendations

- **SP-12: Develop new community flood maps reflective of a 100-year storm event under future sea level rise scenarios** and use this information, in conjunction with similarly updated storm surge models for revising required elevations for new and redevelopment, and in the permitting/licensing of transportation projects, water management systems, and public infrastructure. (9/112)
- **SP-16: Develop policies to address new transportation infrastructure development in light of anticipated future climate impacts**, such as consideration of future floodplain conditions and vulnerable areas which could require the rerouting of roads because of potential flooding and related damage. (8/112)

Southeast Florida Regional Climate Change Compact

Example Recommendations

- **WS-2: Develop a regional saltwater intrusion baseline** and utilize saltwater intrusion models to identify wellfields and underground infrastructure at risk of contamination/infiltration by saltwater with increases in sea level. (Completed by 23/112)
- **WS-4: Evaluate the impacts of rising sea and groundwater levels on soil storage, infiltration rates and inflow** to stormwater and wastewater collection and conveyance systems; consider longer-term influences on water quality; and develop strategies for implementing reclaimed water and stormwater reuse projects that account for current and future conditions. (47/112)
- **WS-9: Incorporate and prioritize preferred climate adaptation improvement projects in capital improvement plans** and pursue funding. (29/112)

Southeast Florida Regional Climate Change Compact

Example Recommendations

- **NS-2: Promote collaborative federal, state and local government conservation land acquisition programs**. Explore fee simple and less-than-fee approaches which reflect regional acquisition priorities and result in conserving a diversity of natural areas including hot spots of biological diversity, protecting open space and buffer areas to create or maintain resilience and adaptive capacity of existing natural areas to transition inland/upslope. (20/112)
- **NS-11: Support regulatory requirements that provide for ecologically beneficial uses of clean, dredged materials.** (7/112)

Southeast Florida Regional Climate Change Compact

Example Recommendations

- **RR-1: Perform vulnerability analysis to identify and quantify the economic value of regional infrastructure at risk under various sea level rise scenarios** and other climate change scenarios utilizing inundation mapping, modeling, and other appropriate tools. While the initial regional vulnerability assessment completed by the Compact Counties for use in this Regional Climate Action Plan has yielded important new insights on regional risk, additional and ongoing analysis is required to further refine our current understanding and to monitor changes in Southeast Florida's risk profile over time. (17/112)
- **RR-3: Incorporate climate change adaptation into the relevant Local Mitigation Strategy** (LMS) to reduce or eliminate long-term risk to human life and property from disasters. Within the LMS, update local risk assessments to include climate change in the hazard analysis and vulnerability assessment section. Develop strategies for hazard mitigation and post-disaster redevelopment planning. (17/112)

Southeast Florida Regional Climate Change Compact

Example Recommendations

- **RR-4: Identify transportation infrastructure at risk from climate change in the region**, and determine whether, when, where, and to whom projected impacts from climate change might be significant. Employ inundation mapping, modeling and other appropriate tools to assess the vulnerability of transportation infrastructure to the projected impacts of climate change under various sea level rise and other climate change scenarios. (20/112)
- **RR-7: Continue to implement and enforce strong building codes** that require new construction and substantial improvements to existing structures to mitigate against the impacts of flooding, severe winds, and sea level rise, and which are consistent with Climate Change Adaptation policy. (18/112)

Southeast Florida Regional Climate Change Compact

Support and Guidance Documents

- Unified Sea Level Rise Projection
- Integrating the Unified Sea Level Rise Projection in Local Plans
- Reducing Climate Risk and Creating Economic Opportunity
- Regional Impacts of Climate Change and Issues for Stormwater Management
- Integrating Climate Change & Water Supply Planning in Southeast Florida

Southeast Florida Regional Climate Change Compact

Implementation:

- Municipal Implementation Survey
  - 2014 (55 municipalities responded)
  - 2016 (66)
- Annual Summit – 9th in December 2017
- Website
  - Calendar of Events
  - Background Information
  - News
  - Resources
    - Reports
    - Database
    - Indicators
  - Summit Info

http://www.southeastfloridaclimatecompact.org/

Sources:
A Region Responds to a Changing Climate: Southeast Florida Regional Climate Change Compact Counties Regional Climate Action Plan, October 2012
Southeast Florida Regional Climate Change Compact 2016 Regional Climate Action Plan Municipal Implementation Survey Report, February 2017

Case Study: Miami-Dade County, Florida

LOCAL COMPREHENSIVE PLAN

Miami-Dade, FL

Miami-Dade County, Florida

- 2.7 million residents
- 34 municipalities (18 cities, 6 towns, 10 villages)
- Total land area: ~1,900 square miles
- CRS Class 5 – unincorporated areas only

Part of the Southeast Florida Regional Climate Change Compact

- As of 2016, has implemented 89 of the 110 recommendations

Comprehensive Plan extensively addresses coastal hazards

- Land Use
- Coastal Management
- Conservation, Aquifer Recharge and Drainage
- Transportation
- Water, Sewer and Solid Waste
- Capital Improvements

Miami-Dade, FL

Land Use Element Example

- **LU-3G: Miami-Dade County shall, by 2017, analyze and identify public infrastructure vulnerable to sea level rise and other climate change-related impacts.** This analysis shall include public buildings, water and waste water treatment plants, transmission lines and pump stations, stormwater systems, roads, rail, bridges, transit facilities and infrastructure, airport and seaport infrastructure, libraries, fire and police stations and facilities.

Coastal Management Element Example

- **CM-9H: Rise in sea level projected by the federal government, and refined by the Southeast Florida Regional Climate Change Compact, shall be taken into consideration in all future decisions regarding the design, location, and development of infrastructure and public facilities in the County.**

Miami-Dade, FL

Transportation Element Example

- **TC-6A: The County shall avoid transportation improvements which encourage or subsidize increased development in coastal high hazard areas**, environmentally sensitive areas II-17 identified in the Coastal Management and Conservation, Aquifer Recharge and Drainage Elements, and areas of high risk of significant inland flooding.

Capital Improvements Element Example

- **CIE-2B: Replacement of infrastructure in coastal high hazard areas will be at or below existing service capacity** except where such replacement will improve hurricane evacuation time, mitigate storm damage, or meet regulatory requirements.

Miami-Dade, FL

In May 2014, the Miami-Dade Board of County Commissioners adopted Resolution No. R-451-14, which directs the mayor to require all county infrastructure projects to consider the potential impacts of sea level rise for planning, design, and construction

"It is the policy of Miami-Dade County that all County infrastructure projects…shall consider sea level rise projections and potential impacts…in order to ensure that infrastructure projects will function properly for fifty (50) years or the design life of the project, whichever is greater."

Miami-Dade, FL

Public Outreach and Education
- Webpage on Flood Protection
  - Flood insurance
  - Flood zone maps
  - Property sale disclosure info
  - Tips for property owners
- "Do You Know Your Flood Zone" Brochure (also available in Spanish and Haitian Creole)

Source: Miami-Dade County (http://www.miamidade.gov/publicworks/library/brochures/flood-zones.pdf)

Miami-Dade, FL

Source: Miami-Dade County (http://www.miamidade.gov/environment/library/brochures/flood-zones.pdf)

Case Study: Charleston County, SC

LOCAL CRS PROGRAM AND FLOODPLAIN MANAGEMENT ORDINANCE

Charleston County, SC

3rd largest county in South Carolina

396,484 residents

16 Municipalities

Area: 714 square miles (35 square miles of urbanized area)

County CRS Program covers unincorporated areas plus 9 towns

Charleston County, SC

CRS Rating Breakdown:
- Rating: 4 (3,267 total points)
- Points from 15 activities (>100 points from 9)
  - Outreach Projects (296 points)
  - Higher Regulatory Standards (1,024 points)
  - Stormwater Management (414 points)
  - Floodplain Management Planning (310 points)
  - Drainage System Maintenance (270 points)

Charleston County, SC

Higher Regulatory Standards:

- All new construction and substantial improvements within the areas of special flood hazard shall comply with the following:
  - Be constructed to meet or exceed the required design flood elevation (DFE), which is the base flood elevation plus a **two-foot freeboard**.
  - Be constructed with **Class 4 or 5 materials** resistant to flood damage as per FEMA Technical Bulletin 2, entitled "Flood-Resistant Materials Requirements for Buildings Located in Special Flood Hazard Areas", incorporated herein by reference, in all areas below the design flood elevation,
- Cumulative Substantial Improvement
  - ***Substantial improvement*** **means any reconstruction, rehabilitation, addition or other improvement of a structure, taking place during any five consecutive years in the life of a building, the cumulative cost of which equals or exceeds 50 percent of the market value of the existing structure** at the date of "start of construction" of the improvement as determined by the building official. This term includes structures which have incurred "substantial damage," regardless of the actual repair work performed.

Source:
Charleston County Code of Ordinances, Chapter 9 – Flood Damage Prevention and Protection

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Case Study: Charleston, South Carolina

LOCAL SEPARATE PLAN

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Charleston, SC

2nd largest city in South Carolina

132,609 residents

Area: 109 square miles

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Charleston, SC

Sea Level Rise Strategy adopted in December 2015

- Interdepartmental staff initiative
  - Public Service, Planning, Preservation and Sustainability, Emergency Management, GIS
- Lays out existing challenges and future projections
- Summarizes actions to date
- Three categories of strategies
  - Reinvest
  - Respond
  - Ready

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Charleston, SC

Three goals:

- Put in place systems that prevent or reduce the impacts of SLR and significant rainfall
- Ensure public safety given flooding potential
- Ensure community and economic viability and recovery given flooding potential

Major Drainage Improvement Projects

Source: Charleston, South Carolina Sea Level Rise Strategy

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Charleston, SC

Initiative: Establish more appropriate standards to protect public and private investments

- **Strategy: Consider additional freeboard for structures that are long term investments or house critical facilities (1.5 to 2.5 ft.)**

Initiative: Establish programs to address specific solutions for repetitive flooding areas

- **Strategy: Identify and raise the elevation of primary streets expected to be impacted by sea level rise in the future**

Initiative: Evaluate and assess the impact of sea level rise on future development

- **Strategy: Update the City's Zoning Code to promote development that negates or minimizes effects of SLR**

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Lessons Learned

Public outreach is key to educating the public and decision makers and to developing support for action

Internal coordination is vital for successful implementation
- Planning
- Public works
- Emergency management
- Economic development

Lessons Learned

Comprehensive and Hazard Mitigation Plans are a good place to start
- Maps and analyses
- Information
- Specific goals, objectives, and policies developed through a public process

Capital improvement programs and ordinances are where the rubber meets the road
- Selecting which projects to fund (transportation, housing, flood management)
- Freeboard requirements in floodplains
- Including other areas in the regulated floodplain

Lessons Learned

CRS – good, but not everything

Significant Benefits
- Incentivizing of good floodplain management practices
- Reduction in flood insurance rates

Challenges/Drawbacks
- "Checking the box"
- Current point structure makes it difficult for coastal urban communities to score in the highest classes
  - Most developed with large floodplains
- Top 3 activities for points are Open Space Preservation (420), Acquisition and Relocation of Buildings (520), and Retrofitted Buildings (530)
  - All use the area of the SFHA or the number of buildings in the SFHA as the denominator for calculations

Questions and Discussion

Thank you!

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HAMPTON ROADS PDC
PLANNING DISTRICT COMMISSION

Virginia Coastal Zone
MANAGEMENT PROGRAM

NOAA