VIRGINIA COASTAL RESILIENCE MASTER PLAN PHASE ONE, DEC 2021

January 11th, 2022

Matt Dalon, PE CFM
Program Manager, Virginia Coastal Resilience Master Plan
matt.dalon@dcr.virginia.gov

DCR
Virginia Department of Conservation & Recreation

Outline

- Why This Plan
- What We've Done
- What We've Learned
- What We're Doing About It
- What's Next

Why This Plan?

Why Virginia needs a Coastal Master Plan

Whole of Government and Community Approach

Ensure Equity

Broader View

Funding Strategy

Master Planning Process Framework

Commonwealth of Virginia
Office of the Governor

Executive Order

NUMBER TWENTY-FOUR (2018)

INCREASING VIRGINIA'S RESILIENCE TO SEA LEVEL RISE AND NATURAL HAZARDS

Importance of the Initiative

Sea level rise, land subsidence, higher average temperatures, more frequent and intense weather events, severe drought, and increased development, have increased risk and will continue to increase and exacerbate risk from natural hazards across the Commonwealth of Virginia. The number of federally declared disasters has steadily increased nationally and in Virginia. The number has experienced a 250 percent increase in federally declared disasters over the past 20 years, including declarations for flooding, hurricanes, severe storms, and wildfire.

The best available science predicts that this trend will continue to worsen. A recent report from the United Nations Intergovernmental Panel on Climate Change states that the world is likely to experience dramatic increases in coastal flooding and severe weather events. Additional studies show that water levels in the Hampton Roads region are now 18 inches higher than they were a century ago, and that they are expected to gain up to five more feet, while the land sinks as much as 7.5 inches, by 2100. That combined rise is faster than anywhere else on the East Coast. The most recent National Climate Assessment reported that the intensity, frequency, and duration of North Atlantic hurricanes, as well as the frequency of the strongest hurricanes, have all increased.

This increase in extreme weather events and natural disasters will continue to have a profound impact on Virginia. It threatens public health and safety, our environment and natural resources, and the economic wellbeing of the Commonwealth, including our ports, military installations, transportation infrastructure, tourism assets, farms, and forests. We must act now to protect lives and property from multiple threats and reduce taxpayer exposure through fiscally responsible planning.

Commonwealth of Virginia
Office of the Governor

Executive Order

NUMBER FORTY-FIVE

FLOODPLAIN MANAGEMENT REQUIREMENTS AND PLANNING STANDARDS FOR STATE AGENCIES, INSTITUTIONS, AND PROPERTY

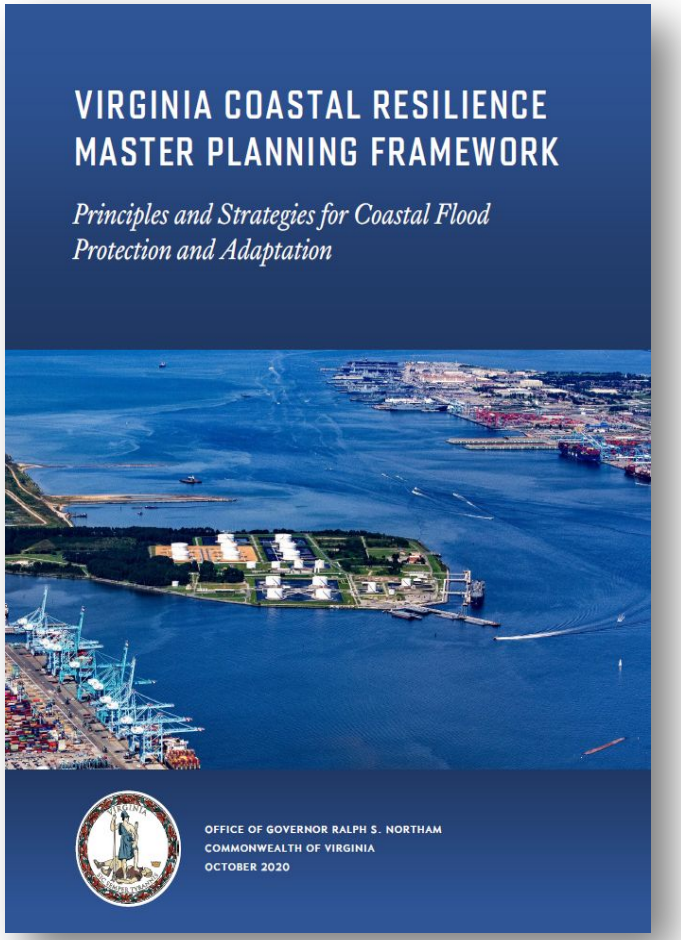
Importance of the Initiative

Executive Order 24 "Increasing Virginia's Resilience to Sea Level Rise and Natural Hazards," issued in November 2018, set the Commonwealth on a course towards addressing its risk and resilience to natural hazards, including flooding. A key element of that Order required an analysis of flooding and flood preparedness in the Commonwealth. Based on that analysis, the Commonwealth must establish new policies and directives to ensure that necessary actions are taken to protect state property from the risk of floods.

Background

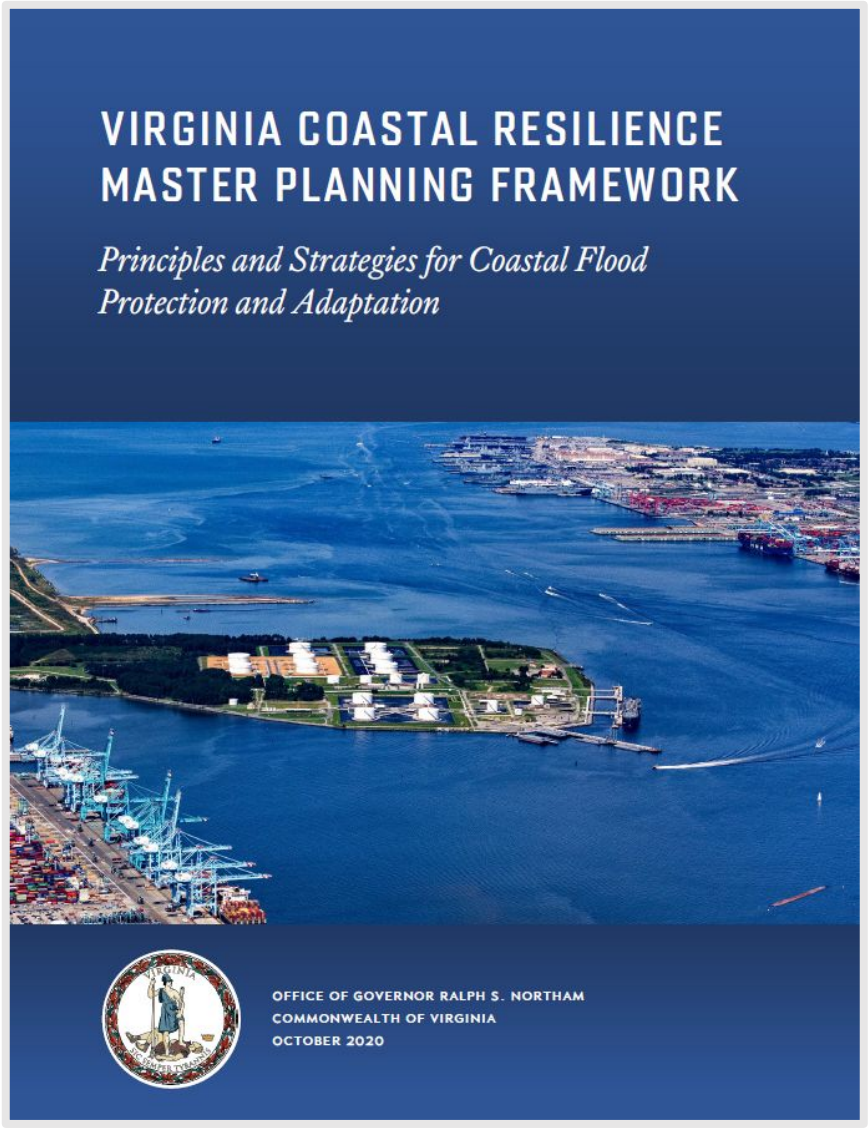
Flooding remains the most common and costly natural disaster in Virginia and the United States. With more than 100,000 miles of streams and rivers, as well as 10,000 miles of estuarine and coastal shoreline, Virginia's flood risk is statewide, comes in many forms, and is increasing because of climate change and increased development in flood-prone areas. In 1987, in order to improve Virginia's flood protection programs and to consolidate all related programs in one agency, responsibility for coordination of all state floodplain programs was transferred from the State Water Control Board to the Department of Conservation and Recreation (DCR). Section 10.1-602 of the *Code of Virginia* names DCR as the manager of the state's floodplain program and the designated coordinating agency of the National Flood Insurance Program (NFIP). The Code stipulates that the Director of DCR or his designee shall serve as the State Coordinator for the NFIP.

DCR's Floodplain Management Program was created to minimize Virginia's flood hazards. In particular, it aims to prevent loss of life, reduce property damage, and conserve natural and beneficial values of state rivers and coastal floodplains. To achieve these goals, DCR promotes



Guiding Principles

- **Acknowledge climate change and its consequences**, and base decision-making on the **best available science**.
- Identify and address **socioeconomic inequities** and work to **enhance equity** through coastal adaptation and protection efforts.
- Recognize the importance of **protecting and enhancing green infrastructure** like natural coastal barriers and fish and wildlife habitat by **prioritizing nature-based solutions**.
- Utilize **community and regional scale planning** to the maximum extent possible, seeking region-specific approaches tailored to the **needs of individual communities**.
- Understand **fiscal realities** and focus on the most **cost-effective solutions** for protection and adaptation of our communities, businesses and critical infrastructure.

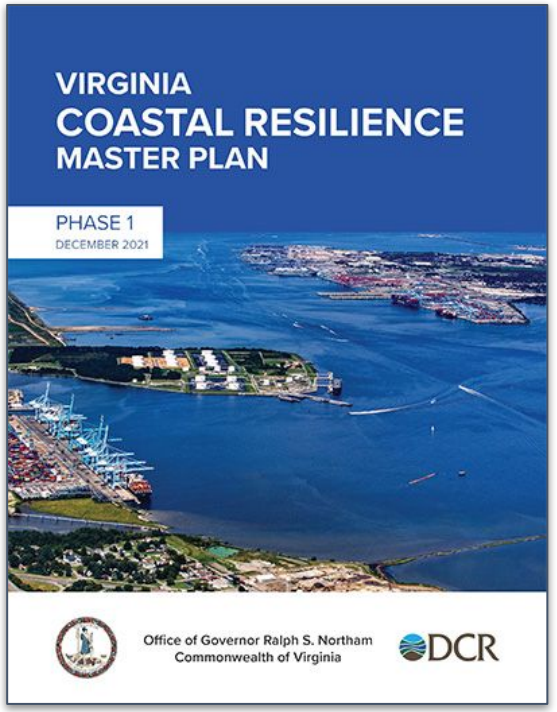


Goals

1. Identify and prioritize projects to **increase the resilience of coastal communities**, including both built and natural assets at risk due to flooding and sea level rise
2. Establish a financing strategy, informed by regional differences and equity considerations
3. **Incorporate and promote climate change projections** into Commonwealth's programs addressing coastal adaptation and protection
4. **Coordinate state, federal, regional, and local** coastal region adaptation and protection efforts

What We've Done

Conceptual Model

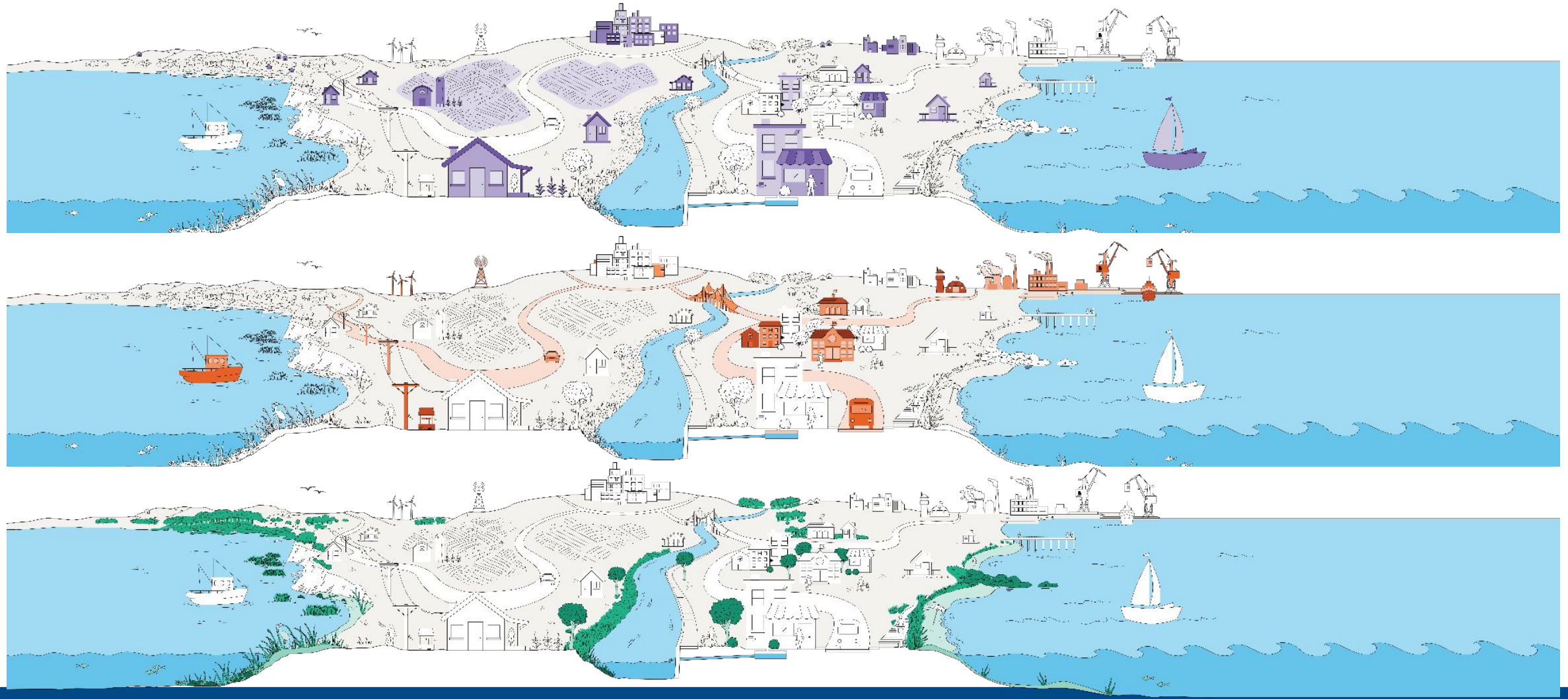


Virginia Coastal Resilience Master Plan

dcr.virginia.gov/crmp/

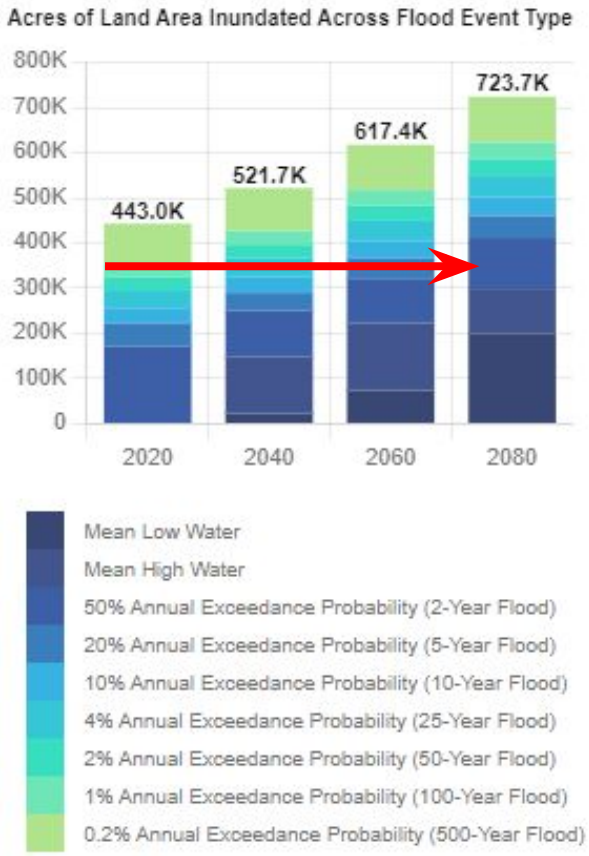
DCR
Virginia Department of Conservation & Recreation

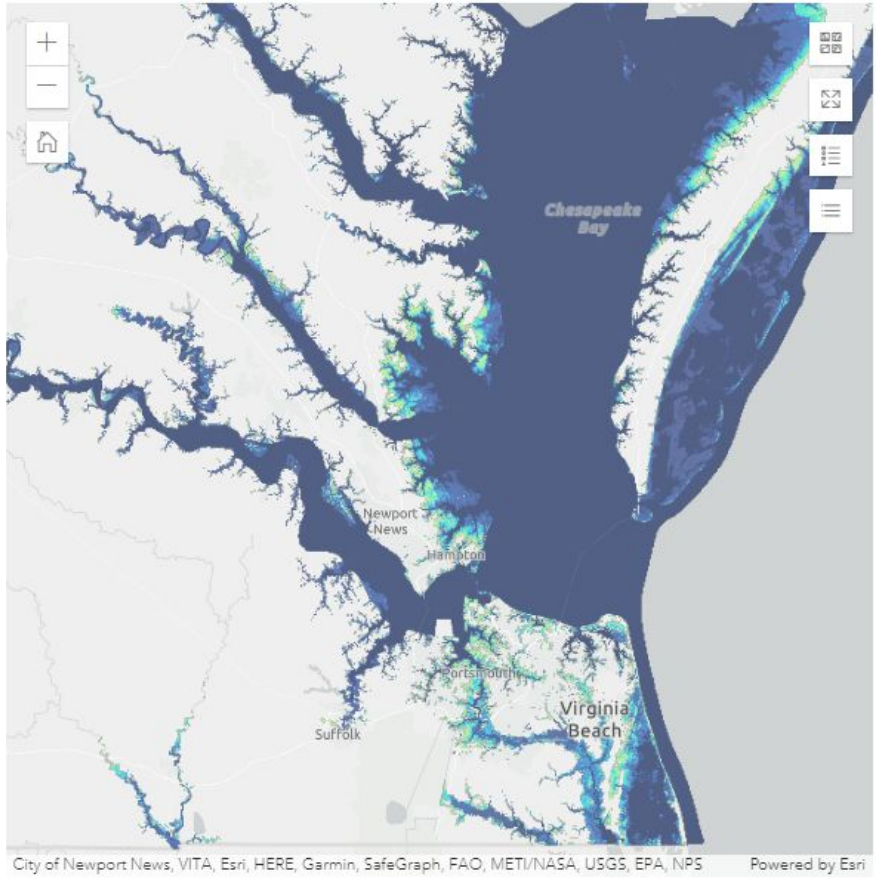
What We've Learned



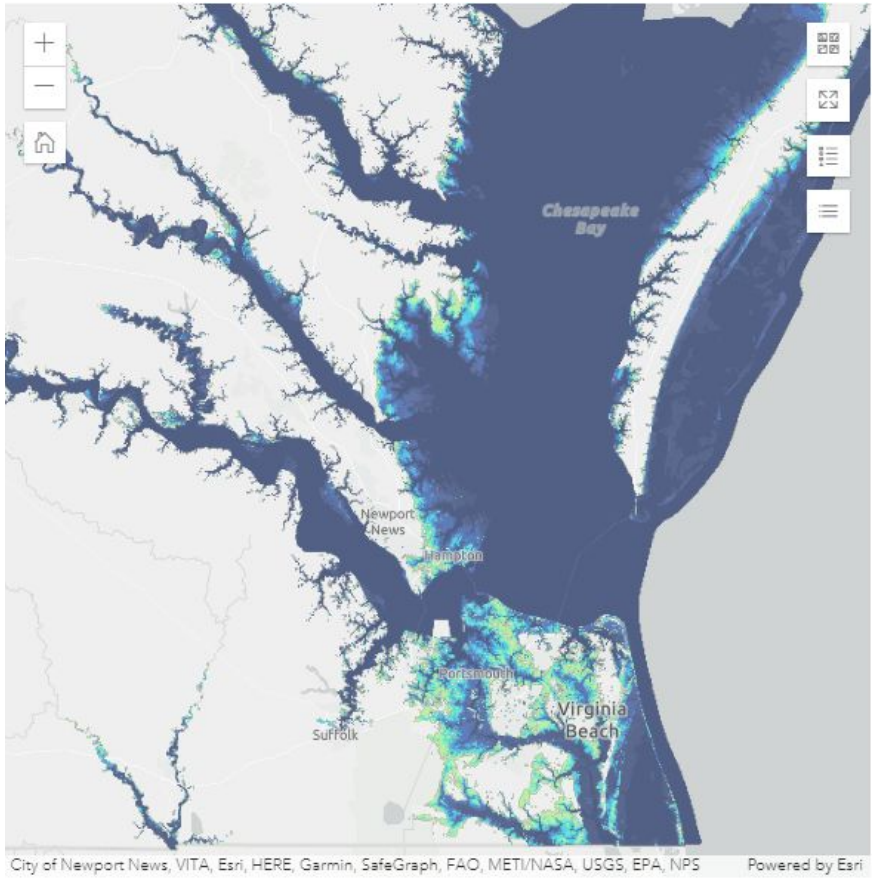
Virginia Department of Conservation & Recreation

Coastal Flood Hazard with SLR





2020



2080

Coastal Flood Hazard ≠ Total Flood Hazard

Sea level rise increases coastal flood hazards in both extent and frequency.

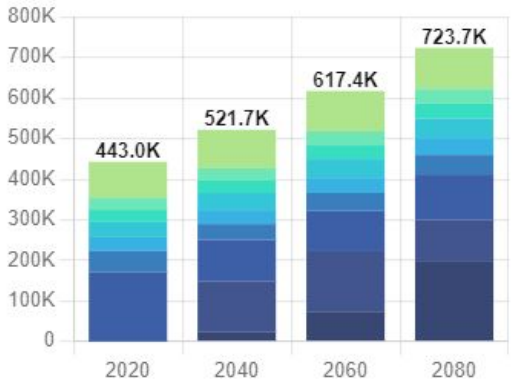
Select Area of Interest:

Commonwealth | Virginia

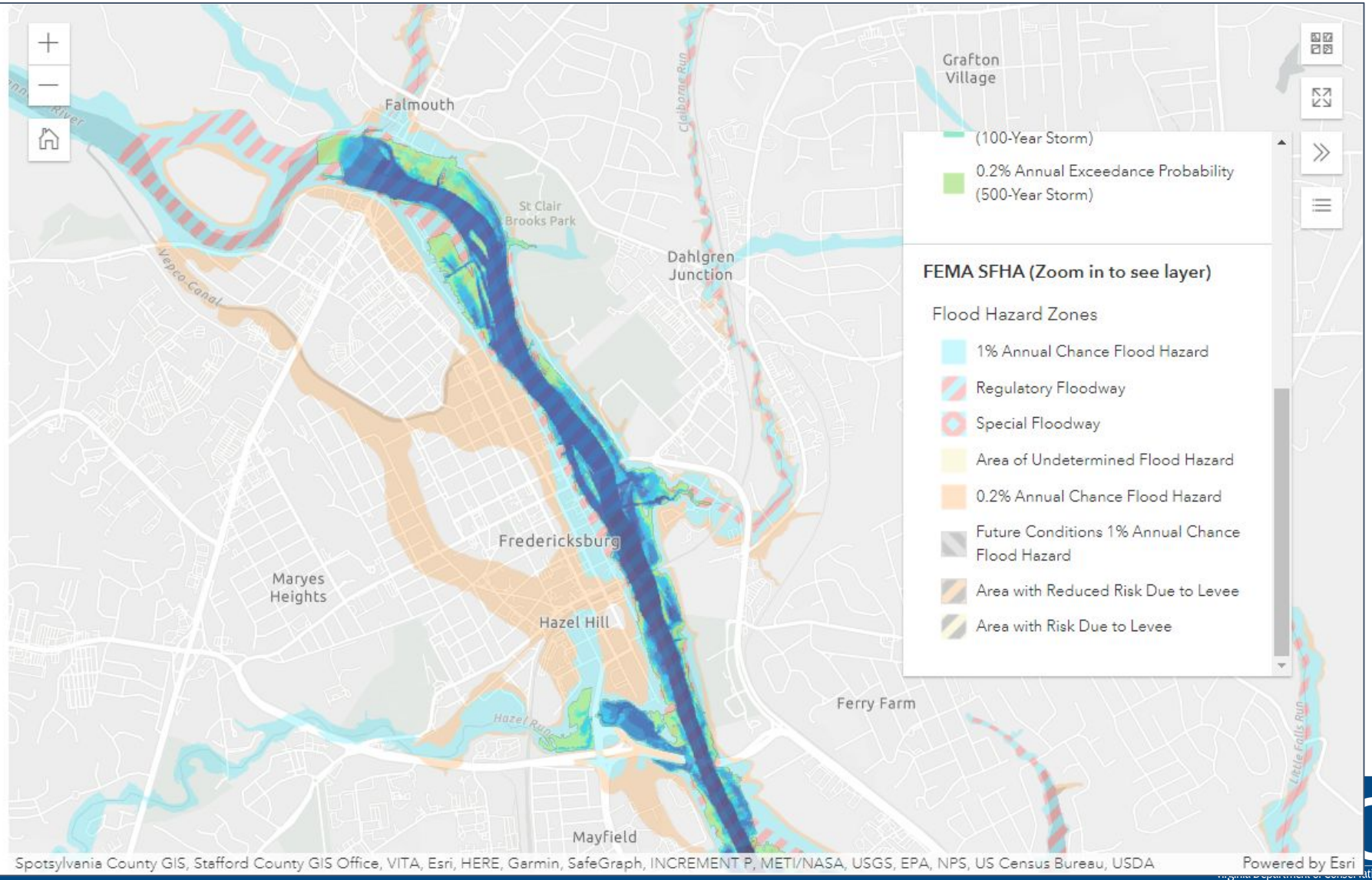
Coastal Flood Time Horizon:

2020 | 2040 | 2060 | 2080

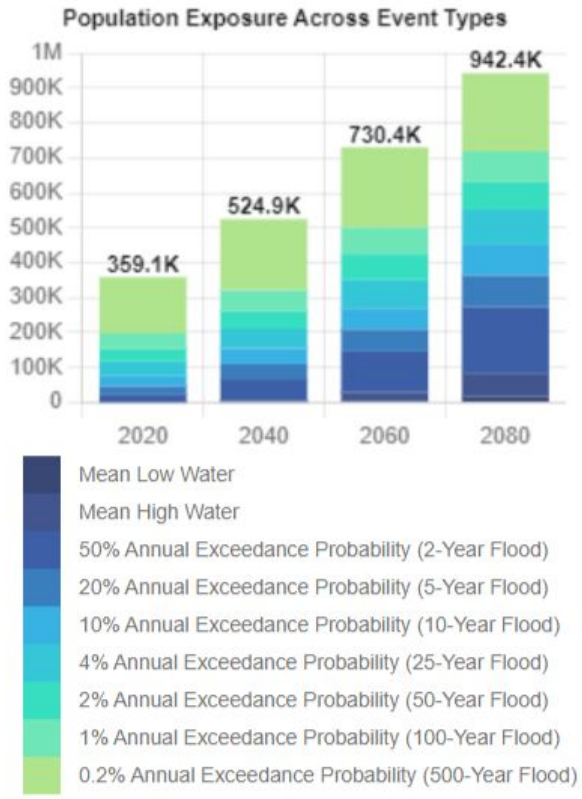
Acres of Land Area Inundated Across Flood Event Type

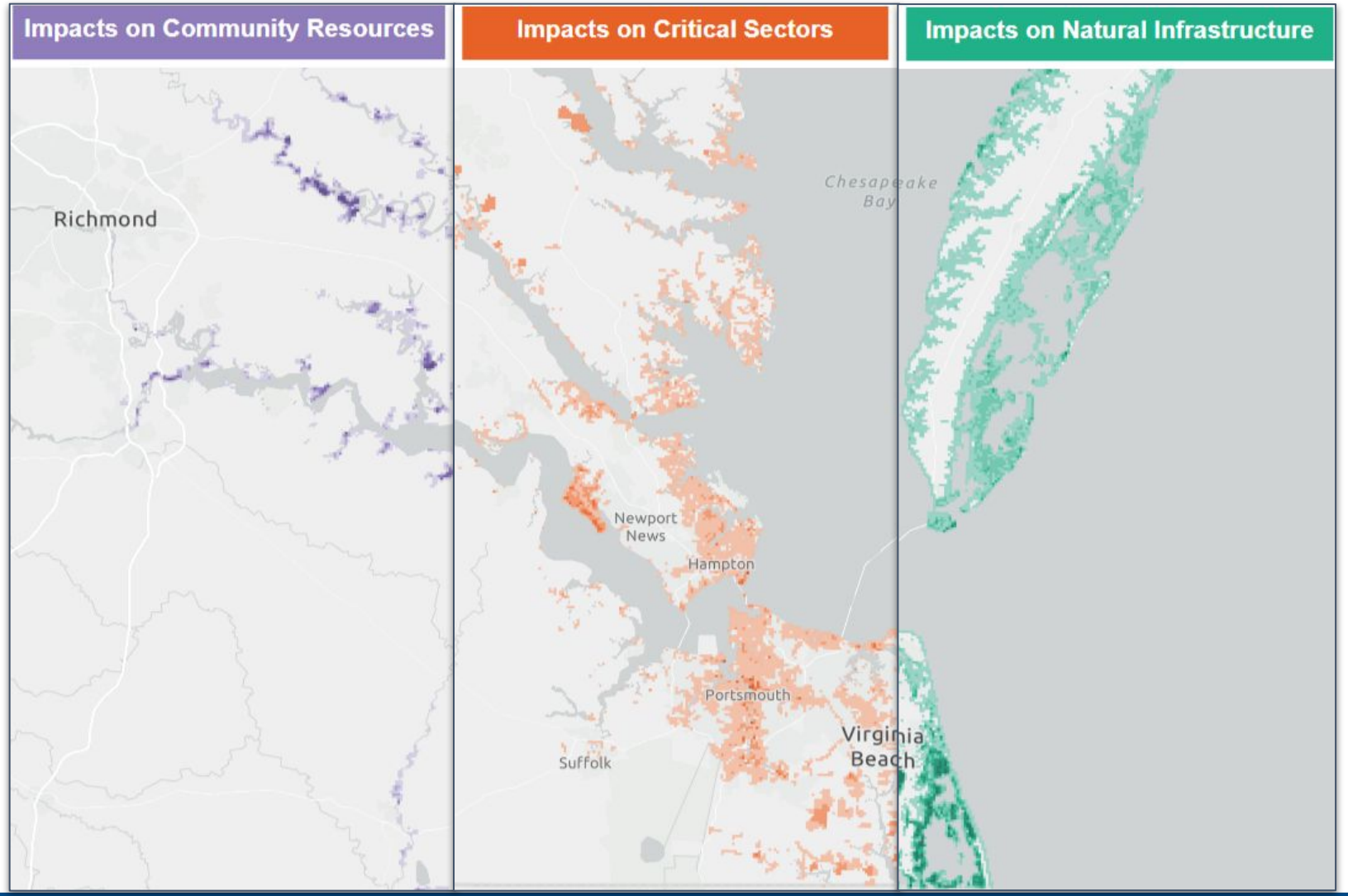


- Mean Low Water
- Mean High Water
- 50% Annual Exceedance Probability (2-Year Flood)
- 20% Annual Exceedance Probability (5-Year Flood)
- 10% Annual Exceedance Probability (10-Year Flood)
- 4% Annual Exceedance Probability (25-Year Flood)
- 2% Annual Exceedance Probability (50-Year Flood)
- 1% Annual Exceedance Probability (100-Year Flood)
- 0.2% Annual Exceedance Probability (500-Year Flood)

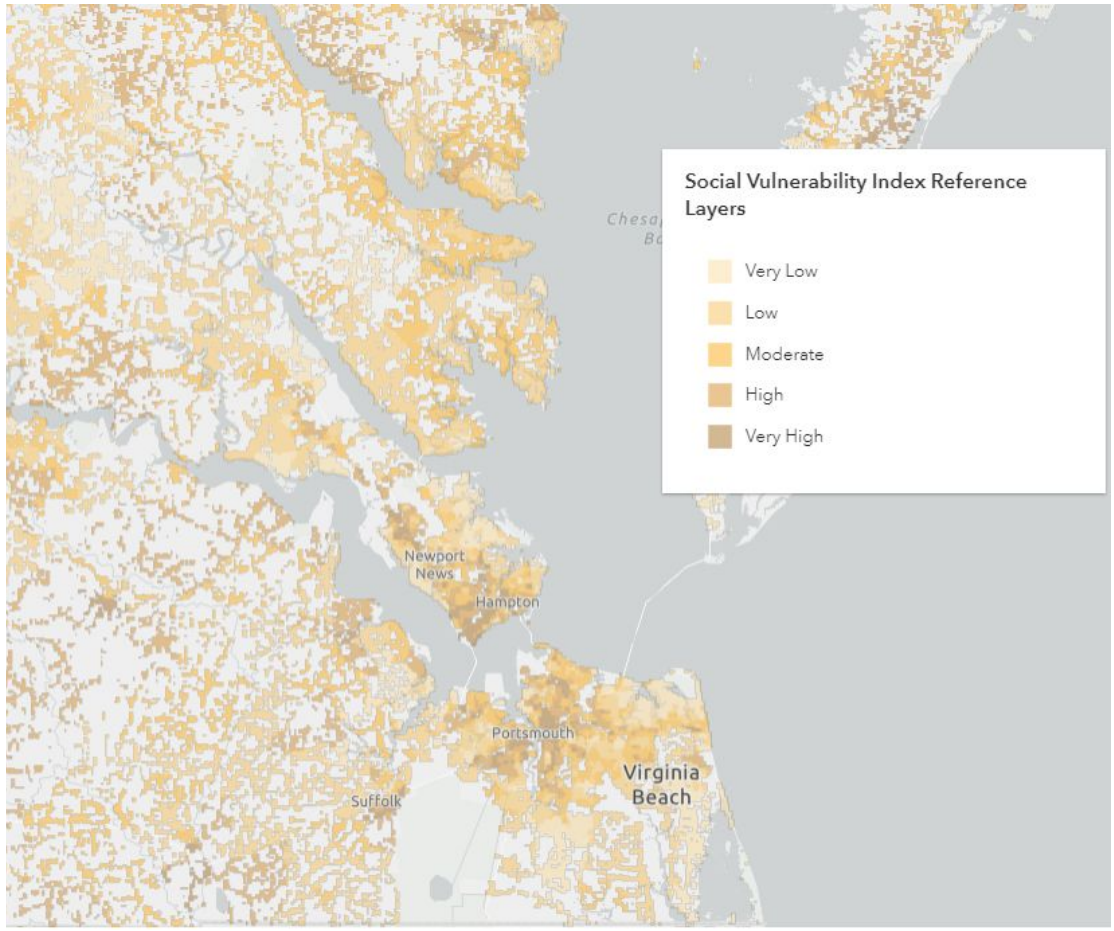


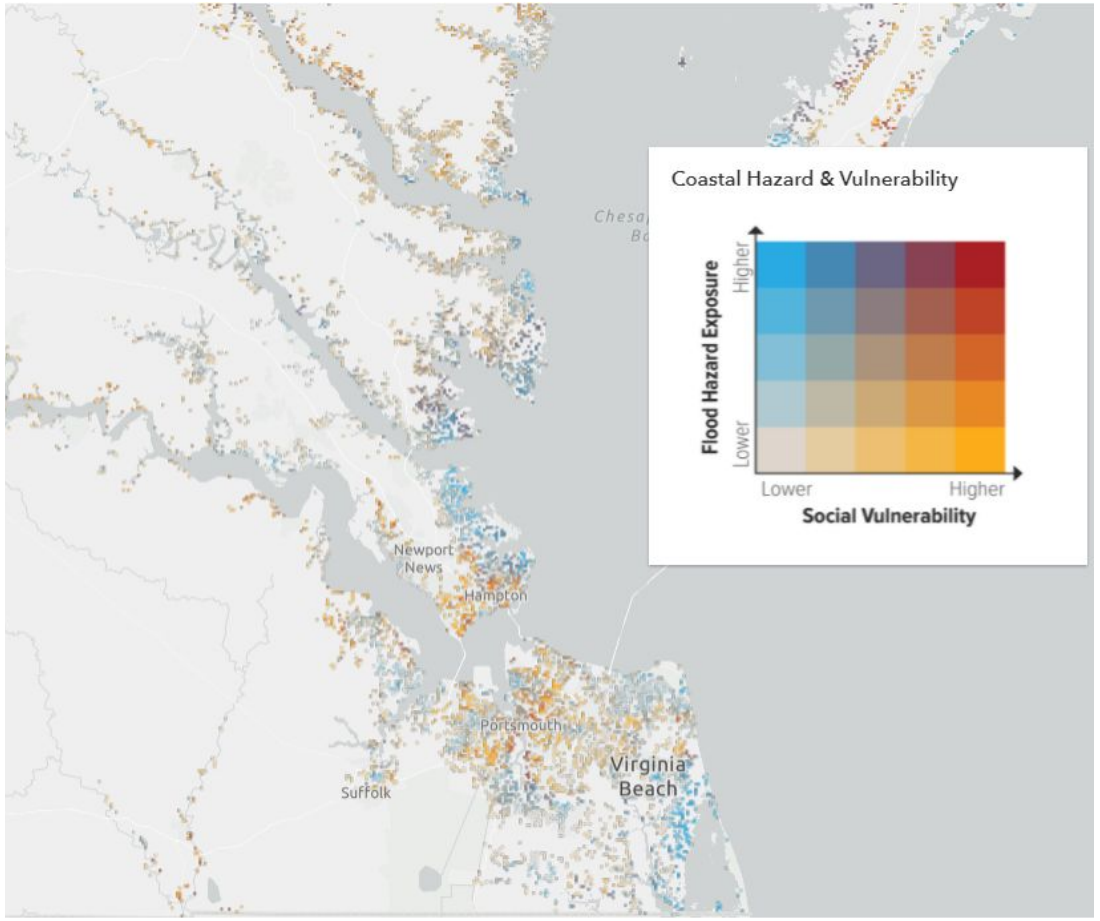
Flood Hazard Impacts



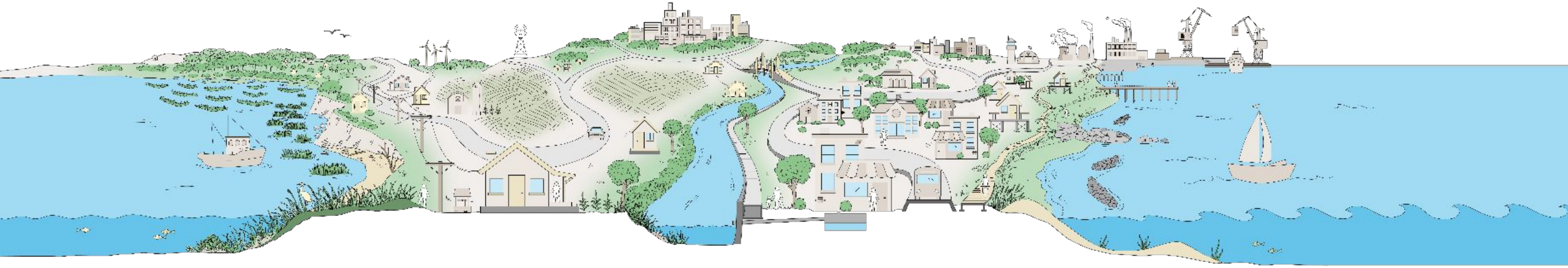


Community Context





What We're Doing About It



Building Coastal Resilience

Select Area of Interest:

Commonwealth | Virginia

Filters:

Category: All

Hazard Addressed: All

Project Class: All

Reset All Filters & Map

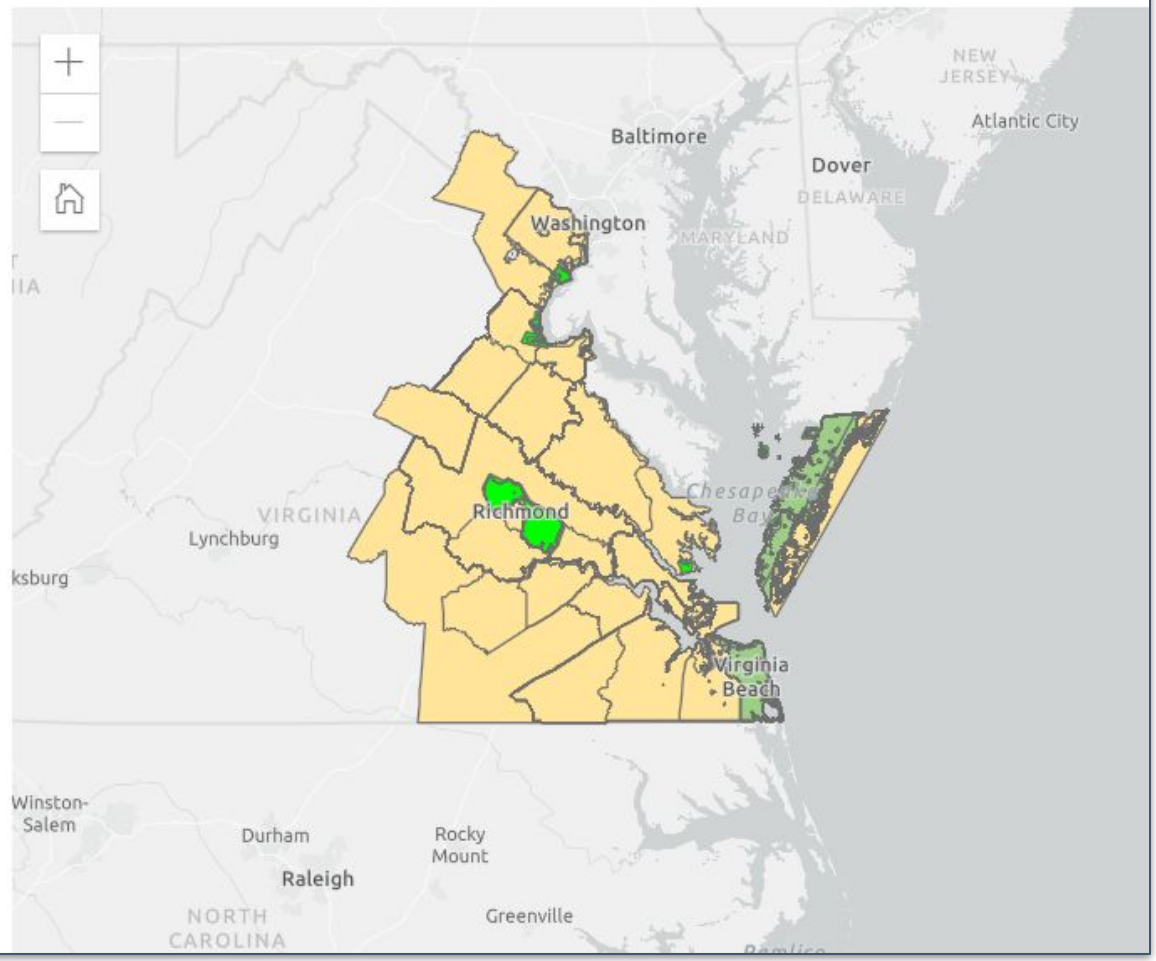
Additional Map Layers: Clear Map Layers

- Coastal Floodplains +
- Community Resource Impact Areas +
- Critical Sector Impact Areas +
- Natural Infrastructure Impact Areas +
- Coastal Hazard and Social Vulnerability +

Search: Clear

Projects and Initiatives (Features: 517, Selected: 0)

Name
18th Street Drainage Improvements
1. Crow's Nest Peninsula and Estuary Conservation
2019 FMA
5th Street Improvements
Aberdeen Gardens Drainage Improvements
Aberdeen Road Disconnect Wet Pond
Aberdeen School Neighborhood Park ED Wetland Retrofit
Amherst Road Wetlands
Annual Coastal Bays seagrass restoration
Appomattox River Trail (blueway and greenway)
Aquatic Center Parking Lot
Aquisition of LiDAR Data
Aragona Drainage Improvements



Funding Coastal Resilience

VA Funding for Projects (Features: 96, Selected: 0)

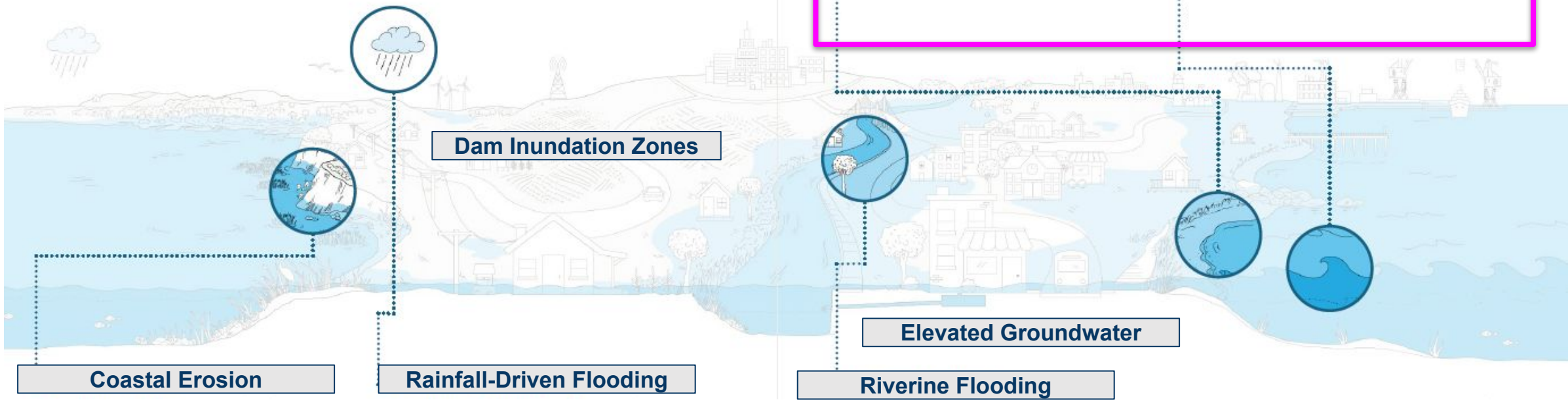
Name	Administering Office	Funding Source	Funding Type	Purpose
Addressing the Impacts of Multiple Stressors on Shellfish Aquaculture Through Research/Industry Partnerships	National Oceanic and Atmospheric Administration (NOAA) Oceanic and Atmospheric Research	NOAA	Federal	Supports: establishing, continuing, and/or expanding collaboration between researchers and shellfish growers in order to st address how acidification and at least one other environmental stressor affects the U.S. shellfish aquaculture industry. Projec multiple parameter physical, chemical, or biological observing systems and/or conduct multiple stressor experimental resea priorities of this funding opportunity are to (1) build or strengthen relationships between the shellfish aquaculture industry a aquaculture research community (including university, industry, private sector, tribal, state, and/or federal scientists represen perspectives), (2) develop scientific knowledge on the impact of ocean and coastal acidification in combination with other st shellfish aquaculture, and (3) create data products, tools, technologies, management practices, or other deliverables that are applicable to building resilience within the shellfish aquaculture sector.
Building Resilience Against Climate Effects: Implementing and Evaluating Adaptation Strategies that Protect and Promote Human Health	National Center for Environmental Health	CDC	Federal	Supports: the building and enhancement of the resilience of U.S. cities and states to the health impacts of climate change th overarching strategies. These strategies include 1) collaboration with stakeholders to create a Climate Impact Compendium data on local climate projections, health effects, social determinants of health, and current adaptive capacity; 2) implementa evaluation of adaptation actions that address the threats identified in the Compendium; and 3) use and dissemination of eva to improve adaptation actions and enhance understanding of effective climate resilience adaptations in public health and re
Bureau of Indian Affairs (BIA) Tribal Climate Resilience Program	Department of Interior, Bureau of Indian Affairs (BIA), Trust Services, Tribal Climate Resilience Program	BIA	Federal	Supports: tribal resilience and ocean and coastal management and planning. The Tribal Climate Resilience Program support prepare for climate change impacts on tribal treat and trust resources, economies, infrastructure, and human health and safe of Available Funding: - Adaptation planning - Ocean and Coastal Management Planning - Capacity Building - Relocation, Ma or Protect-in-Place Planning - Internships and Youth Engagement

What's Next

Tidal Flooding

Storm Surge Flooding

Virginia Coastal Resilience Master Plan
Phase One, December 2021



Dam Inundation Zones

Coastal Erosion

Rainfall-Driven Flooding

Elevated Groundwater

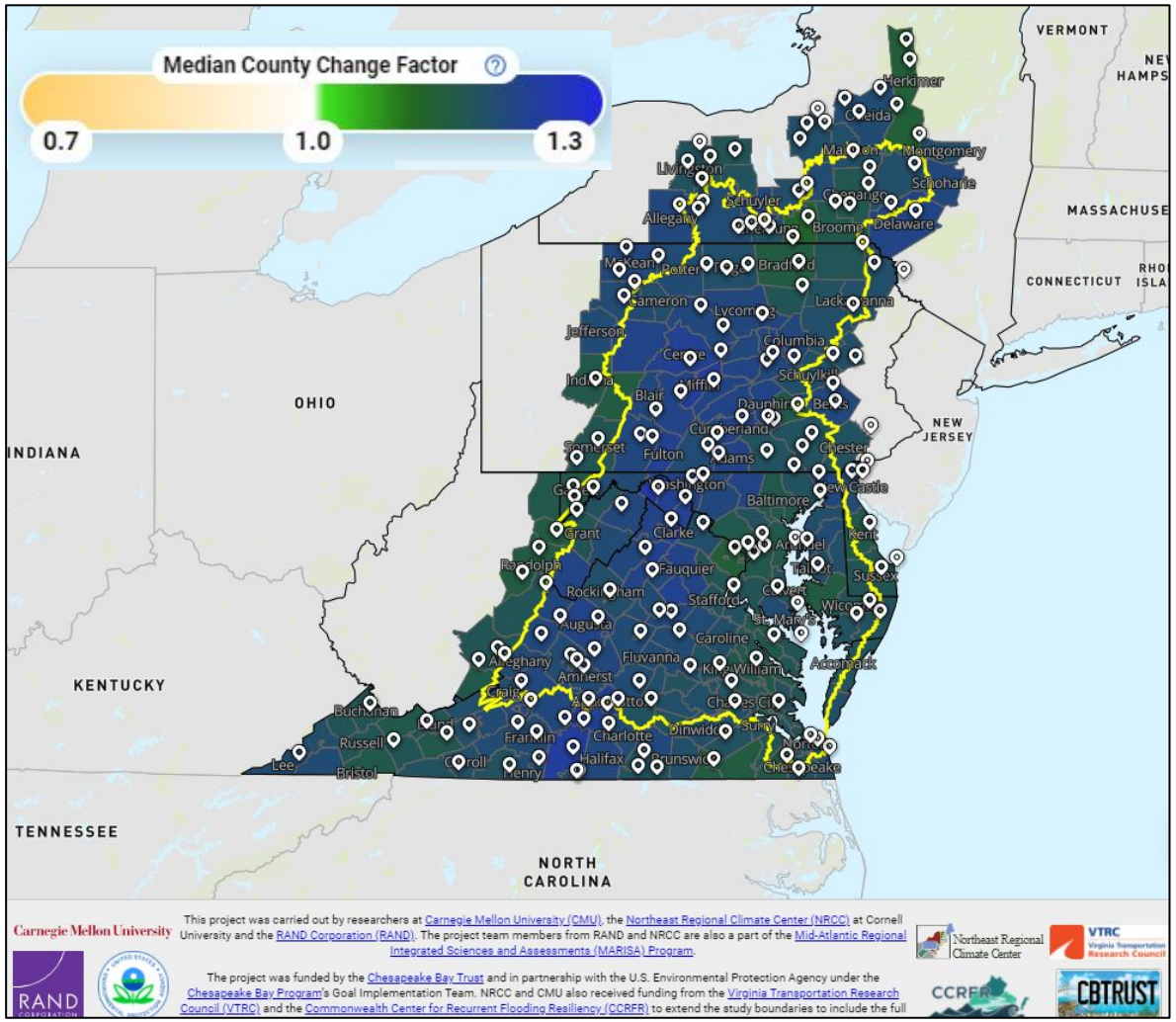
Riverine Flooding

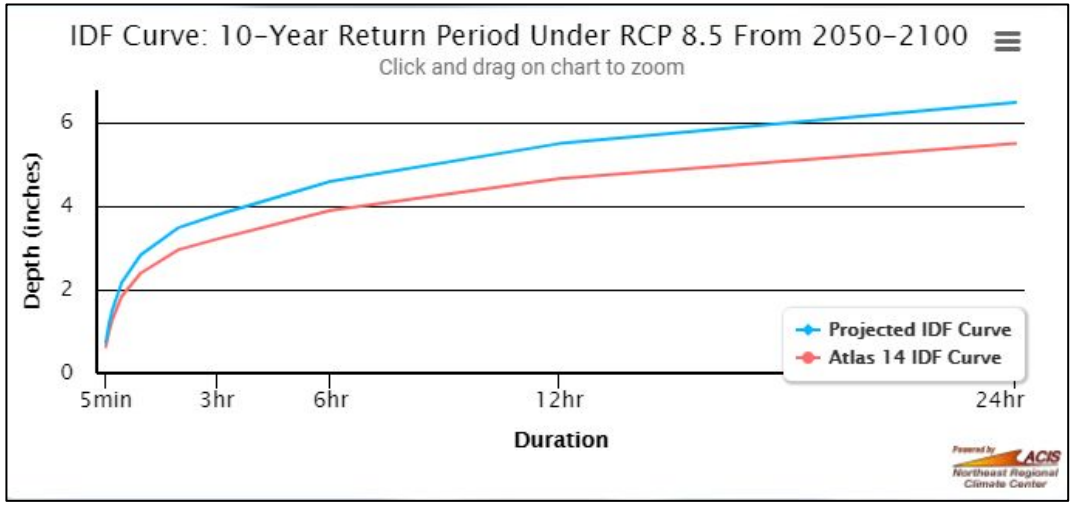
Compound Flooding

Master Plan Centralized Survey Results
Flood Hazard Priority by Master Planning Region

Hampton Roads (HRPDC)	Rural Coastal (NNPDC, MPPDC, A-NPDC)	Fall Line South (Crater PDC, PlanRVA)	Fall Line North (NVRC, GWRC)
1. **Rainfall-Driven Flooding**	1. **Rainfall-Driven Flooding**	1. **Rainfall-Driven Flooding**	1. **Rainfall-Driven Flooding**
2. Storm Surge Impacts	2. Tidal Flooding	2. Riverine Flooding	2. Riverine Flooding
3. Tidal Flooding	3. Coastal Erosion	3. Tidal Flooding	3. Coastal Erosion
4. Riverine Flooding	4. Storm Surge Impacts	4. Storm Surge Impacts	3. Tidal Flooding
5. Coastal Erosion	5. Groundwater Impacts	5. Coastal Erosion	5. Storm Surge Impacts
6. Groundwater Impacts	6. Riverine Flooding	6. Groundwater Impacts	6. Groundwater Impacts

Rainfall-Driven Flooding





NORFOLK INTL AP

Atlas 14 Change Factors for Norfolk City:

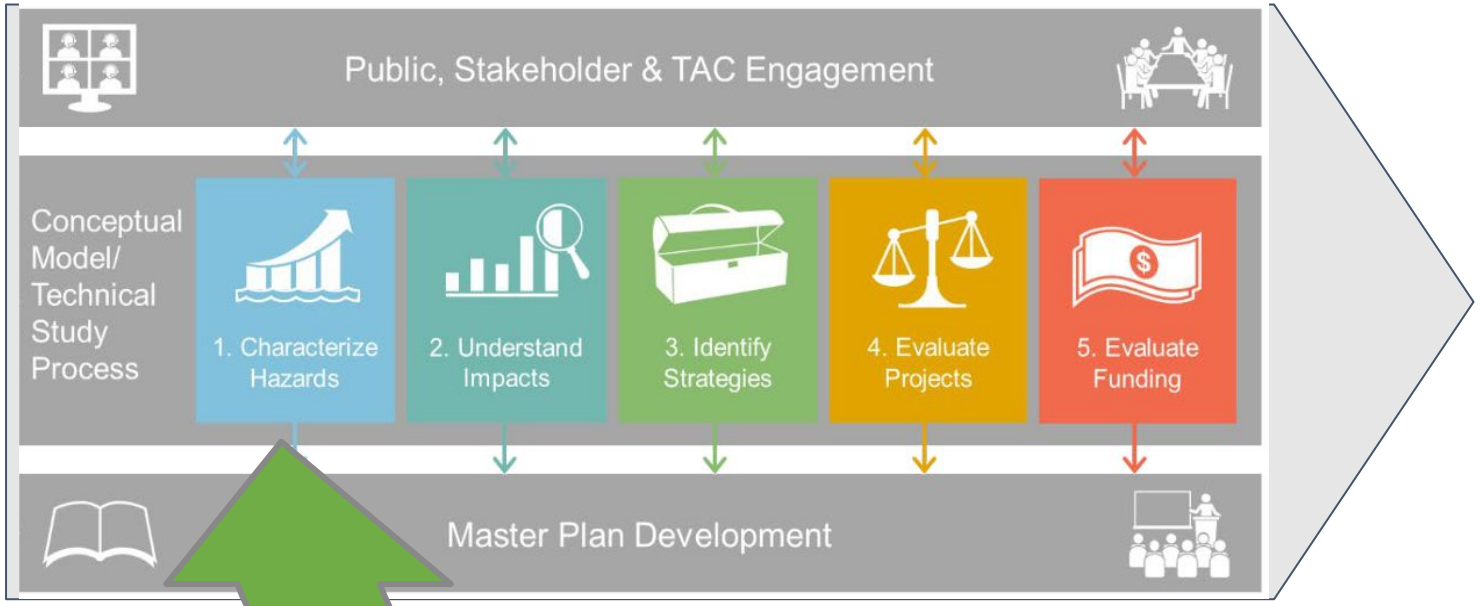
10th Percentile:	1.01
25th Percentile:	1.09
Median:	1.18
75th Percentile:	1.34
90th Percentile:	1.41

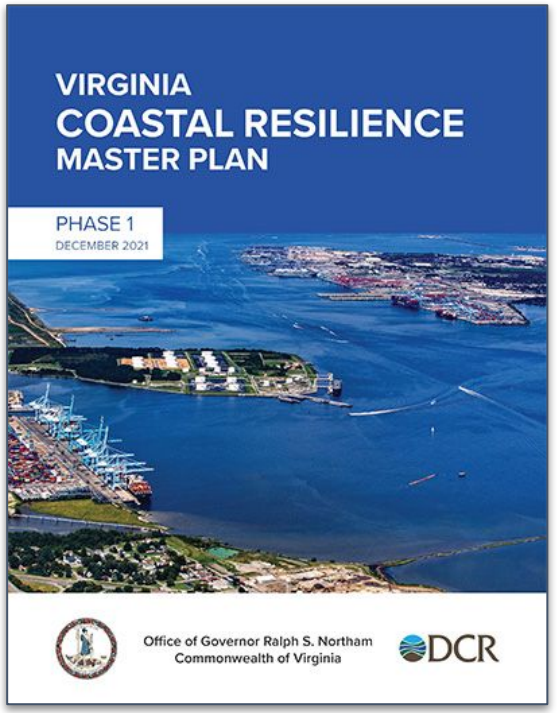
See "Using the Data" above for correct and incorrect application of these change factors.

https://midatlantic-idf.rcc-acis.org/

DCR
Virginia Department of Conservation & Recreation

Adaptive Program Management





Learn and Improve

QUESTIONS

Website:

dcr.virginia.gov/crmp/

Email Questions or Comments to:

Flood.Resilience@dcr.virginia.gov