RECOMMENDATIONS TO THE SECURE COMMONWEALTH PANEL ON THE ISSUE OF SEA LEVEL RISE AND RECURRENT FLOODING IN COASTAL VIRGINIA

SUBMITTED TO THE HONORABLE BRIAN MORAN
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BY THE RECURRENT FLOODING SUB-PANEL

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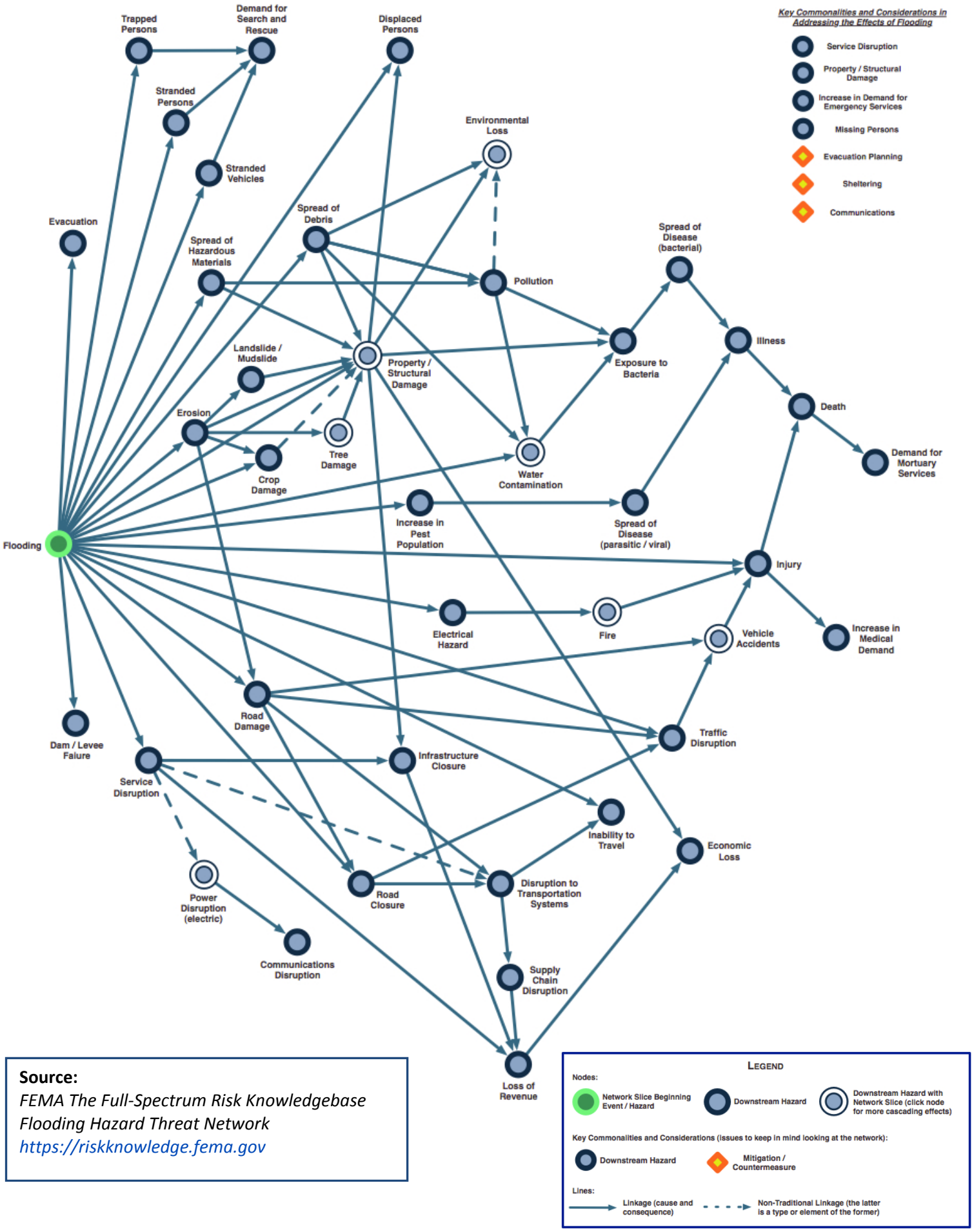

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EXECUTIVE SUMMARY

The purpose of this report is to provide strategic and tactical recommendations for how the Commonwealth can respond and otherwise adapt to the threat of recurrent flooding and sea level rise. Accepting these as threats like any other for which the Commonwealth plans, the document builds on the recommendations posed by the College of William and Mary's Virginia Institute of Marine Science (VIMS) in its 2012 General Assembly chartered report, *Recurrent Flooding Study for Tidewater Virginia.* Additional analysis into which tools, authorities, initiatives and resources already exist, what actions can be taken, and how to bring it all into one effective united effort illustrates a path forward to address the unique impacts of flooding and sea level rise.

Working together to develop these recommendations is not only promising, but evidence what we are capable of turning challenge into opportunity. It is also evident that when we work together, Virginia can overcome any obstacle.

RECOMMENDATIONS AT A GLANCE:

- Work closely with Virginia's Congressional Delegation to effect change at the Federal level, to better assist or otherwise ease the burden on the state, regions and localities, and to solicit federal support to realistically address flooding and Sea Level Rise. Six specific issues involve:
    - Housing and Urban Development (HUD)
    - Federal Emergency Management Agency (FEMA)
    - Office of Management and Budget (OMB)
    - National Oceanic and Atmospheric Administration (NOAA)
    - The need for local resources (i.e. GIS and modeling) to be considered for in-kind credit for federal grants.
    - The ability of localities to rely on the stronger Virginia bonding capacity and its favorable interest rates.
- Utilize the National Incident Management System, and more specifically, establish an Incident Command System structure-style management structure inclusive of all primary and support agencies to manage the effort at the State level.
    - Identify the appropriate executive leader to serve as the "Incident Commander" or "Resilience Coordinator"
    - To help ensure a Whole Community approach, leverage the U.S. Army Corps of Engineer Silver Jackets program as well as the Virginia Sea Grant to facilitate coordination among agencies of all sectors and levels of government.
- Establish a Four Year "Incident Action Plan" or "Flood Resilience Action Plan" with specific, measurable and attainable goals and objectives to be adopted by Executive Order or General Assembly
    - Communicate the Action Plan through the existing Floodplain Management Plan for the Commonwealth of Virginia

    - Accept the VIMS proposed 1.5 feet as the minimum and immediate level to which the Commonwealth should plan for Sea Level Rise; use the U.S. Corps of Engineer's Sea Level Rise Calculator for scenario planning.
- The Commonwealth should identify or establish a fund to assist localities and regions meet their match requirements and otherwise assist them with the costs of adaptation planning.
- Develop a directory of funding sources and their goals, priorities, etc. for inclusion in the Flood Resilience Action Plan; Conduct a "Finance Section" meeting with all funding source organizations to discuss most effective way to leverage such assistance.
- Establish a Single Point of Reference for reliable information (based on rigorous quality checks) on which to access consistent, timely and accurate information.
- Establish strategy to collect and maintain LiDAR (Light Detection and Ranging) for the Commonwealth in conjunction with NOAA and other federal agencies. (http://oceanservice.noaa.gov/facts/lidar.html)
- Conduct a more accurate vulnerability assessment throughout the Commonwealth (also necessary for hazard mitigation planning), working with the Army Corps of Engineers, Virginia Department of Conservation and Recreation, and localities to update local HAZUS planning data (make requirement for funding eligibility)
- Recommend FEMA Special Flood Hazards Area be reassessed
- Develop and implement a Post-Incident Data Collection Plan. Deploy volunteers, damage assessment teams, low-cost sensors and community (via social media) to capture high water data and marks.
- Leverage Social Media and Crowdsourcing Technology such as Wetlands Watch's Sea Level Rise App and the Virginia Department of Emergency Management's ReadyVirginia App.
- Develop project and resource prioritization criteria
- Develop funding eligibility criteria
- Have projects / designs / applications prepared in advance for potential, unannounced, short-fused funding opportunities.
- Establish communication / information sharing plans and coordinate outreach materials - all using the same information and/or consolidating into one effort.
- Consider modification to Real Estate disclosures to include flood-related damages
- Invest in the education of Virginia's youth and college graduates – the Commonwealth's future scientists and planners.
- Schedule cross-discipline training to ensure consistency and awareness among various departments, agencies, organizations and associations; tie them to continuing education credits.
- Maintain a comprehensive website with not only access to all flood-related materials, plans and resources, but a list of all past, current and proposed flood mitigation projects.
- Rely on the creativity of the entire Commonwealth through challenges, competitions and hackathons.

INTRODUCTION

As detailed in Virginia's Homeland Security Strategic Plan (2006), the Commonwealth's Vision is a "Virginia where its communities, businesses and government are safe, secure and prepared." Likewise, at the Federal level, the Vision for the National Preparedness Goal is "a nation prepared with coordinated capabilities *to prevent, protect against,* respond to, and recover from *all hazards* in a way that balances risk with resources and need" [emphasis added]. As such, steps must be taken to effectively and efficiently respond to Virginia's highest probability / highest impact hazard: Recurrent Flooding and Sea Level Rise.

Sea Level Rise is real. It is as real a threat as all other threats for which Virginia plans. Natural and human-caused incidents – from terrorism to tornados to hurricanes - all have a level of risk, probability and impact. Flooding and Sea Level Rise are the most probable as they are already occurring. The geographic extent of the impact, and the potential and perpetual loss of land and revenue, touch the entire coast of the Commonwealth and beyond. The breadth of impact among localities, individual homeowners, the environment, businesses, the economy and national security is staggering. Fortunately, Virginia is blessed with many engaged stakeholders and partners – among agencies, educators and champions with enormous amounts of expertise and resources. If brought together in unity of effort, Virginia can achieve an acceptable level of protection and effective strategies to adapt and live responsibly with the water.

In an effort to address the severe issue of Recurrent Flooding, the Virginia General Assembly commissioned William and Mary's Virginia Institute of Marine Science (VIMS) to conduct a study on the topic, including the cause and resulting threat to the Commonwealth.

> *Per Virginia Code, § 28.2-1100, VIMS is charged with a variety of research responsibilities, including:*
>
> > *8. Engage in research and provide training, technical assistance and advice to the Board of Conservation and Recreation on erosion along tidal shorelines, the Soil and Water Conservation Board on matters relating to tidal shoreline erosion, and to other agencies upon request; and*
> >
> > *9. Develop comprehensive coastal resource management guidance for local governments to foster the sustainability of shoreline resources by December 30, 2012. The guidance shall identify preferred options for shoreline management and taking into consideration the resource condition, priority planning, and forecasting of the condition of the Commonwealth's shoreline with respect to projected sea-level rise.*

Based on this report, the Secure Commonwealth Panel included the threat of Recurrent Flooding and Sea Level Rise into its threat matrix, and thus instituted a Recurrent Flooding Sub-Panel to consider the VIMS recommendations and apply additional tactical considerations in order to turn conceptual ideas into actionable policy recommendations.

This work of the Sub-Panel is an example of Virginia coming together, in unity of effort, to combat the very real threat of recurrent flooding. Agencies from all sectors and various levels of government engaged on the issue, offering ideas and recommendations and otherwise leveraged valuable time, tools and resources. The end result is not only ways to combat or adapt to the threat, but opportunities identified to work better together and more efficiently toward a stronger Virginia.

BACKGROUND

VIMS Recurrent Flood Study

During the 2012 legislative session, the General Assembly and Virginia Senate passed, with Governor McDonnell signing, House Joint Resolution 50 and Senate Joint Resolution 76, 2012. This charged VIMS with completing an examination of the overall issue of Recurrent Flooding and Sea Level Rise in the Tidewater Region (note: this Recurrent Flooding study addresses all localities in Virginia's coastal zone – p. vi). The Virginia General Assembly requested that in conducting its study, VIMS should:

- review and develop a comprehensive list of ideas and examples of strategies used in similar settings around the United States and the world;
- convene a stakeholder advisory panel for the purpose of discussing and assessing the feasibility of employing these strategies in Tidewater and Eastern Shore Virginia; and offer specific recommendations for the detailed investigation of preferred options for adapting to relative sea-level rise. (VIMS Report, Executive Summary, pg. vi)

The VIMS report, completed and submitted to the General Assembly in January 2013, identifies Recurrent Flooding issues, examines predictions for future flooding challenges and evaluates a global set of adaptation strategies for reducing the impact of flood events. Specifically, the report found that:

- Recurrent Flooding is a significant issue in Virginia coastal localities and one that is predicted to become worse over reasonable planning horizons (20-50 years).
- The risks associated with Recurrent Flooding are not the same throughout all areas of Tidewater Virginia.
- Data are often lacking for comprehensive and/or fine resolution analysis of flood risks in the region
- Review of global flood and Sea Level Rise management strategies suggests that it is possible for Virginia to have an effective response to increasing flood issues BUT it takes time (20-30 years) to effectively plan and implement many of the adaptation strategies.

(VIMS Recurrent Flooding Study, Exec Summary, p. vi).

Furthermore, "The advisory panel felt strongly that Virginia localities are not adequately empowered to address the issues through policy and management actions, and localities do not

have the necessary financial resources for many accommodation or protection strategies." (p. vii)

Virginia Secure Commonwealth Panel

The VIMS report and its findings were presented to the Secure Commonwealth Panel on May 6, 2013. The Panel exists in Virginia Code (§ 2.2-233, Section B.) to "monitor and assess the implementation of statewide prevention, preparedness, response, and recovery initiatives and where necessary to review, evaluate, and make recommendations relating to the emergency preparedness of government at all levels in the Commonwealth. Additionally, the Panel shall facilitate cabinet-level coordination among the various agencies of state government related to emergency preparedness and shall facilitate private sector preparedness and communication. The Panel shall make quarterly reports to the Governor concerning the state's emergency preparedness, response, recovery, and prevention efforts." (*http://leg1.state.va.us/cgi-bin/legp504.exe?000+cod+2.2-233).* As a result of this presentation, the Panel accepted the charge and then initiated a Recurrent Flooding Sub-Panel, to be Co-Chaired by two Secure Commonwealth Panel members: the Honorable John Watkins (Senator, 10th District) and Mr. Jim Redick (Director, City of Norfolk Emergency Preparedness and Response).

Point of clarification: The nature of the recurrent flooding threat was identified in the VIMS report among numerous other flood insurance studies, hazard mitigation plans, and Corps of Engineers reports. Therefore there was no charge to discuss *why* Recurrent Flooding and Sea Level Rise are occurring. The studies have been done and the threat is real. The purpose of the Sub-Panel was to develop comprehensive strategy recommendations based on the VIMS recommendations.

Sub-Panel Participation / Presidential Policy Directive #8 (PPD-8)

The Recurrent Flooding Sub-Panel was committed to looking from within to tap the talents, skills, perspectives and resources throughout Virginia and her partners, and thus took a "whole community approach." Focus was on unity of effort. Further, the Sub-Panel's vision was an action-oriented approach, facilitating effective, efficient, timely and ongoing prevention, mitigation, preparedness and response measures to establish proactive and defendable recommendations based on current science.

THE PROCESS

Virginia is richly blessed with an impressive array of impassioned and renowned experts spread throughout various sectors and levels of government. After a considerable amount of research by the Sub-Panel Co-Chairs, the initial findings were posted to an Alfresca document sharing site. There, the experts were encouraged to review the materials collected, offer corrections or recommendations for inclusion to help ensure a comprehensive and accurate starting point for Sub-Panel meeting discussions.

Because of overlapping VIMS recommendations and to respect the time of the participants, the Sub-Panel felt the best way to organize was to establish a panel of executive leaders at the State level to set the tone and priorities, along with the following workgroups comprised of industry leaders and technical experts. These groups, the dates they met and the locations are as follows:

Sub-Panel of State Executive Leadership
September 25, 2013 @ House 1, VA State Capitol, Richmond
November 25, 2013 @ VA War Memorial, Richmond

Foundations Workgroup – Process & Policies
February 17, 2014 @ William and Mary Law School
April 10, 2014 @ Old Dominion University
June 13, 2014 @ Virginia EOC (Richmond)

Data / Mapping Workgroup
February 5, 2014 @ NOAA CO-OPS (Chesapeake)
April 2, 2014 @ Virginia Institute of Marine Science
June 9, 2014 @ Army Corps of Engineers – Norfolk Office

Outreach and Education Workgroup
April 1, 2014 @ George Mason University
June 11, 2014 @ William and Mary Law School

Sub-Panel Co-Chair Jim Redick facilitated the workgroup meetings to ensure adequate content focus and to carry questions and concerns discussed in one group to another as appropriate. Along with the meetings, there were numerous conversations, phone calls and email exchanges in an effort to contribute toward this report and its recommendations.

Legal Aspects Workgroup
It is important to note that workgroup was also established to consider the legal aspects of Sea Level Rise adaptation, comprised of Ms. Cathie Hutchins of the Virginia Attorney General's Office, Director Shana Jones and Fellow Mary-Carson Stiff of the William and Mary Law School's Virginia Coastal Policy Clinic. The need for legal research and guidance occurred in most all workgroup meetings; therefore, rather than meeting independently of the aforementioned workgroups, Ms. Jones and Ms. Stiff attended most all the workgroup meetings.

Community Rating System
FEMA's National Flood Insurance Program (NFIP) has a Community Rating System (CRS) which rewards participating localities for their flood management and mitigation action beyond the minimum standards. This reward then trickles to the individual policy holders in a community with decreases in their insurance premiums. As such, the Sub-Panel was also focused on capturing all Community Rating System (CRS) points available through various state recommendations/actions which would benefit participating localities' CRS ratings. Ms. Shannon Hulst of Wetlands Watch was instrumental in this review and analysis.

The initial draft of the report was posted on August 8, 2014 on the City of Norfolk's Emergency Preparedness and Response website at http://www.norfolk.gov/index.aspx?NID=2955 where the document was accessed over 120 times. The revised version was posted again on August 27 with a deadline for comments of September 3, 2014.

The report was officially delivered and presented to the Honorable Brian Moran, Secretary of Public Safety and Homeland Security and Chair of the Secure Commonwealth Panel, on September 5, 2014.

THE PLANS

It was quickly discovered that there are plethora of documents which exist on this topic. However, those documents to which the Sub-Panel looked for consistency, and to leverage the work which had been completed prior to this effort as follows:

2008 Governor's Commission on Climate Change Report

The issue of Recurrent Flooding has proven to be an ongoing threat spanning multiple administrations. Then-Governor Timothy Kaine chartered and led a Commission on Climate Change ("*Final Report: A Climate Change Action Plan*," December 2008) which found the impacts of Sea Level Rise to the Commonwealth could include:

- a serious threat to roads, railways, ports, utilities and other critical infrastructure.
- Impact to national security, as several major military installations are located in low-lying areas.
- Insurance rates could continue to increase along coastal areas and the availability of insurance could become an increasing problem.

The 2008 Commission's specific recommendations appropriate for this report include the following:

- Direct all Commonwealth agencies to adopt preparedness and resilience plans
- Create an assistant to the Governor for Climate Change Preparedness
- Foster federal, state and local cooperation on preparedness and resilience (industry too)
- Require Sea Level Rise be addressed in transportation planning and funding decisions
- Require Planning District Commissions in Coastal Virginia to adopt preparedness and resilience plans.
- Require Sea Level Rise be addressed in all local infrastructure plans in Coastal Virginia for which the Commonwealth provides funding.
- Grant the State Corporation Commission authority to mandate preparedness and resilience standards for privately owned critical infrastructure
- Understand the impact of changes in the National Flood Insurance Program to ensure local governments have the authority and tools they need to adapt.
- Encourage all local jurisdictions in Coastal Virginia to achieve Community Rating System level 8 or better – and provide the support they need to accomplish this.
- Complete LiDAR mapping and incorporate into GIS standardized across Coastal Virginia.

Many of the recommendations from this group will be seen again throughout this report.

U.S. Army Corps of Engineers North Atlantic Coast Comprehensive Study (NACCS, aka "Sandy Comprehensive Plan")

A post-Hurricane Sandy requirement of the U.S. Army Corps of Engineers (USACE), in accordance with Public Law 113-2, is to "conduct…a comprehensive study to address the flood risks of vulnerable coastal populations in areas impacted by Hurricane Sandy within the boundaries of the North Atlantic Division of the United States Army Corps of Engineers" (p. 127 Stat. 5). "Conducted in coordination with other Federal agencies, and state, local, and tribal officials to ensure consistency with other plans to be developed, as appropriate" (NACCS: Virginia, p. 86).

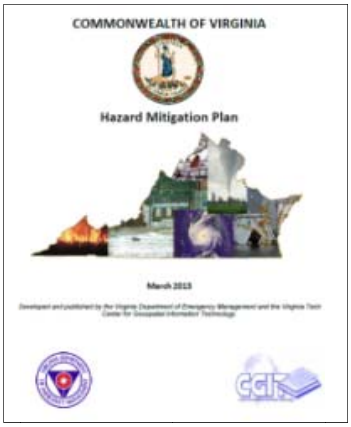
The Goals of the NACCS are to:

- Provide a risk reduction framework, consistent with U.S. Army Corps of Engineers (USACE) and National Oceanic Atmospheric Administration (NOAA) Rebuilding Principles; and
- Support resilient coastal communities and robust, sustainable landscape systems, considering future Sea Level Rise and climate change scenarios, to reduce risk to vulnerable populations, property, ecosystems, and infrastructure (NACCS: Main Report, Executive Summary, p. v)

It provides

- An analysis of Sea Level Rise scenarios
- Significant closure of data gaps
- The identification of activities and areas warranting further analysis, and
- The identification of institutional and other barriers (Main report, p. 3).

It does *not* include project-specific recommendations (Main: p. 1).

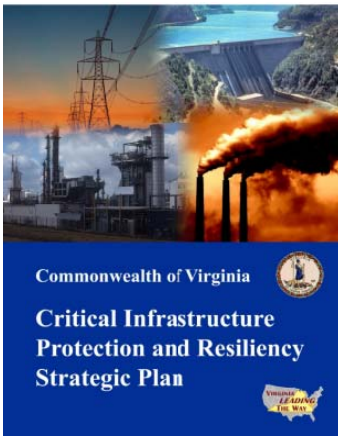


Commonwealth of Virginia Hazard Mitigation Plan

In accordance with the Disaster Mitigation Act of 2000, States – as well as regions or localities – must maintain a Hazard Mitigation Plan in order to be eligible for mitigation grant funds. Primary components of this plan is the identification of hazards for which the community faces, a vulnerability assessment and goals and objectives to minimize or eliminate the threat(s). Virginia is in good standing with this requirement, with the latest version of the plan approved in 2013. The issues and recommendations included in this report will be labeled throughout this report accordingly to bring attention to potential resolutions in the mitigation plan.

Best Practice – Some localities include private sector partners in their mitigation planning efforts, or at the very least shared their hazard identification / risk assessments with their partners to ensure a unified awareness of the hazards facing their community.

Virginia Critical Infrastructure Protection & Resiliency Strategic Plan (Virginia Plan)



Central to the mission of the Commonwealth of Virginia is ensuring that communities, businesses, and government are safe, secure, and prepared. Pivotal to the success of this mission is the ability to protect the Critical Infrastructure (CI) and Key Resources (KR) of the Commonwealth. The focus of the *Virginia Critical Infrastructure Protection & Resiliency Strategic Plan* (here for referred to as the "VA Plan") is the enhancement of CIKR protection and resiliency to ensure that essential governmental missions, state services, and economic functions are maintained in the event of a terrorist attack, natural disaster, or other type of significant incident. (p. iii).

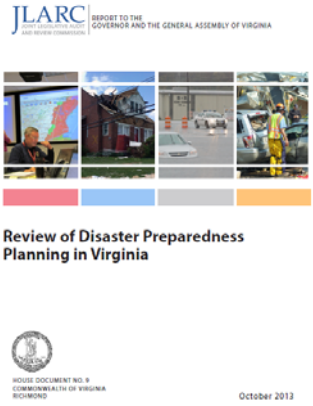
The Virginia Plan Supports the National Infrastructure Protection Plan (NIPP) by establishing a coordinated approach to national priorities, goals, and requirements for critical infrastructure and key resources protection. It requires the development of Sector Specific Plans (SSPs) to provide the means by which the NIPP is implemented across all critical

infrastructure and key resources sectors, as well as a national framework for each sector to address its unique characteristics and risk landscape.

Infrastructure Sectors are as follows:

Chemical
Commercial Facilities
Communications
Critical Manufacturing
Dams
Defense Industrial Base
Emergency Services
Energy
Financial Services
Food and Agriculture
Government Facilities
Healthcare and Public Health
Information Technology
Nuclear Reactors, Materials and Waste
Transportation
Water and Wastewater Systems

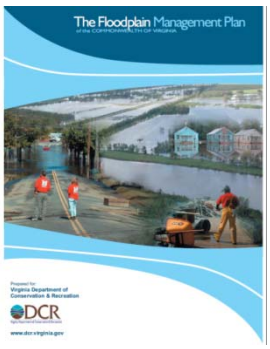
Joint Legislative Audit and Review Commission (JLARC): *Review of Disaster Planning in Virginia (October 2013)*



This document identifies the need and opportunities to adopt smart practices in disaster planning. It also suggests "All levels of government as well as private organizations and citizens share responsibility for disaster preparedness and play a role in responding to disasters." (p. 1).

One significant reference in the JLARC report is the Secure Commonwealth Strategic Plan and Virginia's Preparedness Priorities and Goals (p. 10). These include (and are not limited to):

- Goal 4: Develop information sharing system that includes federal, state, local, volunteer and private partners in support of a comprehensive Common Operating Picture for emergency management applications
- Goal 7: Support Virginia institutions of higher learning as they undertake an all-hazards approach to disaster management
- Goal 8: Increase number of Virginians who are prepared for natural and human-caused emergencies.
- Goal 10: Enhance Critical Infrastructure / Key Resources protection and resiliency to ensure that government missions, state services and economic functions are maintained.
- Goal 15: Enhance inter- and intra-state collaboration to respond to natural and man-made emergencies.



The Floodplain Management Plan of the Commonwealth of Virginia *(~2005)*

The Floodplain Management Plan provides a comprehensive guidance document to federal, state, and local officials in addressing floodplain management issues common to Virginia and to assess the floodplain management needs of the communities in the Commonwealth while establishing strategies, measures, and priorities for meeting those needs. (P. ES-1). This document is undated but makes reference to documents as late as 2005.

THE RECOMMENDATIONS

VIMS RECOMMENDATION:

THE STATE SHOULD REQUEST AN EXPERT REVIEW OF LOCAL GOVERNMENT LEGAL AUTHORITY TO ADDRESS CURRENT AND PROJECTED FLOODING RISKS AND WHAT LEVELS OF EVIDENCE ARE LIKELY TO BE REQUIRED TO JUSTIFY LOCALITY ACTION. THE STATE SHOULD THEN ENACT ANY ENABLING AUTHORITY NEEDED TO ALLOW LOCALITIES TO ADDRESS CURRENT AND PROJECTED FLOODING ISSUES.

"LEGAL AUTHORITY"

To address legal authorities and other issues of legislative importance, the William and Mary Law School's Virginia Coastal Policy Clinic played a pivotal role in researching the issues and providing the Sub-Panel guidance for its recommendations. Under the leadership of then-Program Director Shana Jones, Post-Graduate Fellow Ms. Mary-Carson Stiff conducted and coordinated countless hours of research alongside Mr. Chris Olcott and Ms. Erica Penn. Their recommendations were also shared and discussed with Ms. Cathie Hutchins of the Virginia Attorney General's Office, local City Attorneys, military representatives, and Mr. Henry "Speaker" Pollard, Partner and Environmental Attorney with the law firm of Williams Mullen – all of whom played a key role in raising and discussing legal considerations during workgroup meetings.

Localities obviously play a crucial role adapting to recurrent flooding and sea level rise. To twist former Speaker of the House Tip O'Neill's famous quip: "All *disasters* are local." Some of the most critical and challenging decisions must be made at the local level. While there are many tools available to assist with these decisions, including digital mapping and simulations, questions exist as to those authorities on which local leaders and planners may rely in order to

make meaningful adaptation change. As such, the Sub-Panel's intent was to establish a clear and concise compendium pertaining to the authorities on which localities can base their difficult and challenging decisions.

Dillon Rule Limitations

The Dillon Rule is quite often considered the primary limiting factor to addressing Sea Level Rise; therefore, this was the first topic which the Sub-Panel asked the Virginia Coastal Policy Clinic to address. The following is a culmination of guidance provided by Post-Graduate Fellow, Mary-Carson Stiff, as well as Mr. Speaker Pollard. Additional mention and detail is offered in *The Floodplain Management Plan for the Commonwealth of Virginia* (p. 4-13 – 4-18).

As a Dillon Rule State, the powers of localities and their governing bodies are limited to:

- Those expressly granted by the General Assembly.
- Those necessarily or fairly implied from express powers.
- Those which are essential and indispensable to the exercise of express powers.

As it pertains to "express powers," there is a good deal of language in the Code of Virginia which speaks clearly on this topic.

- Localities are permitted to spend money to manage flood prone areas, for the purpose of preventing damage to property and individuals per Va. Code §10.1-658: ***State interest in flood control.*** This code further states:
    - "Storm events cause **Recurrent Flooding** of Virginia's land resources and result in the loss of life, damage to property, unsafe and unsanitary conditions and the disruption of commerce and government services, placing at risk the health, safety and welfare of those citizens living in flood-prone areas of the Commonwealth"
    - "Public interest requires the **management of flood-prone areas** in a manner which prevents injuries to persons, damage to property and pollution of state waters"
    - "The General Assembly . . . supports and encourages those measures which prevent, mitigate and alleviate the **effects of stormwater surges and flooding.**
    - "[T]he **expenditure** of public funds and any **obligations** incurred in the **development of flood control and other civil works projects**, the benefits of which may accrue to any county, municipality or region in the Commonwealth, **are necessary expenses of local and state government**."
- Localities are also permitted to construct "works" to prevent damage from present and future flooding. Va. Code §15.2-970.
    - Authority to "construct a dam, levee, seawall or other structure or device, or perform dredging operations hereinafter referred to as 'works,' the purpose of

which is to **prevent the tidal erosion, flooding or inundation** of such locality, or part thereof."

- Virginia Code at § 15.2-2400 allows the creation of local government special districts to accomplish certain necessary tasks and could be used in high-risk inundation zones to create disincentives for land uses at odds with higher risk from flooding and Sea Level Rise. (VIMS report, p. 46).

  Various local adaptation measures and their authorities are further referenced in the following:

  - **Berms**
    Source of Authority: Code of Virginia §§ 10.1-658; 15.2-970
  - **Seawalls, Dams, Levees**
    Source of Authority: Code of Virginia §§ 10.1-658; 15.2-970(A)
  - **Flood Gates**
    Source of Authority: Code of Virginia §§ 10.1-658; 15.2-970
  - **Water Pumps**
    Source of Authority: Code of Virginia §§ 10.1-658; 15.2-970
  - **Drainage Pipes**
    Source of Authority: Code of Virginia § 10.1-658
  - **Mandatory Setbacks**
    Source of Authority: Code of Virginia §§ 10.1-658; 15.2-2279
  - **Condemnation**
    Source of Authority: Code of Virginia §§ 10.1-658; 15.2-1901.1; 15.2-2284
  - **Down Zoning**
    Source of Authority: Code of Virginia §§ 10.1-658; 15.2-2286

    The Floodplain Management Plan for the Commonwealth of Virginia goes into further detail citing Section 15.2-2283 of the Code of Virginia and the "reasonable considerations" to the following purposes of ***zoning***:

    1. To provide for adequate light, air, convenience of access and safety from fire, **flood** and other dangers;
    2. To Reduce or prevent congestion in the public streets;
    3. To facilitate the creation of a convenient, attractive and harmonious community;
    4. To facilitate the provision of adequate police and fire protection, **disaster evacuation, civil defense, transportation, water, sewerage, flood protection,** schools, parks, forests, playgrounds, recreational facilities, airports and other requirements;
    5. To protect against destruction of or encroachment upon historic areas;
    6. To protect against one or more of the following: overcrowding of land, undue density of population in relation to the community

facilities existing or available, obstruction of light and air, danger and congestion in travel and transportation, or **loss of life, health, or property from fire, flood,** panic or other dangers;

7. To encourage economic development activities that provide desirable employment and enlarge the tax base;
8. To provide for the preservation of agriculture and forestal lands;
9. To protect approach slopes and other safety areas of licensed airports. Such ordinance may also include reasonable provisions, not inconsistent with applicable state water quality standards, to protect surface water and ground water as defined…

"This clearly represents an intent by the General Assembly to guide localities in implementation of local regulations that recognize floodplains and natural areas as resources that serve citizens and deserve special management practices" (Virginia Department of Conservation and Recreation, p. 4-15 – 16)

Another difficult issue to address than identifying authorities to take action is the actual execution of that authority and the impact on property rights (tort, takings, etc.). This was the focus of a September 13, 2013 forum hosted by the William and Mary Law School which included presentations from regional leaders and legal experts. (VCPC, p. 9).

The issue pertaining to local land use regulations, Professor Lynda Butler, Chancellor Professor of Law, William & Mary Law School offered the following:

> *In the Koontz decision, the Supreme Court decided that a local government's exercise of land use regulation powers, including denying a permit for the right to develop, must demonstrate a logical relationship and a rough proportionality between what it asks from the landowner and the impacts of the land use sought. Further, this relationship and rough proportionality applies to requests for monetary contributions from landowners seeking land use permits (it is common for localities to seek contributions from developers to pay fees for schools or road maintenance because new development often increases the use of such public resources).* ***In other words, the government must prove that any payment sought in exchange for approving a land use permit is designated to offset the actual harm or impact caused by the development…***

" When . . . a regulation that declares 'off-limits' all economically productive or beneficial uses of land goes beyond what the relevant background principles would dictate, compensation must be paid to sustain it." (Speaker Pollard)

In light of these cases, local governments seeking to regulate land use while limiting takings liability should, as opposed to a ban on coastal development:

- *Consider rolling development restrictions on the coast;*
- *Offer economic incentives to stop development; and/or*
- *Remove public subsidies to coastal landowners.*

(VCPC, p. 9-10*)*

What if a city determines it may need to stop maintaining public services to avoid expensive maintenance costs? Or just can't keep up because flooding is such a problem?

The question under tort law will be: does the city have a **duty** to maintain these services? Ms. Shana Jones of the Virginia Coastal Policy Clinic provided the following:

A City May be Liable For ….	A City Is Unlikely to be Liable For ….
Failure to maintain roads. Cities have a duty to maintain roads in safe condition under the common law. The duty extends to dangerous conditions adjacent to a road that could affect road travel. A city does not have to ensure road safety immediately after emergencies.	**Failure to maintain a discontinued road.** (While discontinuing a road should not incur tort liability, takings – if complete access is lost – should be analyzed.)
Failure to maintain sewer services. Virginia courts require cities to maintain sewer systems. While sovereign immunity protections cities from liability for planning and design, it doesn't protect them from failure to maintain.	**Failure to maintain drainage, erosion, and flood control works.** **SOVEREIGN IMMUNITY.** Va. Code § 15.2-970 immunizes cities from negligent design, construction, performance, **maintenance**, and operation of these works.
Failure to maintain water services. Virginia courts require cities to maintain water services.	**Discretionary decisions about roads, water, sewer, and emergency services.** **SOVEREIGN IMMUNITY.** Cities can claim sovereign immunity for governmental functions but not proprietary functions. Governmental functions are discretionary or performed for the public's benefit; proprietary functions are ministerial or performed for the muni's benefit.
Failure to maintain emergency services. Va. Code §15.2-955 requires localities to "seek to ensure emergency medical services are maintained throughout the entire locality." *Note: this statute was enacted after the most recent Va. Supreme Court case on this issue, which held that the city should have sovereign immunity in this instance.*	**Failure to provide emergency services.** **SOVEREIGN IMMUNITY.** Although Va. Code §15.2-955 requires localities to "seek to ensure emergency medical services are maintained throughout the entire locality," this statute was enacted after the most recent Va. Supreme Court case on this issue, which held that the city should have sovereign immunity if services are not delivered in time. So a little unclear, although courts cite *Edwards* with approval.

Balance Between Mitigation and Development

"We reported that hazard mitigation goals and local economic interests often conflict, and the resulting tension can often have a profound effect on mitigation efforts. For example, we reported that community goals such as building housing and promoting economic development may be higher priorities than formulating mitigation regulations that may include restrictive development regulations and more stringent building codes. In particular, local government officials we contacted as part of that work commented that developers often want to increase growth in hazard-prone areas (e.g., along the coast or in floodplains) to support economic development. These areas are often desirable for residences and businesses, and such development increases local tax revenues but is generally in conflict with mitigation goals."

Government Accountability Office (GAO)
Disaster Resilience: GAO-14-603T, page 4

What if property owners want to alter a sand dune to improve their view?

Federal guidance exists through 44 CFR 60.3: ***Flood plan management criteria for flood-prone areas*** which "prohibit[s] man-made alteration of sand dunes and mangrove stands within Zones V1-30, VE, and V on the community's FIRM which would increase potential flood damage." (Section e, (7).

"Costs resulting from local decisions must not be passed on to another administrative level, or to society as a whole. They must be borne by those who benefit from these plans." (Delta Commission, p. 12).

Of course there are actions localities can take now, and should be encouraged to do so, which do not require legal advice. These include:

- Develop an economic base analysis for the locality then "overlay" the projected impacts as identified using the SLR calculator numbers to identify where efforts and funding need should be prioritized.
- Track high water marks and repetitive loss structures post-incident
- Start planning NOW for the next disaster. Consider how prepared the locality is if a devastating storm were to hit tomorrow? Does the locality have the tool, policies, plans and regulations in place now to rebuild? And not just rebuild to the same vulnerable standard, but to do so smartly, with sound mitigation and resilience in mind?
- Integrate resilience principles and practices throughout the local planning and development process; ensure the Disaster Recovery plan, Land Use plan,

Comprehensive and Capital Improvement Plans, Mitigation plans, Transportation and Economic Development plans are all in alignment.

During recovery from a disaster, a locality can enact policies to mitigate future disasters after a storm. Policies are generally not challenged since everyone is making an effort to "return to normal" as quickly as possible. This attitude can hinder long-term mitigation efforts by returning to possibly inappropriate practices.
- The Floodplain Management Plan for the Commonwealth of Virginia, p. 3-12

In addition to the Dillon Rule and local authorities available through the Code of Virginia additional legal issues surfaced. They are listed below and provided throughout the report indicated by this gavel graphic.

- Preparedness of Critical Infrastructure / SCC Authorities (p. 63)
- Virginia Real Estate Disclosure Laws (p. 73)

Photo by Chuck Epes /
Chesapeake Bay Foundation Staff

VIMS RECOMMENDATION

THE STATE SHOULD TAKE A LEAD ROLE IN ADDRESSING RECURRENT FLOODING IN VIRGINIA FOR THE FOLLOWING REASONS:

A. ACCESSING RELEVANT FEDERAL RESOURCES FOR PLANNING AND MITIGATION MAY BE ENHANCED THROUGH STATE MEDIATION.

B. FLOODING PROBLEMS ARE LINKED TO WATER BODIES AND THEREFORE OFTEN TRANSCEND LOCALITY BOUNDARIES.

C. RESOURCE PRIORITIZATION EFFORTS WILL REQUIRE CONSISTENT OR STANDARDIZED ASSESSMENT PROTOCOLS ACROSS ALL LOCALITIES AND REGIONS.

D. LOCALITIES DO NOT FEEL ENABLED TO ADDRESS ALL FLOODING AND SEA LEVEL RISE ISSUES.

"STATE AND FEDERAL SUPPORT"
RECURRENT FLOODING SUB-PANEL RECOMMENDATIONS

- Utilize Virginia's Congressional Delegation to affect change at the Federal level, to better assist or otherwise ease the burden on the state, regions and localities to be able to solicit federal support and realistically address flooding and Sea Level Rise. Six specific issues involve:
    - Housing and Urban Development (HUD)
    - Federal Emergency Management Agency (FEMA)
    - Office of Management and Budget (OMB)
    - National Oceanic and Atmospheric Administration (NOAA)
    - The need for local resources (i.e. GIS and modeling) to be considered for in-kind credit for federal grants.
    - Allow localities to rely on the bond capacity of the State and its favorable interest rates on behalf of local / regional projects.

Background

Since the submission of the VIMS Recurrent Flooding report, the issue of Recurrent Flooding and Sea Level Rise has gained a great deal of momentum in the Commonwealth. The questions as to whether Sea Level Rise is real have passed; Virginia's leaders, agencies and several communities acknowledge not only is it real, Sea Level Rise is here and immediate action is necessary. The following are just a few of the comments made by some of Virginia's leaders:

"It is time for state government to say there is a problem, and that we need to address it." Senator John Watkins, District 10 during a September 13, 2013 event hosted by William and Mary Law School… https://law.wm.edu/academics/programs/jd/electives/clinics/vacoastal/docs/adaptive%20planning%20conference%20documents/finalreport.pdf

"There is no doubt that Virginia is at significant risk for property damage and loss of life from flooding…We know we have a problem; we have studied it thoroughly, and it is time to take action." Del. Chris Stolle, R-Virginia Beach *http://www.timesdispatch.com/news/state-regional/fighting-va-flooding-linked-to-rising-seas-will-be-complicated/article_5d0587f9-82a5-5d7c-b397-1ef50b5b9f0d.html?mode=print*

"If we want to help the environment tomorrow, we have to make smart, common-sense decisions today."
Governor Terry McCullough during VMI Environmental Virginia Symposium, April 8, 2014 (https://governor.virginia.gov/news/newsarticle?articleId=5342 and http://www.roanoke.com/news/virginia/mcauliffe-to-reactivate-climate-change-commission/article_d4cf8204-bf53-11e3-aa36-0017a43b2370.html).

"*We do not need too much prescription of the problem; we need action."*

- Senator Tim Kaine (ODU's Rising to the Challenge)

Resources to take meaningful action are limited at best at the local and state level. With a need to access relevant federal resources for planning and mitigation efforts, it is imperative Virginia, particularly at the State and federal level, speak with one unified voice rather than localities and regions doing so disparately and unsuccessfully. There is a prescription on how this can be accomplished later in this report. Fortunately, Virginia currently enjoys a unified Congressional delegation interested in seeking and deploying federal solutions to assist.

Virginia at the Federal Level:

The Virginia Commission on Military Installations and Defense Activities focused on a similar strategy in its 2013 Initial Report which focused on a unified strategy toward BRAC and military resource needs: "Virginia should encourage 'unity of action' of the Virginia Congressional Delegation (CODEL), that they should be encouraged and assisted in developing and executing a unified plan of action to ensure Virginia receives the Federal support necessary to make meaningful change in its approach to adapting to [Sea Level Rise]".

This unity of action should not be difficult as the Virginia delegation has already shown such unified support of protecting Hampton Roads and all of coastal Virginia. During the June 30, 2014 event at Old Dominion University: "Rising to the Challenge," U.S. Senator Tim Kaine, U.S. Representative Scott Rigell, U.S. Representative Bobby Scott, U.S. Representative Rob Wittman along with Norfolk Mayor Paul Fraim and Virginia Beach Mayor Will Sessoms participated in a thoughtful and productive dialogue on the issues and challenges.

http://odu.edu/news/2014/6/sea_level_rise_forum#.U9v9W6zD_ct

Best Practice - Old Dominion University's Mitigation and Adaptation Research Institute (MARI) has done well in successfully bringing Federal partners to the table and even international partners. MARI is committed to continuing this inclusive whole community and global planning in a Sea Level Rise Pilot project.

Throughout the Sub-Panel's workgroup discussions, multiple issues surfaced pertaining to areas in which Virginia's Congressional Delegation could assist:

Housing and Urban Development (HUD)

An inconsistent approach in policy and protection from various federal agencies was highlighted as a concern. For example, one concern shared by members of the Sub-Panel involved HUD's approach to fulfill their mission by filling in the floodplain to foster development, thus further putting those who are socio-economically vulnerable in greater danger to flooding. Many felt HUD, considered a "neutral" federal agency – and also bound by Executive Order 11988, is supportive of unwise development, guaranteeing mortgages and thus encouraging developers to build where they shouldn't. HUD and the USACE and FEMA must collaborate. Perhaps a Memorandum of Agreement among the agencies would be helpful, similar to that between FEMA and the EPA

EPA-FEMA Memorandum of Agreement

In 2010, EPA and the Federal Emergency Management Agency (FEMA) signed a Memorandum of Agreement (MOA) that makes it easier for the two agencies to work together to help communities become safer, healthier, and more resilient. The agencies collaborate to help communities hit by disasters rebuild in ways that protect the environment, create long-term economic prosperity, and enhance neighborhoods. FEMA and EPA also help communities incorporate strategies that improve quality of life and direct development away from vulnerable areas into their hazard mitigation plans. EPA and FEMA are

using the lessons they learn from working together under this MOA and with other federal agencies to ***better coordinate assistance to communities on hazard mitigation planning and post-disaster recovery. The MOA also helps the agencies work together on climate change adaptation.***

Federal Emergency Management Agency (FEMA)

FEMA promotes Hazard Mitigation Assistance to help localities elevate eligible repetitive and severe repetitive loss properties. Virginia Beach Mayor Sessom's mentioned during his remarks at Old Dominion University's "Rising to the Challenge" event, the process to mitigate – at least in FEMA Region III - is "overwhelmingly cumbersome to the point of being counterproductive to implementing relief activities."

Compared to other FEMA regions, there appears to be a difference in interpretation and inconsistent application of FEMA policies. In one 2011 press release FEMA boasts of awarding more than $31m for the elevation of 224 homes in Galveston Co, Texas. This is during the same time when Virginia Beach submitted their elevation application, and three years later the first home had not been elevated. FEMA Region III requires *Virginia Beach* to contract on behalf of homeowners, which has proven a significant impediment in the process, while other FEMA Regions allow *homeowners* to engage pre-qualified contractors leaving the municipality to award the contract, manage eligibility requirements and issue final payment for eligible costs.

Another locality reported FEMA Region III requires designs prior to awarding the contract, forcing contractors to bid from designs which are not their own.

Per Mayor Sessoms, and several others in the region, the cost-sharing formula also needs to be revamped – whereby homeowners can contribute a greater portion to the elevation of their homes. The restrictive cost-benefit ratio for federal approval negates the great majority of repetitive flood homeowners from participating.

Office of Management and Budget (OMB)

Mr. Matthew Wall, State Hazard Mitigation Program Manager, offered a creative way to leverage multiple federal funding sources: Every grant or funding source has targeted objectives. Typically these objectives can be classified as benefits. Comprehensive projects have multiple opportunities or areas of benefits. Key to the blending is to identify the targeted benefit for a specific funding stream and qualify/quantify the value associated with that benefit. Once that benefit is valued, then the comprehensive project could receive funding from that source equal to but not to exceed the benefit. One practical example is as follows: a $10,000,000 project provides a positive mitigation effect for transportation infrastructure (roads and rail), energy infrastructure, and environmental preservation. The appropriate identification of the mitigation/preservation value would be then split between the Federal Highway Administration (FHWA), Department of Energy (DOE), and the Environmental Protection Agency (EPA) funding opportunities.

Precedent exists for this blending of funding. Specifically, Community Development Block Grants (CDBG) can be used to leverage virtually any other federal grant provided the CDBG priorities are also being met.

National Oceanic and Atmospheric Administration (NOAA)
NOAA plays a key role in many aspects of climate change adaptation including acquisition and archive of mapping / elevation data used in inundation models, research on the impacts of sea level rise, training for local government staff, and support of state coastal zone management (CZM) programs. NOAA has placed increasing emphasis on building coastal resiliency through state CZM programs, but generally through existing legislation and funding. Additional federal support for NOAA would enhance its ability to address recurrent flooding issues, especially in support of local government planning initiatives.

Local Resources to be Considered for In-Kind Credit for Federal Grants (i.e. GIS and modeling)
Many localities invest in technologies and tools to improve their ability to plan effectively, and quite often at a significant cost. If a locality is working on a grant and has/provides/includes data/information of value to use (in which they had invested, and would otherwise have a cost to obtain by any other source), Virginia should recommend that data in which the locality had invested have a value assigned and used as part of local match (i.e. in-kind credit).

"This is a matter of national security…it effects our ability to continue our operations…it puts life and property at risk, it is an issue that must be dealt with as a national security issue – just a pandemics, other natural hazards, other non-state-generated threats to the United States… It's a mission readiness issue." – Judge Alice Hill, National Security Council

"This is national. It's affecting us. It's affecting others too and…if we on the federal level can accelerate that and be about solutions…we might be able to set a template for how other communities deal with these challenges."

- Senator Tim Kaine on Hearsay with Cathy Lewis
July 22, 2014 at 15:25

With regards to the other bulleted points of this VIMS recommendations pertaining to flood problems linked to water bodies, the transcendence beyond local boundaries, and that localities are unable to address flooding and Sea Level Rise independently, every effort should be made to approach mitigation activities with a multi-jurisdictional or watershed focus. Not only considering No Adverse Impacts "NAI" on neighboring localities, but taking a watershed or regional approach toward capital projects – make the most effective, common-sense

investments resulting in the biggest return. This too is discussed in greater detail in the next section.

VIMS RECOMMENDATION

GIVEN THE LONG TIME FRAME NECESSARY TO EFFECTIVELY ADDRESS RECURRENT FLOODING AND SEA LEVEL RISE ISSUES AND GIVEN THE SPEED AT WHICH RISKS ARE PROJECTED TO INCREASE, VIRGINIA AND ITS COASTAL LOCALITIES SHOULD IMMEDIATELY BEGIN COMPREHENSIVE AND COORDINATED PLANNING EFFORTS.

"THE FRAMEWORK AND PROCESS"
RECURRENT FLOODING SUB-PANEL RECOMMENDATIONS

- Utilize the National Incident Management System (NIMS), and more specifically, establish an Incident Command Structure-style management structure inclusive of all primary and support agencies to manage the effort at the State level.
    - Identify the appropriate executive leader to serve as the "Incident Commander" or "Resilience Coordinator"

    - To help ensure a Whole Community approach, leverage the U.S. Army Corps of Engineer Silver Jackets program to facilitate coordination among agencies of all sectors and levels of government.
- Establish a Four (4) Year "Incident Action Plan" or "Flood Resilience Action Plan" with specific, measurable, attainable, and realistic goals and objectives; to be adopted by Executive Order or General Assembly
    - Communicate the Incident Action Plan through the existing Floodplain Management Plan for the Commonwealth of Virginia
    - Acceptance of (with caution and some exceptions) the VIMS proposed 1.5' as the minimum and immediate level to which the Commonwealth should plan for Sea Level Rise; use of U.S. Corps of Engineer's SLR Calculator
- The State should identify or establish a fund to assist localities and regions meet their match requirements and otherwise assist them with the costs or adaptation planning.
- Develop a directory of funding sources and their goals, priorities, etc. for inclusion in the Incident Action Plan; Conduct a "Finance Section" meeting with all funding source organizations to discuss most effective way to leverage such assistance.

BACKGROUND AND EXPLANATIONS

INCIDENT COMMAND STRUCTURE

"The National Incident Management System (NIMS) is a systematic, proactive approach to guide departments and agencies at all levels of government, nongovernmental organizations, and the private sector to work together seamlessly and manage incidents involving all threats and hazards—regardless of cause, size, location, or complexity—in order to reduce loss of life, property and harm to the environment" (FEMA – NIMS).

NIMS and the Incident Command System is a proven system used every day throughout Virginia and the nation in response to natural and human-caused incidents.

Did You Know? Federal Departments and agencies are required to make adoption of NIMS by local, state, territorial, and tribal nation jurisdictions a condition to receive Federal Preparedness grants and awards.

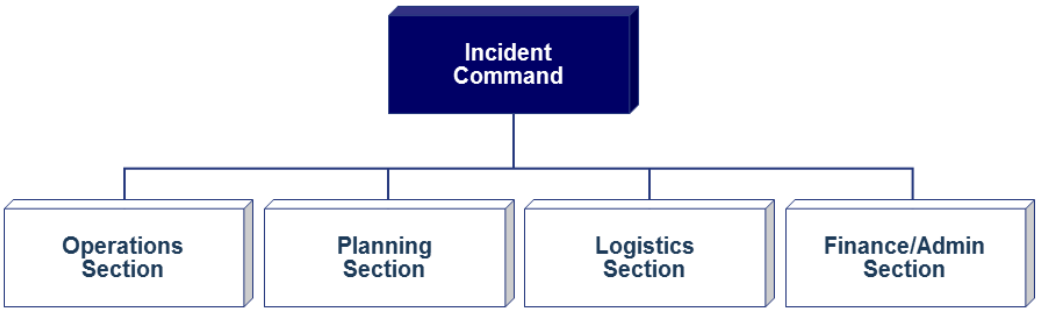
According to the Federal Emergency Management Agency (FEMA): Prior to the Incident Command System, weaknesses in incident management were often due to:

- Lack of accountability, including unclear chains of command and supervision.
- Poor communication due to both inefficient uses of available communications systems and conflicting codes and terminology.
- Lack of an orderly, systematic planning process.
- No common, flexible, predesigned management structure that enables commanders to delegate responsibilities and manage workloads efficiently.

- No predefined methods to integrate interagency requirements into the management structure and planning process effectively.

FEMA goes on to say "A poorly managed incident response can be devastating to our economy and our health and safety. With so much at stake, we must effectively manage our response efforts. The Incident Command System, or ICS, allows us to do so. ICS is a proven management system based on successful business practices." (FEMA Course IS-100).

Incident Commander or "Resilience Coordinator"



As with any incident or program, there must be one person identified as the lead – a person to establish the course of action, to monitor progress and otherwise ensure accountability. (see JLARC, p. 27). It is important to note many outside the world of emergency management and public safety are unfamiliar with the term Incident Commander, or found it a bit confusing using it in this context. Therefore, the term 'Incident Commander' will be replaced with '**Resilience Coordinator**.'

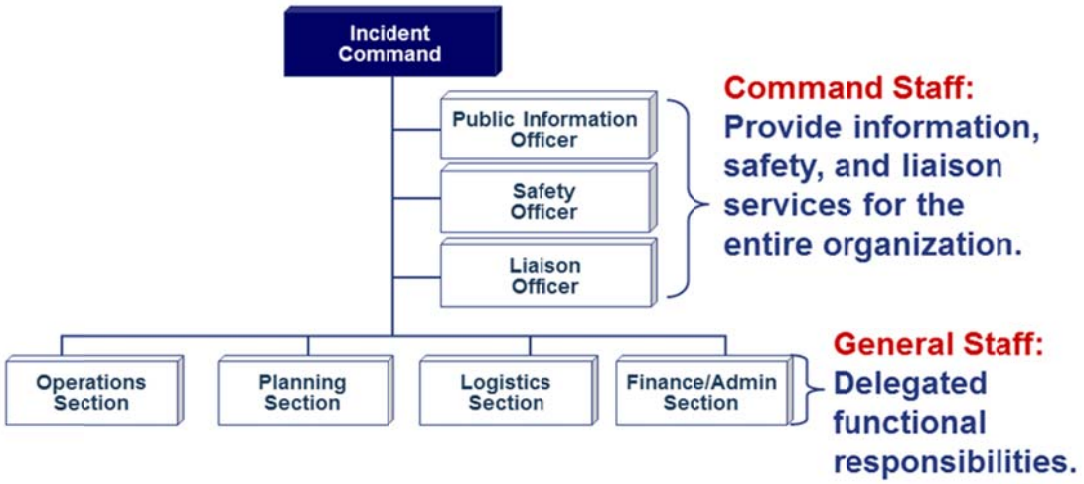
There have been many discussions as to who would make an ideal Incident Commander or Resilience Coordinator. While many felt elected officials would bring the much needed exposure and support to the effort – the benefits which may be reveresed by the vulnerability to political influences. A position under the Secretary of Natural Resources is also a consideration given the Department of Conservation and Recreation's designation as the State Coordinating Agency in accordance with CFR Title 44, Section 60.25: "Designation, Duties, and Responsibilities of State Coordinating Agencies." Likewise, the Sub-Panel believed a Resilience Coordinator should be closely aligned to the Secure Commonwealth Panel, and in an effort to partly fulfill the mission and otherwise ensure consistency and continuity throughout, a full-time career Resilience Coordinator positioned under the Secretariat of Public Safety and Homeland Security was proposed for consideration.

Such a position was recommended by the 2008 Climate Change Commission: *Create an assistant to the Governor for Climate Change Preparedness*. An example of such a position and office being put into place outside of Virginia, one could look at those areas hardest hit by Superstorm Sandy in 2012. The "Office of Flood Hazard Risk Measures" in New Jersey was implemented through Governor Chris Christie's Executive Order 140 (Christie, Sept. 25, 2013).

Additionally, establishing a "Chief Risk Officer or unit" was also a recommendation in the NYS2100 Commission report "to provide a platform for coordination between different state agencies and neighboring municipalities and create an "all-hazards" approach to planning, investment and decision-making… to minimize duplication and conflict among agencies, find areas of cooperation to make better use of tax-payer dollars, and improve outcomes for citizens and communities." (NYS 2100 Commission, p. 12, 37).

As the threat of Recurrent Flooding and Sea Level Rise will be on on-going one, this individual in Virginia would also be expected to report to the Secure Commonwealth Panel on a regular basis, with annual situation reports, quarterly updates and spot reports as necessary.

Of course, there is much more work to be done than one lone Resilience Coordinator can accomplish and the proposed Command structure allows for that scalability and coordination. There are command and general staff positions which can be deployed – most all of which are appropriate in addressing Recurrent Flooding and Sea Level Rise.



(FEMA, ICS-100b)

Public Information Officer

The PIO is responsible for communicating with the public, media, and/or coordinating with other agencies, as necessary, with incident related information requirements. The PIO is responsible for developing and releasing information about the incident to the news media, incident personnel, and other appropriate agencies and organizations. (FEMA, Basic Guidance for PIO).

Communicating one unified message that is consistent, accurate, timely and actionable is a crucial component to responding to any incident. Likewise, this information must be disseminated using all available means available. Efforts must be made to focus on continuous and consistent public outreach and education, reaching multiple audiences. Along with the public, planners and elected officials must also have tools available to them so they can access the information most pertinent to their decision making processes. To address such messaging

strategies, the Sub-Panel included an additional recommendation focused on Outreach and Education located on page 69. There the reader will find the impressive work already being done by George Mason University's Center for Climate Change Communication (C4), Old Dominion University's CCSLRI/MARI (since 2010), William and Mary's Virginia Coastal Policy Clinic and Virginia Institute of Marine Science, Wetlands Watch and so many others who have a great deal of experience and skills in crafting effective messages .

Liaison Officer

The Liaison Officer is the Incident Commander's point of contact for representatives of other governmental agencies, non-governmental organizations (NGOs), and/or the private sector to provide input on their agency's policies, resource availability, and other incident related matters.

> ***Virginia enjoys and should continue to foster meaningful international relationships with those who have also been mitigating this threat for decades, particularly The Netherlands. Several products from which Virginia can learn include the Delta Commission's 2008 Report: "Working Together with Water," as well as the publication by the Netherlands U.S. Water Crisis Research Network (NUWCReN): "Flood Preparedness in The Netherlands: A U.S. Perspective."***

> ***Mr. Dale Morris of the Royal Netherlands Embassy has been engaged in the Sub-Panel's efforts as well as locally in Norfolk.***

This Resilience Coordinator, who can also serve as the Liaison Officer, would be responsible for corralling all programs, initiatives and resources akin to a fusion center in order to improve situational awareness with one common operational picture, one plan, one unified and proactive effort. Of course, there are many agencies and organizations which fall into one of two categories: 1.) Those which are identified as primary and support agencies through Virginia Code and Executive Order, or 2.) Agencies and organization which are not identified, but must be.

One group which already exists to facilitate collaboration among numerous agencies from the Federal Government to the State, Regional and Local level is the U.S. Army Corps of Engineer's Virginia Silver Jackets. The Virginia Silver Jackets team brings individuals from different agencies together to facilitate collaboration, share information, and leverage resources and provide 'one-stop' for local and state governments to obtain information and identify solutions to reduce flood hazards. In addition to the Army Corps of Engineers, the Virginia Team currently includes staff from the Virginia Department of Emergency Management, Virginia Department of Conservation and Recreation, Natural Resources Conservation Service, Federal

Emergency Management Agency, National Weather Service, and U.S. Geological Survey. The Virginia Silver Jackets Team first met on June 23, 2010.
http://www.nfrmp.us/state/factVirginia.cfm

Along with the aforementioned agencies and organizations currently associated with the Virginia Silver Jackets, many more should also be included and the Virginia Silver Jackets Charter changed to reflect the following:

Agriculture and Consumer Services (VDACS)^‡☼	Marine Resources Commission (VMRC)*+☼
Chesapeake Bay Preservation*	Mines, Minerals and Energy^*‡☼
Congressional Delegation Representatives	Natural Resources^
Critical Infrastructure Sectors –Energy, Water, Telecomms	NOAA Office of Ocean and Coastal Resource Management
Department of Defense / Virginia Military Advisory Council^	Old Dominion University CCSLRI / MARI
Department of Environmental Quality (DEQ)	Public Safety and Homeland Security^
Economic Development (State and Local)	Soil and Water Conservation Board*
Environmental Protection Agency (EPA)	Transportation (VDOT)^*‡☼
Forestry^*‡☼	Virginia Association of Counties (VACo)
Game and Inland Fisheries*+☼	Virginia Coastal Zone Management Program (CZM)
George Mason University C4	Virginia Economic Development Partnership‡
Health (VDH)+☼	Virginia Institute of Marine Science‡☼
Historic Resources‡☼	Virginia Municipal League
Housing and Community Development*	Virginia Port Association (VPA)
Housing and Urban Development (HUD)	Wetlands Watch
Legal – Attorney General's Office; Virginia Coastal Policy Clinic	
Localities / Planning District Commissions^☼	

^ indicates mention in Governor McAuliffe's Executive Order 19 (2014): Convening the Governor's Climate Change and Resiliency Update Commission
** indicates mention in State Code § 10.1-659. Flood Protection Programs; coordination*
† indicates Lead in State Code § 10.1-602. Powers and Duties of Department (DCR)
! indicates Lead in Virginia Flood Damage Reduction Act of 1989
 # indicates Lead in Governor McDonnell's Executive Order 18 (2010): Continuation of the Coastal Zone Mgmt Program
+ indicates primary role in Governor McDonnell's Executive Order 18 (2010): Continuation of the Coastal Zone Mgmt Program
‡ indicates support role in Governor McDonnell's Executive Order 18 (2010): Continuation of the Coastal Zone Mgmt Program
◊ indicated Lead in Virginia Coastal Zone Management Program
☼ indicates participation in Virginia Coastal Zone Management Program

Note: Any DoD support to civil authorities will be implemented in accordance with existing policy guidance to include DoD Directive 3025.18, "Defense Support of Civil Authorities."

The following Associations and Commissions should also be included in the efforts:

- American Planning Association, Virginia Chapter
- American Public Works Association, Mid-Atlantic Chapter
- Virginia 1st (Banking Sector focused on disaster planning)
- Virginia Banker's Association
- Virginia Association of Realtors
- Virginia Association of Zoning Officials
- Virginia Floodplain Management Association
- Virginia Housing Commission
- Virginia Property Insurance Association
- Mortgage Bankers Association / Lenders
- Appraisers
- Insurance Sector
- Developers

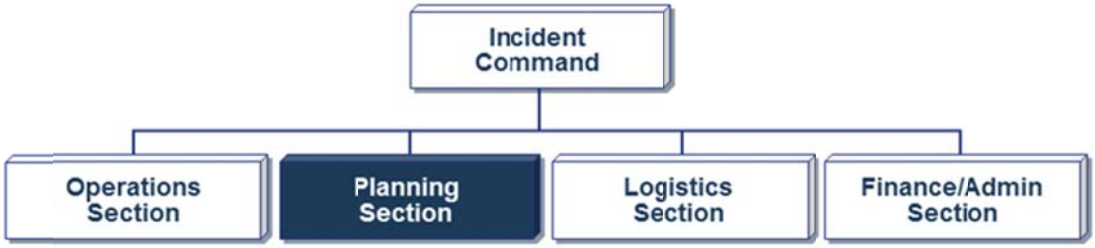
Private Sector

In a whole-community approach to preparedness and resilience, the private sector must also be seen and valued as a critical partner. Along with the protection of critical infrastructure and key resources, there are opportunities for ideas and investments. A collection of business executives from multinational companies across multiple industries came together to establish a "Resilience Action Initiative," sharing their thoughts and concerns in a report entitled Turbulence: A Corporate Perspective on Collaborating for Resilience (*2014, Amsterdam University Press*). "The focus of RAI is not only on the companies themselves, but on the resilience of the cities and regions in which they operate and where they eventually sell their products and services. The companies have found that by engaging with the resilience of their environment and that of their clients, they also strengthen their own resilience" (p. 9-10). Moreover, there is expertise within corporations which can bring fresh ideas and energy to the challenge: "…the people working in these companies have the talent and the commitment to contribute to society and drive progress on the ground, even in the absence of clear global policy frameworks" (p. 13).

"Solving [complex challenges] requires a broad, holistic approach, an open mind and an understanding beyond our own areas of expertise" (Turbulence, p. 14)

The Commonwealth should engage, partner with and challenge private industry and civic-minded partners like never before. Groups like the CIVIC Leadership Institute (http://civichr.org/) and LEAD Hampton Roads (http://www.leadhamptonroads.org/) are great opportunities to broach a discussion with industry professionals who are committed to the betterment of their communities.

Planning Section



The Planning Section of the Incident Command System offers at a minimum the following:

- Management by Objectives
- Collecting, evaluating, and displaying incident intelligence and information.
- Preparing and documenting Incident Action Plans.
- Tracking resources assigned to the incident.
- Maintaining incident documentation.

(FEMA, ICS-100b)

Reporting and otherwise accountable to the "Resilience Coordinator," the Planning Section is responsible for continuous observations and planning for the next "operational period" – which in the case of this effort, is proposed to be a four (4) year period with annual Situation Reports (presented to the Secure Commonwealth Panel), Quarterly Reports (distributed electronically), Spot Reports as needed and real-time information maintained on a "Virginia Flooding Action and Resource" website. Therefore, while the Operations Section is always focused on projects currently underway and otherwise ensuring strategic plans are being implemented, the Planning Section continuously works to address and set the path for the next operational period. This will be done by setting performance measures, conducting routine (annual) environmental observations and forecasts by Old Dominion University and the Virginia Institute of Marine Science, developing data-driven project prioritizations (including benefit costs analyses), assessing the effectiveness or potential for mitigation strategies, identifying funding sources and tracking legislation.

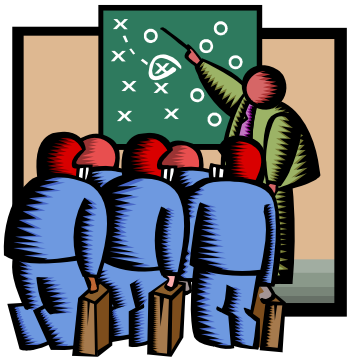
> *JLARC: Without goals and objectives against which it can measure progress, the Commonwealth cannot evaluate the effect of grant expenditures on its preparedness and response capabilities. (p. 27)…Annual reviews … are important to identify goals that have been completed and to show what still remains to be done. This information can be used to prioritize strategic plan goals toward which insufficient progress has been made. Without this type of annual review, it may be difficult to ensure that grant funds are being used for the highest-priority preparedness needs each year. Annual reviews are also important to ensure that new and emerging issues and threats are addressed by the plan in a timely manner." (p. 28)*

Environmental Observations and Forecasts
There is … a need discuss the "how much" [depth] and to reassess the risk associated with SLR when our knowledge about the driving processes of SLR changes significantly. During May and June 2014, a number of outstanding papers reported new results that changed the perspective for the melting of the ice sheets in Antarctica and Greenland fundamentally, with very much revised probabilities for large melts and rapid SLR during the 21st century. This has a huge impact on the risk (defined here as a to product of hazard probability, vulnerability, and exposed assets) particularly for the high end of the hazard spectrum. This should influence the discussion of what impact mitigation and adaptation makes economic and social sense. – Dr. Hans-Peter Plag, Old Dominion University

Joint VIMS-ODU efforts to monitor SLR and evaluate predictions
On-going efforts include a joint VIMS-ODU effort to establish a protocol for monitoring Sea Level Rise and using historic trends to evaluate model projections. Still in its planning phase, the effort is likely to recommend a non-parametric approach to analyzing historic Sea Level Rise data in a manner that can be easily and continuously updated as new data is obtained. – Ms. Molly Mitchell, VIMS

The most important product produced by the Planning Section, and the piece which instills a proactive approach versus reactive is the Incident Action Plan.

Incident Action Plan (IAP) or "Flood Resilience Action Plan"
Incident Action Plans provide a coherent means of communicating the overall incident objectives in the context of both operational and support activities.



At the simplest level, all Incident Action Plans must have these elements:

- What do we want to do?
- Who is responsible for doing it?
- How do we communicate with each other?

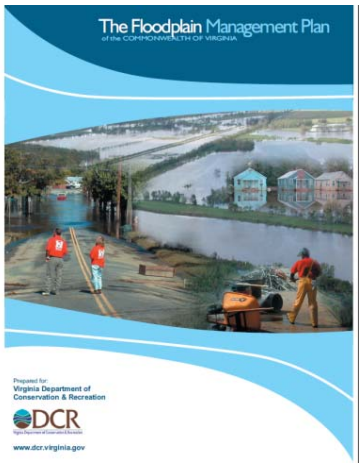
(FEMA, ICS 100b)

As it pertains to Virginia's response to Seal Level Rise, some elements of the Incident Action Plan, or in this case the "Flood Resilience Action Plan" may identify which mitigation projects to be studied or completed. Likewise, performance measured and training / outreach activities scheduled. Who will be tracking the latest forecasts, studies and models to recalibrate the group's planning assumptions and priorities?

Based on the DHS/FEMA Core Capability for Long-Term Vulnerability Reduction, the target is "to achieve a measurable decrease in the long-term vulnerability against current baselines amid a growing population base and expanding infrastructure base."
(FEMA - Crosswalk, p. 9)

As stated, the Sub-Panel recommends a 4-year operational period focused on projects which can be accomplished, with an eye on long-term resilient solutions. Incidentally, the State's Floodplain Management Plan already establishes a short-term 5-year horizon that identifies more immediate problems, needs, solutions and priorities for implementation that will focus on reducing or preventing the creation of new flood hazards (P. 1-4); a Sub-Panel proposed 4-year cycle falls more in line with Governor terms as well as the National Climate Assessment (also 4 years).

The Floodplain Management Plan of the Commonwealth of Virginia → is already a document which offers a wealth of information and contains the following:



- Federal and State Regulations
  - Federal Floodplain Regulations
  - Virginia Floodplain Regulations
- Understanding & Reducing Flood Losses
  - Coastal Hazards
  - Modify Susceptibility to Flooding and Flood-Related Damages
  - Flood Control
  - Onsite Retention Measures
  - Shoreline Protection
  - Modify the Impact of Flooding on Individuals and the Community
- Maintaining Natural Floodplain Resources
  - Deterrents to Natural and Beneficial Value Protection
  - Resource Impacts Resulting From Loss of Natural Values
  - Approaches for the Management of Natural and Beneficial Values
  - Tools for the Management of Values
  - Management of Wetlands Resources
- An Inventory of the Commonwealth's Floodplain Areas
  - Land Areas Subject to Flooding – The Floodplains
  - Floodplain Development and Flood Insurance
  - Historic Flood Events
  - Hazard Mapping
  - Natural and Beneficial Resources
- A Strategy for Floodplain Management
  - Administering an Effective Floodplain Management Program Within the Commonwealth of Virginia

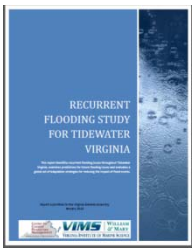
The Sub-Panel recommends updating the Floodplain Management Plan of the Commonwealth of Virginia to reflect the latest forecasts, policy changes, proven best practices, tools and resources, that it serve as Virginia's Sea Level Rise / Recurrent Flooding Incident Action Plan and be adopted by the General Assembly or Governor Executive Order to formally set the course for the following four years. By adopting this document and strategy,

it should provide the encouragement to unify efforts as well as the needed support to localities challenged to make bad land use decisions by disallowing this behavior.

How can we be sure the models are accurate and that we will receive such flooding as predicted?

In the world of emergency management and homeland security, never is there a complete picture on which to base critical decisions. Decision-makers must act on the intelligence they have at a given time.

The Planning Section is tasked with constantly reviewing and analyzing the latest studies and trends; relying on the foremost experts in Virginia such as Old Dominion University and the Virginia Institute of Marine Science as well as Military and Non-Profit Organizations. With such engaged and renowned partners, Virginia will always have and rely on the most up-to-date information. Furthermore, there is prudence in following the advice of the Oceanographer and Navigator of the Navy Rear Admiral Jonathan White and implementing a Flexible Adaptation Plan. As Dr. Carl Hershner of VIMS states: **"**allow ability to adjust for whatever plays out and do not lock yourself into an untenable position in the future."

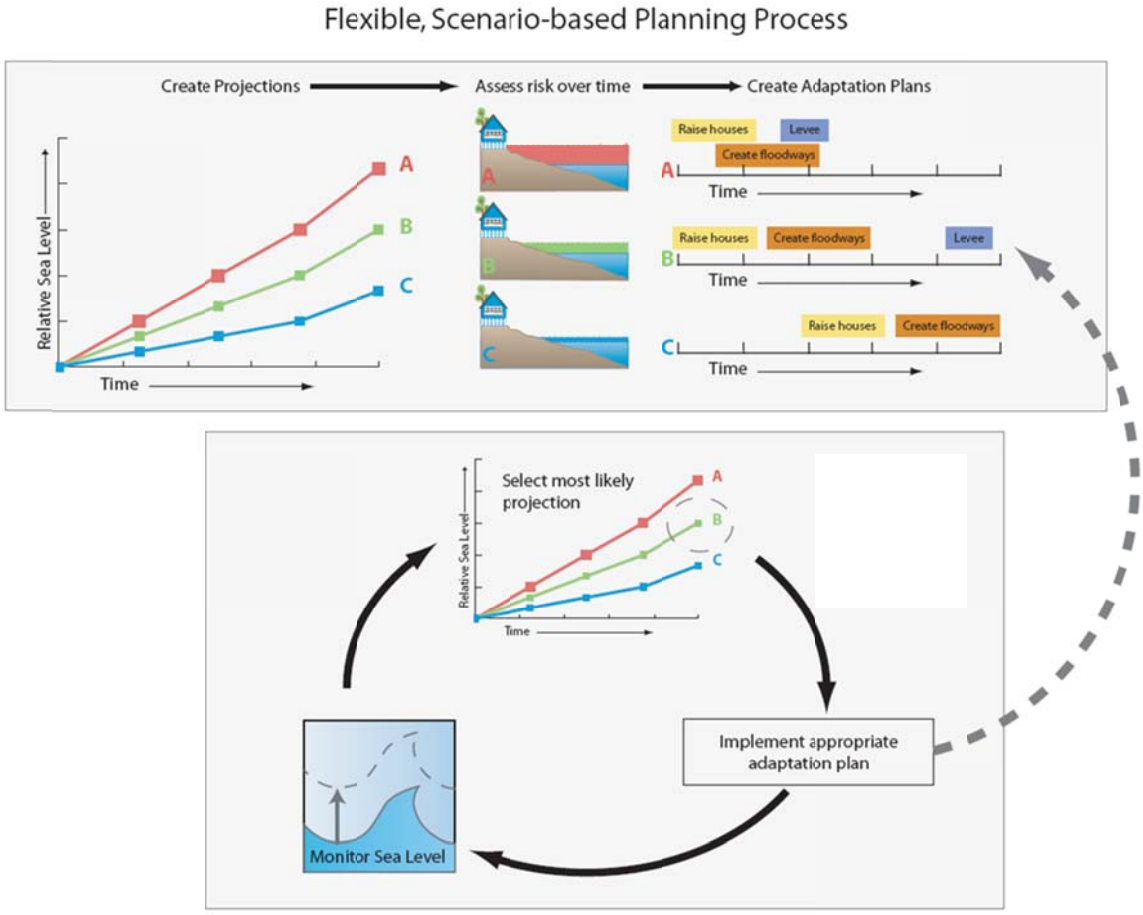


To create a flexible adaptation plan, the state would need to look at flooding throughout Tidewater Virginia and group issues into tiers:

1. *Areas that need immediate attention*
2. *Areas that will be facing problems ~40 years from now (given current predictions)*
3. *Areas that will be facing problems ~100 years from now (given current predictions)*

VIMS Report, p. 50

Ms. Molly Mitchell, also of VIMS, adds the following: "Requirements of a Flexible Adaptation Plan include serious planning, commitment of resources, and careful analysis of evolving conditions. The Benefits include reduction of unnecessary expenses, ensures development decisions are informed, and recognizes the long lead times required for effective implementation of many adaptation options."



Graphic from Dr. Carl Hershner, 2014

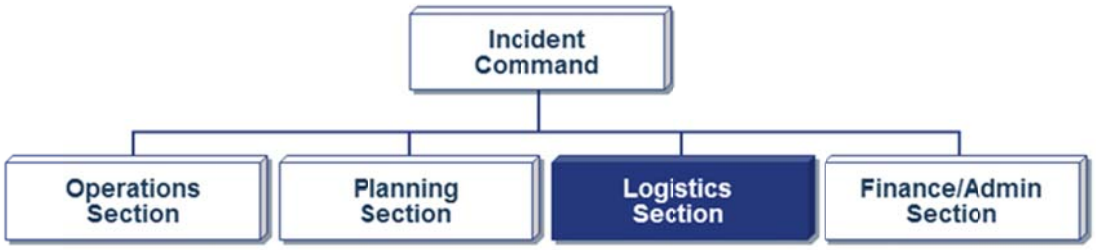
Adaptive Management Approach is also recommended by the 2008 Delta Commission and further validated by DoD's, EPA's and DOE's Strategic Environmental Research and Development Program (SERDP).

"If we had observations of the future, we obviously would trust them more than models, but unfortunately…

…observations of the future are not available at this time."
(Tom Knutson and Robert Tuleya)

"…the work is never done…it will be necessary to keep knowledge up to date and modify the plans continually in light of the latest developments and insights.
(Delta Commission 2008, p. 97)

Logistics



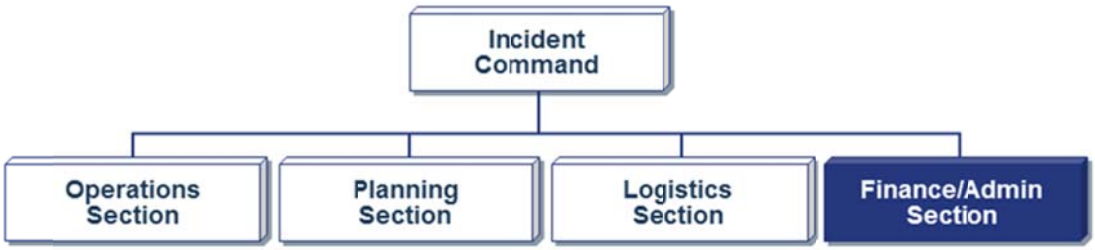
- Ordering, obtaining, maintaining, and accounting for essential personnel, equipment, and supplies.
- Providing communication planning and resources.

(FEMA ICS 100b)

For this Recurrent Flooding and Sea Level Rise initiative, three divisions within the Logistics Section are appropriate:

1. Meeting, training and event planning
    a. The need for future meetings, trainings, workshops and conferences is communicated throughout this report. Efforts will be made to not only de-conflict scheduled events, but to provide support in scheduling, planning, and communicating the events.
2. Data/Mapping Needs
    a. Work will be needed to leverage all existing mapping data, coordinate on new acquisition, establish one common operational tool, and ensure the data feeding that tool is reliable and accurate.
3. Communications plan (how communication will be done among stakeholder agencies)
    a. There must be an organized means by which agencies communicate to share information, review material and provide input, etc. Such a communication plan falls under the Logistics section.

Finance



The Finance/Administration Section is responsible for:

- Contract negotiation and monitoring.
- Timekeeping.
- Cost analysis.
- Compensation for injury or damage to property.
- Documentation for reimbursement (e.g., under MOUs).

(FEMA ICS 100b)

As for the Finance Section, this should be where all flood-related (mitigation / response) expenditures and losses should be captured and documented. Working with the Planning Section, Finance should knock down funding barriers and maximize all funds available to the Commonwealth. Likewise, determining cost-effectiveness and benefits of the funds received and expended fall within this section.

Working with the Planning Section, the Finance Section should be able to communicate the following in the Incident Action Plan:

> *Implementation of Recommendations will have approximately $_____ in economic benefits to the region over fifty years. This includes $_____ in reduced repetitive flood costs, $_____ in reduced cost of sinking land, $_____ in reduced flood insurance premiums through the National Flood Insurance Program's Community Rating System, $_____ in increased property values, and $_____ in direct and indirect jobs.*
>
> *(Verbiage used in New Orleans)*

Funding Sources:

There are multiple funding sources available to address Recurrent Flooding and Sea Level Rise. The Disaster Mitigation Act of 2000 (addendum to the Robert T. Stafford Act). *§201.4(c)(3)(iii) states* ***The State mitigation strategy shall include an] identification of current and potential sources of Federal, State, local, or private funding to implement mitigation activities.*** This information is in fact included in the ***Commonwealth of Virginia Hazard Mitigation Plan,*** under 'Mitigation Action Details' for the individual strategies listed in Chapter 5. Many funding sources are also mentioned throughout the ***Floodplain Management Plan of the Commonwealth of Virginia.***

Funding Sources include:

- **Academic Grants**
- **Agency Funds**
- **Clear Water Revolving Loan Fund**
  http://water.epa.gov/grants_funding/cwsrf/cwsrf_index.cfm
- **Coastal Zone Management (CZM) Program**
  http://www.deq.virginia.gov/programs/coastalzonemanagement.aspx
- **Community Development Block Grant (CDBG)**
  http://portal.hud.gov/hudportal/HUD?src=/program_offices/comm_planning/communitydevelopment/programs
- **Crowdfunding**
  - Like Neighbor.ly – a website to help people invest in places and civic projects they care about, and to help cities greenlight tough projects – while saving money and capital. *(FEMA: Toward More Resilient Futures: Putting Foresight Into Practice, p. 29) - https://neighbor.ly/*
- **Dam Owners**
- **Department of Defense**
  - Authorized to make community planning assistance grants to undertake Joint Land Use Studies where conflicts emerge between a military facility and the surrounding community (10 U.S.C. § 2391): *http://www.gpo.gov/fdsys/granule/USCODE-2010-title10/USCODE-2010-title10-subtitleA-partIV-chap141-sec2391*
- **Endowments**
- **Environmental Protection Agency (EPA)**
- **FEMA Community Assistance Program – State Support Services Element (CAP-SSSE)**
  http://www.fema.gov/floodplain-management/community-assistance-program-state-support-services-element
- **FEMA Hazard Mitigation Assistance (HMA)**
  - *Hazard Mitigation Grant Program (HMGP) - Comprehensive mitigation planning to include flood hazard – HMGP historically has had a state share to off-set the non-federal share of 25% required),*
    - *HMGP 406 Funding – In accordance with Title 44 CFR §206.226 Restoration of damaged facilities contains a provision for the consideration of funding additional measures that will enhance a facility's ability to resist similar damage in future events. http://www.fema.gov/public-assistance-local-state-tribal-and-non-profit/hazard-mitigation-funding-under-section-406-0*
  - *Pre-Disaster Mitigation (PDM) - Comprehensive mitigation planning to include flood hazard. No state share.*
  - *Flood Mitigation Assistance (FMA) - Floodplain/flood hazard mitigation planning only. No state share. http://www.fema.gov/hazard-mitigation-assistance*

- **FEMA Hazard Mitigation Technical Assistance Program (HMTAP)** *http://www.fema.gov/national-incident-management-system/fema-technical-assistance-division*
- **FEMA Public Assistance (Post-Disaster)**
- **Mid-Atlantic Sea Grant**
- **National Science Foundation Grants**
- **Special Tax Districts**
- **Stormwater Fees / Stormwater infrastructure financing mechanisms**
- **Transportation Funding**
    - *On September 24, 2012, the Federal Highway Administration announced federal cost-sharing would be available for "activities to plan, design, and construct highways to adapt to current and future climate change and extreme weather events (VIMS, p. 42)*
- **Urban Public-Private Partnership Redevelopment Fund and the Virginia Removal or Rehabilitation of Derelict Structures Fund (Dept. of Housing and Community Development)**
- **U.S. Army Corps of Engineers**
    - ***USACE*** *has Planning Assistance to States (PAS) and Floodplain Management Services, which can both address flood related topics, PAS is cost-shared and FPMS is 100 percent Federally funded.*
- **U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration (PHMSA) Technical Assistance Grants (TAG)**
- **Virginia Dam Safety, Flood Prevention and Protection Assistance Fund** *https://leg1.state.va.us/cgi-bin/legp504.exe?000+cod+10.1-603.19*
- **Virginia Department of Emergency Management (VDEM)**
- **Virginia Environmental Endowment (See Joseph Maroon, p. 6:** https://law.wm.edu/academics/programs/jd/electives/clinics/vacoastal/docs/adaptive%20planning%20conference%20documents/finalreport.pdf)
- **Virginia Public Building Authority Bonds**
    - **Bonds (***Washing D.C. example: http://efc.web.unc.edu/2014/07/10/news-d-c-water-considers-first-ever-century-bond-public-utility/)*
- **Virginia Sea Grant:** *http://seagrant.noaa.gov/WhatWeDo/PastFocusAreas(2009-2013)/HazardResilientCoastalCommunities.aspx*

BUILDING ON THE VIRGINIA DAM SAFETY, FLOOD PREVENTION AND PROTECTION ASSISTANCE FUND, THE COMMONWEALTH MUST BUILD ON THE CAPACITY TO ASSIST LOCALITIES WITH THE FUNDING OF FLOOD-RELATED PROJECTS.

FURTHERMORE, THE SUB-PANEL RECOMMENDS UPDATING AND MAINTAINING ONE DIRECTORY OF ALL FUNDING SOURCES WITH THEIR GOALS, PRIORITIES, REQUIREMENTS AND OFFERINGS, FOR INCUSION IN THE FLOOPLAIN MANAGEMENT PLAN FOR THE COMMONWEALTH OF VIRGINIA / FLOOD RESILIENCE ACTION PLAN

The General Assembly passed the following amendment to the 2-year budget:
Requires every locality with a SWM utility fee to report to DEQ: (1) the programs funded by the fees; and (2) the expected pollutants removed by each program. The amendment also requires each locality with a stormwater utility fee to certify to the Auditor of Public Accounts in its annual reporting requirements that the funds collected are used in compliance with state law. Item 363 #1s

A concerned expressed is 2-fold: (1) the stormwater fee programs are local revenue adopted by local elected officials; and (2) as prescribed in state law "Any locality, by ordinance, may establish a utility or enact a system of service charges to support a local stormwater management program consistent with Article 2.3 (§ 62.1-44.15:24 et seq.) of Chapter 3.1 of Title 62.1 or any other state or federal regulation governing stormwater management."

Implicit in this authority is the ability for local governments to use stormwater utility fees for more than just nutrient and sediment reductions. This means localities can spend the money on stormwater projects to mitigate flooding impacts. Given this, it would be appropriate to recommend that the Administration instruct DEQ to consider flood reduction benefits along with runoff and nutrient reduction.

The ultimate concern is the General Assembly may analyze these reports and conclude that the legal authority for local governments to establish stormwater utility fees be limited only to reduction of nutrients and sediments, thereby limiting potential revenue necessary to address the impacts of Recurrent Flooding.

DID YOU KNOW? SEA LEVEL RISE DATA IS AVAILABLE FOR USE IN FEMA HAZARD MITIGATION ASSISTANCE APPLICATIONS

DHS/FEMA Hazard Mitigation Assistance (HMA) assistance is available to localities on an annual basis – or in the instance of the Hazard Mitigation Grant Program (HMGP), after a Presidentially-Declared disaster. Depending on the program within HMA, non-federal matches go from 25%-0%. In some cases there is also a State contribution. The challenge as previously stated on page 21 is the inconsistent interpretation and application of policy among the various FEMA regions as well as the timeframe by which an application is started to final determination to the actual construction phase.

"On December 23, 2013, the Federal Emergency Management Agency (FEMA) has issued guidance through our Regional offices to state, local, tribal, and territorial partners on the ability to incorporate Sea Level Rise estimates in Hazard Mitigation Assistance (HMA) project grant applications. In accordance with the objectives outlined in the President's Executive Order – Preparing the United States for the Impacts of Climate Change, FEMA continues to support the initiative by integrating climate change adaptations into programs, policies, and operations to strengthen the nation's resilience by planning for future risk.

The National Oceanic and Atmospheric Administration and the U.S. Army Corps of Engineers have recently released Sea Level Rise estimates for various coastal areas. This available data will allow applicants to determine the projected Sea Level Rise at a specific site. The data can be included in FEMA's Benefit-Cost Analysis Tool that is used to validate the cost benefit of potential projects that protect against future risk."

Using sea level rise estimates gives a false sense of safety and does note account for the nature of the problem, that is, a probability density function for sea level rise and an associated probability density function for risk. Unfortunately, while the probability for large sea level rise goes to zero, the risk probability continues to increase a lot even for 21st century SLRs of 2 meters and more.

FEMA does not require applicants and sub-applicants to incorporate Sea Level Rise estimates into HMA projects. However, detailed information is being provided on how to incorporate Sea Level Rise considerations when performing a Benefit-Cost Analysis for project applications using these federal data sources. Communities that use this information will have the benefit of more accurately planning for and taking steps to mitigate against this vulnerability.

(FEMA – Incorporating Sea Level Rise)

These recommendations are in line with:

2008 Climate Change Commission Report

- Create an assistant to the Governor for Climate Change Preparedness
- Foster federal, state and local cooperation on preparedness and resilience (industry too)
- Require Planning District Commissions in Coastal Virginia to adopt preparedness and resilience plans.

U.S. Army Corps of Engineers "Sandy Comprehensive Plan"

- Finding: Addressing coastal storm risk is a shared responsibility (Main Report, p. 7)
- Opportunity: Dynamic Collaboration (Main Report, p. 9)
- Opportunity: A new regional governance structure (Main Report, p. 9)
- Opportunity: Public-Private Partnerships (Main Report, p. 9)
- Opportunity: Resource Optimization (Main Report, p. 9)
- Opportunity: Flexible and adaptive coastal risk management (Main Report, p. 10)

Commonwealth of Virginia Hazard Mitigation Plan

- Acquisition and Demolition of Flood Prone Properties (FL-5, 6)
- Mitigation Reconstruction of Severe Repetitive Loss Properties (FL-8)
- Encourage Local Government Sponsorship of Grant Projects to Mitigate Repetitive Loss Properties (FL-26)

- Continue to Encourage Communities to Increase Design Flood Elevation in Local Floodplain Ordinances (FL-23)
- Floodproofing of Public, Commercial, and Historic Buildings (FL-7)
- Structural Retrofit of Existing Buildings (MH-2)
- Non-Structural Retrofit of Existing Buildings (MH-3)
- Infrastructure Retrofit (MH-4)
- Minor Localized Flood Reduction Projects (FL-9)
- Promote and Implement Virginia Silver Jackets Program (FL-18)

Floodplain Management Plan of the Commonwealth of Virginia

- Principle #1: State Floodplain Management Programs Need Strong, Clear Authority (p. 6-10)
- Principle #2: State Floodplain Management Programs should be Comprehensive and Integrated With Other State Functions (p. 6-11)
- Principle #9: The levels of funding and staffing for floodplain management should meet the demand within the state (p. 6-14).
- Principle #10: Evaluation of the effectiveness of the State's Floodplain Management Program [and Incident Action Plan] is essential and successes should be documented (p. 6-14)
- Strategy #1: Enhance the Floodplain Management Program's Effectiveness in Coordinating NFIP activities and achieving the program's goal and objectives (p. 6-20)
- Strategy #5: Expand upon existing partnerships of floodplain management stakeholders and develop additional partnerships (p. 6-27)

Joint Legislative Audit and Review Commission Report

- Goal 15: Enhance inter- and intra-state collaboration to respond to natural and man-made emergencies.

Community Rating System Analysis

By itself, the National Incident Management System is unlikely to be eligible for CRS credit. However, some components may help to cover or encourage communities to undertake the activities that are requirements and prerequisites for CRS activities, specifically in Section 510, Floodplain Management Planning, and Section 610, Flood Warning and Response. For example, if the NIMS is to be used, additional credit may be available for Element 610c, Flood Response Operations Plan.

An "Incident Action Plan" may be eligible for up to 115 points under Element 610c, Flood Response Operations Plan. However, a statewide plan would have to be very detailed to meet all of the requirements and prerequisites. It may be that a state level plan is eligible for a small amount of Uniform Minimum Credit that all communities can take advantage of, if those communities fulfill most of the requirements on their own.

Existing Hazard Mitigation Plans and other emergency operations procedures may meet these requirements with minimal adjustments.

Level of Effort: Low. Based on existing community Hazard Mitigation Plans and emergency operations procedures, potentially low effort to earn CRS credit. Use of the National Incident Management System may help to cover prerequisites for Flood Response Operations Plan credit.

Cross-Credit Opportunities:

- An outreach project is required for credit under section 610. The outreach project can easily be designed to receive credit under section 330, Outreach Projects.
- Hazard Mitigation Plans are required if a community wishes to receive Hazard Mitigation Grant Program funding from FEMA, so many communities already have these plans in place. These may earn credit under Section 510, Floodplain Management Planning. Depending on their content, Hazard Mitigation Plans may also be eligible for additional credit in Section 330, Outreach Projects.

- Details:
  - Element 610c, Flood Response Operations Plan (FRO): Up to 115 points for implementation of specific tasks to reduce or prevent threats to health, safety, and property. Flooding must explicitly be addressed. The plan must include details about emergency warning systems, and specific actions taken based on different flood levels, and must be adopted each individual community (may be some wiggle room here depending on how it's implemented). An exercise and evaluation must be conducted annually. Full credit is available if all buildings in the SFHA are affected.
  - Prerequisites: Communities must receive credit for having a flood recognition system, emergency warning dissemination, and critical facilities planning. Prerequisites may already be met by Hazard Mitigation or Floodplain Management Plans, which receive separate CRS credit. Communities must also have and use flood inundation maps, or flood stage forecast maps that show at least three different flood or surge levels, and must conduct outreach to inform residents of flood procedures.
  - Consult Section 610 of the CRS Manual to ensure all requirements are met. Detail is essential for credit, and additional bonus points are available for certain elements. For example, if the National Incident Management System is utilized, additional bonus points may be available. Lower levels of credit are available if not all criteria are met.
  - Uniform Minimum Credit: If this is implemented by state agencies, all communities in the state may be granted credit for the state action if they meet the prerequisites. They will likely need to adopt the plan at the community level to receive credit.

VIMS RECOMMENDATION

THE STATE SHOULD INITIATE IDENTIFICATION, COLLECTION AND ANALYSIS OF DATA NEEDED TO SUPPORT EFFECTIVE PLANNING FOR RESPONSE TO RECURRENT FLOODING ISSUES IN VIRGINIA

"DATA AND MAPPING"
RECURRENT FLOODING SUB-PANEL RECOMMENDATIONS

- Establish **A SINGLE POINT OF REFERENCE** for reliable information (based on rigorous quality checks) on which to access consistent, timely and accurate information.
- Establish strategy to collect and maintain topographic / bathymetric LiDAR data for the Commonwealth, including coordinating with federal coastal mapping agencies such as NOAA, the Army Corps of Engineers and USGS.
- For a more accurate vulnerability assessment throughout the Commonwealth (also necessary for hazard mitigation planning), work with the Army Corps of Engineers, DCR and localities to update local HAZUS data (make requirement for funding eligibility)
- Recommend FEMA Special Flood Hazards Area be reassessed
- Develop and implement a Post-Incident Data Collection Plan. Deploy volunteers, damage assessment teams, low-cost sensors and community (via social media) to capture high water data and marks.
- Leverage Social Media and Crowdsourcing Technology such as Wetlands Watch's Sea Level Rise App and VDEM's ReadyVirginia App.

BACKGROUND AND EXPLANATIONS

One component of Sea Level Rise and Recurrent Flooding which is not lacking in terms of observations and response needs is sources of data. In fact, during research and discussions throughout the workgroups, one constant arose and was succinctly noted in a recent GAO report:

> *"According to NRC studies and decision makers and other infrastructure stakeholders we interviewed, decision makers are unsure about where to go for information and what information they should use because (1) vast amounts of information come from multiple, uncoordinated sources and (2) the quality of the information varies." (GAO-13-242, p. 39).*

Likewise, the Department of Defense is also committed to finding the most reliable sources of information. Per the DoD (Roadmap) Goal 2: *Utilize a robust decision making approach based on the best available science. (p. 5):*

Assessing climate change vulnerabilities, impacts, and adaptive responses requires a deliberative and iterative approach. The Department intends to develop appropriate assessment tools for use across all affected DoD Components. In developing its approach to assessment, adaptation planning, and implementation, the Department will strive to:

- Establish a process to obtain updated scientific data on potential future climate conditions and potential impacts;
- Use commonly accepted future climate scenarios that are based on the best available science, recognize uncertainties, and updated as the science changes;
- Provide guidance so that assessments consistently apply science that is appropriate in terms of location, resolution, and timeframe; and
- Use pilot approaches to develop decision frameworks for assessment and adaptation planning that attempt to match decisions to available and appropriately down-scaled climate information and other data.

In order to establish a single point of reference of all trusted planning sources, there must be a full data dive into all data mapping sources to determine the most credible and reliable sources for each data categorized need. To ascertain the quality and reliability of the date, an inventory of existing data must conducted. Over sixty (60) planning and response tools identified as potential resources by the Sub-Panel are provided in the Appendix I. With all the sources of information available, the question became "what information is needed?"

Essential Elements of Information

During the initial Data/Mapping workgroup it was decided to conduct a poll on what information is needed during planning and response phases, and on which tool users most rely. A summary of the results, provided on the following page, indicated a wide range of information needs by an equally wide range is stakeholder agencies. Furthermore, in some cases, the need for information highlighted a lack of awareness of its availability.

- GIS
- Based Flood Elevations (BFE)
- First Floor Building elevations
- Elevations of structure
- Bathymetry *(elevation of the seafloor or bay floor)*
- Comprehensive plans
- Depth grids
- FEMA maps
- Flood Depth Grids
- Google earth
- Google engine
- Hydraulic models
- Land use Plans
- LIDAR data
- Tidal data
- Recorded rain fall
- Topography
- Subsidence projections
- Tidal data and gauging
- Information on previous damage
- Mitigation
- Storm surge
- NOAA Sea Level Rise viewer
- Sea Level Rise scenarios

The simple conclusion was the information needs depended on the user. There is no "one size fits all" approach. To help address this issue, the Sub-Panel looks to two tools designed to consume information from multiple sources in order to establish a common operational picture, based on the defined needs and permissions of the user: the Flood Risk Information System (FRIS) and Virginia Information Sharing Program (VISP).

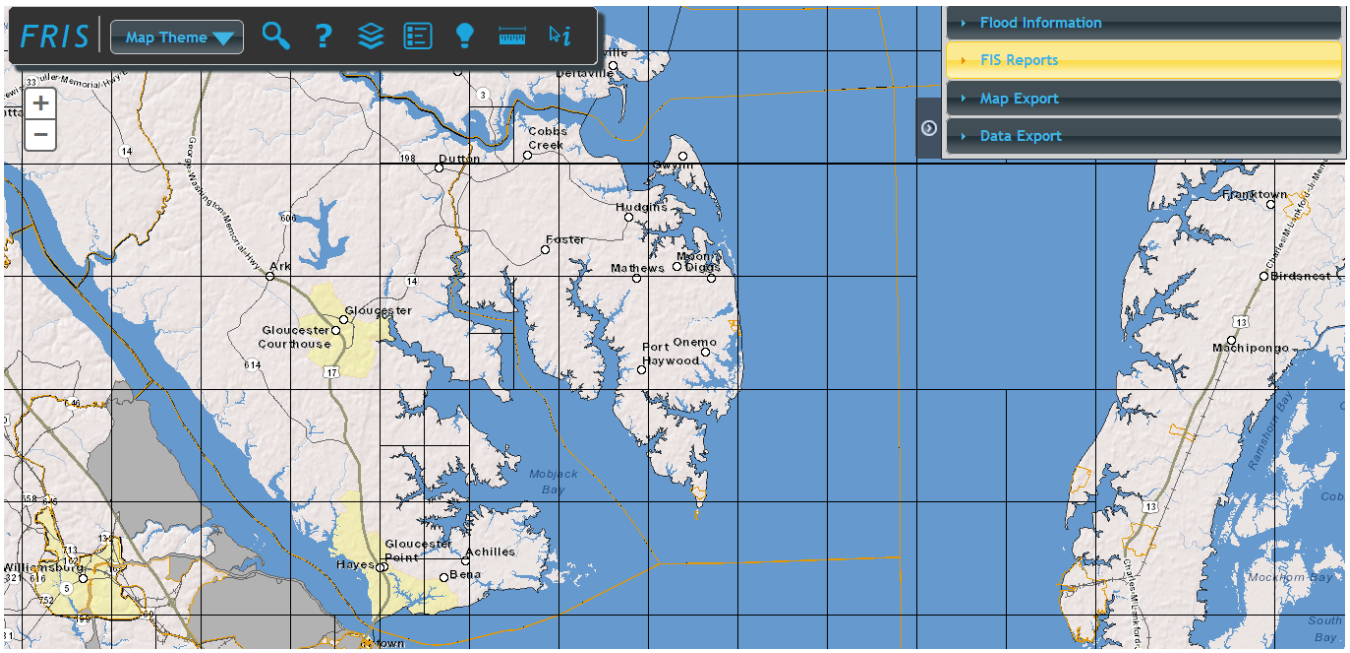
Virginia Flood Risk Information System (FRIS)

http://rfris.nc.gov/fris/?ST=VA

In 2012, under the Silver Jackets Pilot Program, the Virginia Silver Jackets Team, at the request of the Virginia Department of Conservation and Recreation, partnered with the North Carolina Floodplain Mapping Program to expand the existing website to host Virginia data. Beyond, the nationally available Federal Emergency Management Agency Map Service Center, the Commonwealth of Virginia did not have a state-wide Digital Flood Insurance Rate Map resource. As such, the availability of Flood Insurance Rate Maps fell upon the capability of each community, which may vary due to resources.

"Flooding is one of our most catastrophic and costly natural disasters," said [former] Governor McDonnell. Since both states share more than 400 miles of border and river basins with flooding hazards, this partnership makes economic sense and will provide seamless maps and data on flooding within those inter-state river basins. In these tough economic times, this agreement gives Virginia and North Carolina the opportunity to realize efficiencies and improve public service through a partnership that protects lives and reduces future flood damages."

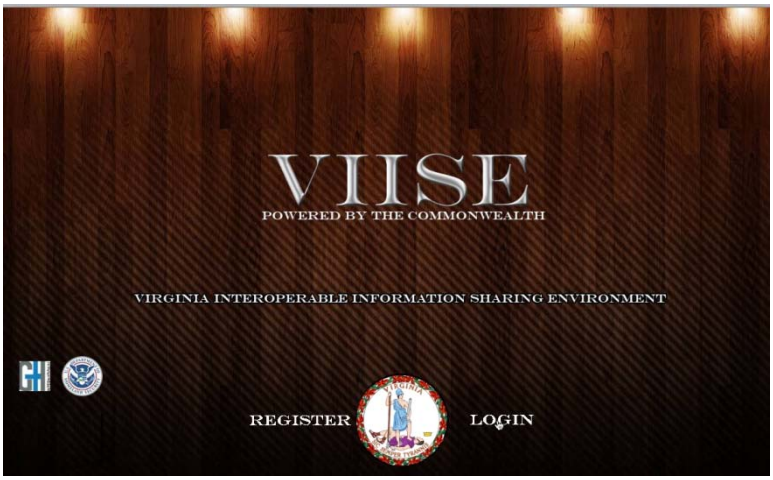
"The transition from paper to online digital floodplain maps and flood risk data will produce improved floodplain management through easier access to more accurate, up-to-date information at reduced cost," said Virginia Department of Conservation and Recreation Director David Johnson.



Citizens will be able to input the address of any property into the website to identify its location on a Digital National Flood Insurance Rate Map and determine if the property is in a Special Flood Hazard Area. Homebuyers will be able to make more informed decisions regarding flood risk when purchasing or building a home. Local governments, responsible for enforcing floodplain ordinances to enable their citizens to qualify for National Flood Insurance, will benefit from the statewide accessibility of digital maps and data. Local and state emergency responders also will benefit from easy access to seamless information to better protect lives and property.

In the future, as data becomes available, the website will allow users to estimate flood damage and costs to properties from various storms on an individual and community-wide basis. The data will be used to support and prioritize mitigation actions and increase education about hazard mitigation options to reduce flood danger and losses.

Virginia Information Sharing Program (VISP, formerly VIISE)
UNDER DEVELOPMENT



The 2013 JLARC Review on Disaster Preparedness in Virginia also mentions Virginia's Preparedness Priorities, of which one is Goal 4: "Develop an information sharing systems that includes federal, state, local, volunteer, and private partners in support of a comprehensive Common Operating Picture for emergency management applications (JLARC, Exhibit 1, p. 10)

The concept of VIISE is to consume information from various sources in an effort to develop a more real-time situational awareness for all stakeholders. This can be used in planning as well as response. It may be possible for one situational awareness package to be developed reflecting all overlays and resources from other sites into one common operating picture.

Data Management and Governance

It is not enough to decide which programs may be useful in planning and responding to flooding and Sea Level Rise. Equally important is the "Assembling [of] records into a consistent database …for development of a state strategy, but it will require time and resources beyond those available for this report." (VIMS Recurrent Flooding Report, p. 6). A data management strategy (user group, etc) for this data including what information will be shared, how, by whom, and in what consistent format. This will include parcel data, finished floor elevations, etc. Standards will need to be developed and implemented for consistent, current data.

One State-level initiative which already exists in developing a governance structure for information sharing is the Critical And Situational Awareness Working Group (CASAWAG). This group developed a policy recommendation for incorporation of information sharing into the Commonwealth of Virginia Emergency Operations Plan (COVEOP) and appropriate SOPs. Col. Bob Mauskapf (Ret.), Director of Emergency Preparedness with Virginia Public Health has also presented to the Secure Commonwealth Panel (SCP) on a number of occasions, which tasked the Homeland Security Working Group and CASAWG with carrying out the recommendation. The Virginia Interoperable Information Sharing Environment (VIISE) was another product on which this group had been working.

The governance and policy models established by this group should be leveraged to address this additional focus on information sharing. In addition, under a sub-component to the CASAWAG, the group should

a) Identify defined standards to allow different data paths / sharing of information to be consumed by various tools.
b) Establish an update schedule for data sets and standards
c) Develop a gap assessment on what data is available, what is needed, what is outdated and determine priorities to address.

An immediate gap shared by the Data/Mapping workgroup was the lack of any statewide First Floor elevation data, for which the approach thus far has been piecemeal and pushed to the localities. North Carolina was mentioned as a State with an effective program in place to collect such information. Along with collecting this data from the localities that have it, in an effort to paint a more accurate picture at the State level, there was strong interest in identifying and cataloging what information already exists, where, what is needed, and what is planned in the near and long-term. Moreover, a minimum standard to this data collection and labeling must be incorporated (interface formats / interchange data). The information should also be maintained and available to all agencies that need it based on proper permission / access / agreements, etc.

HAZUS - MH, Hazards United States - Multi- Hazard was another tool which is often used but out of date and inaccurate. Used by FEMA among other Federal, State and Local agencies, particularly for mitigation planning, HAZUS is used to run models for estimating potential impacts (economic and social) from flooding (as well as earthquakes and hurricanes). While working with localities to update VFRIS, efforts should be made to update Hazus data sets to ensure a most accurate picture of potential loss throughout coastal Virginia. An updated version of HAZUS is currently under development by FEMA and is expected to be released towards the end of 2014. Ms. Hamor of the Army Corps of Engineers shared the following sets:

- Building footprints or parcels including the following attributes:
    - Land use (for each parcel/footprint) as specific as possible. For example it is important to know if it is a single family or multi-family residential unit, not just a residential structure.

- Building value (assessed value in actual $)
- Content value - this can be calculated as a percentage of the structure based upon land use.
- Total built area of each structure
- Number of buildings per parcel
- Year built
- Foundation Type (slab on grade, crawl space etc.)
- Building type (wood, masonry, concrete, steel etc.)
- First floor height (can be estimate from elevation certificates or local knowledge)
    - Other potential information to collect for CI/KR
    - (Elevation/location of backup generators, storm sewer elevations, Fiber optic, telecom, and other utility hook-ups: cox cable, water, sewer, gas, electricity).
    - Promote the participation in the USACE Emergency Power Facility Assessment Tool

- Additionally, information should be collected on critical facilities, including fire stations, emergency operation centers, hospitals, police stations, schools, etc.
- While collecting this information, wind rating is also a valuable data for critical facilities in coastal areas (as it relates to hurricane impacts).
- Other data regarding transportation and utility infrastructure is also welcome. This could include the location of transit shelters and facilities.

Note: The proposed building data is ambitious and would require close cooperation with local tax assessors and GIS staffs. It would be immensely valuable data, however, and a subgroup comprised of NOAA, VGIN, VDEM and localities could work through the details out.

As it pertains to updating and collecting data, Mr. Joe Lerch of the Virginia Municipal League referenced information included in a bill presented to Virginia legislators:

> *The Department of Environmental Quality shall provide a grant from the Water Quality Improvement Fund to provide for statewide digital orthography, in cooperation with the Virginia Information Technologies Agency's Geographic Information Network Division, to significantly improve the resolution of the statewide digital orthography files used by the Commonwealth and the localities responsible for implementation of Watershed Implementation Plan water quality improvements. As a component of this effort, the department shall also include data to update prior LIDAR surveys of elevations along coastal areas to support activities related to the management of recurrent coastal flooding."*
> *http://leg2.state.va.us/WebData/14amend5002.nsf/bdaf73bc8841c0778525688b005f54a8/83d851e09df6aa8a85257ca60008bac9?OpenDocument*

Taking the data which exists along with the "wish list" of needs, there should be a prioritization of effort. *The group felt Prioritization #1 should be acquiring consistent high-resolution*

elevation data for the state, and then the collection of first floor elevation data and shallow water bathymetry (Though there was a warning about relying solely on FIRM or first floor elevation data).

Ms. Ashley Chappell announced NOAA's interest in conducting a gap assessment on data – to include building footprints and elevations - and priorities. They are also looking to automate elevation data in their products.

Post-Incident Data Collection

Of course, models and simulations are only as good as the data entered into them. Such programs often rely on *reported* impact information. Unfortunately, too often high water marks and other data go unreported after an incident. There was unanimous consensus among the Data/Mapping workgroup that a post-incident data collection plan should be developed (which results in additional Community Rating System points for those participating localities). Just as localities are required to submit an initial damage assessment within 72 hours of an incident to include damages to public and private property and infrastructure, inclusion of observed flooding data and damages could/should be included not only for potential public assistance funding, but to further calibrate planning models. Capturing high water marks could be accomplished by deploying volunteers, damage assessment teams, and other force multipliers throughout the community (via social media) to capture high water data and marks.

Other resources exist to capture post-incident information:

- USGS Mobile Storm Surge Sensor Network
- Civil Air Patrol obliques,
- NOAA National Geodetic Survey overflights
- Local Pictometry – all of which should be submitted in one location for all stakeholders who rely on such data.

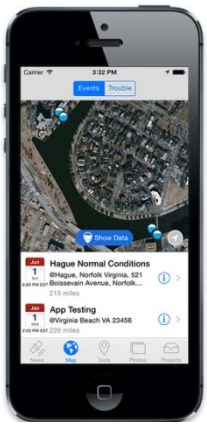
NASA Langley Flood Impact Analysis Tool

NASA's Flood Impact Analysis Tool illustrates water level impact from an authoritative prediction source. Years ago NASA Langley developed a Flood Impact Analysis Tool which is based on GIS and also web enabled, utilized by NASA LaRC, Johnson Space Center, Langley Air Force Base, and more recently City of Poquoson. It is not a predictive tool, but rather it illustrates water level impact from an authoritative prediction source. Again, the more accurate the data (see HAZUS, p. 46), the better the outcomes.

Intelligence through Social Media and Crowdsourcing

Social Media and Crowdsourcing tools have proven quite effective in not only pushing information out, but retrieving it was well. Once again, Virginia has some excellent tools already in which to leverage and otherwise engage the community in flood awareness and preparedness.

Wetlands Watch has developed a flood-related phone app and is getting some exposure in the Norfolk area for beta testing. Information is currently available online at HamptonRoadsCares.org.



The Virginia Department of Emergency Management (VDEM) also maintains a mobile app called "ReadyVirginia" available at vaemergency.gov. This is an effective tool in distributing preparedness information and was recently presented to the White House as a Best Practice.

The opportunity may exist to incorporate the capabilities of Wetland Watch's Sea Level Rise app with the ReadyVirginia app.

These recommendations are in line with:

2008 Climate Change Commission Report

- Complete topographic / bathymetric LiDAR mapping and incorporate into GIS standardized across of Coastal Virginia.

U.S. Army Corps of Engineers "Sandy Comprehensive Plan"

- Outcomes: Closed data gaps and enhanced tools (Main report, p. 8)

Commonwealth of Virginia Hazard Mitigation Plan

- Incorporating Updated Flood Frequency Data into Updated DFIRMS (FL-15)

- Continued Natural Hazard Information Collection and Sharing (MH-21)
- Incorporate Hazard Mitigation into Data Collection Processes for State Facilities and Assets (MH-22)
- Real Time Flood Inundation Program (FL-14)
- TIDEWATCH Program (FL-4)
- FEMA Risk Map Program (FL-19)
- SUPPORT VIRGINIA FLOOD RISK INFORMATION SYSTEM – (FL-20), P. 5-28.
- Continued Natural Hazard Information Collection and Sharing (MH-21)
- Real Time Flood Inundation Program (FL-14)

Floodplain Management Plan of the Commonwealth of Virginia

- Hazard Mapping; Future Considerations (p. 5-29 – 5-30)
- Strategy #2: Expand the Role of the Program in Floodplain Management Activities (p. 6-21)

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- Goal 4: Develop information sharing system that includes federal, state, local, volunteer and private partners in support of a comprehensive Common Operating Picture for emergency management applications

Community Rating System Analysis

Up to 160 points may be available in 410d, Higher Study Standards, for providing better topographic data than FEMA has used or plans to use for the next FIRM update. Up to 132 points may be available in 410g, Cooperating Technical Partner, for entering into a partnership with FEMA where the partner agrees to provide certain map information, such as LiDAR. Uniform Minimum Credit is likely to be available for both of these activities if they are undertaken on a state or regional level.

Level of effort: Low – High. The Cooperating Technical Partnership should be relatively easy if the strategy proposed is set up and maintained, but the likelihood of a state or regional entity using that data to create new flood analyses and maps is low.

Cross-Credit Opportunities:

- If the LiDAR is used to create new maps that were not paid for in full by FEMA, up to 290 points can be earned in Element 410a, New Study (NS).
- If the LiDAR is used in hydraulic analyses that were not paid for in full by FEMA, a multiplier can be applied to earned credit under Element 410b, Leverage (LEV).
- If the LiDAR is used in hydraulic analyses or to improve accuracy of floodplain boundaries and elevations, that were not paid for in full by

FEMA, up to 160 points may be available in 410d, Higher Study Standards (HSS).

- Details:
  - Up to 160 points may be available in Element 410d, Higher Study Standards, for providing FEMA with a base map that has better topographic data than what is currently available from USGS or that exceeds current NFIP standards. Note that if USGS succeeds in its effort to provide LiDAR to the whole country, a state effort would not be necessary or better than USGS's data and no credit would be available.
  - Up to 132 points are available for entering into a Cooperative Technical Partnership with FEMA, credited under Element 410g, Cooperating Technical Partner (CTP). This means that the entity (which does not necessarily have to be the state) agrees to provide certain map information; in this case, improved or new topographic data. Data must be submitted to FEMA to revise the affected FIRMs; when available, the new FIRMs must be adopted for regulation.
  - Uniform Minimum Credit would be available for coastal communities, and is common in other states with Cooperating Technical Partnerships. Uniform Minimum Credit may also be available if LiDAR is provided for all coastal communities by a state or regional entity.

For a more accurate vulnerability assessment throughout the Commonwealth (also necessary for hazard mitigation planning), work with the Army Corps of Engineers, DCR and localities to update local HAZUS data (make requirement for funding eligibility)

- CRS Credit Summary: No direct credit, but data may be useful for earning credit in several activities, more specifically in 320 Map Information Service, 360 Flood Protection Information, 410 Floodplain Mapping, 440 Flood Data Maintenance (Additional Map Data), 510 Floodplain Management Planning, 610 Flood Warning and Response, 620 Levees, and 630 Dams.

No credit is explicitly available for a Post-Incident Data Collection Plan, but the use of the data can earn credit. Up to 50 points are available in Element 330b, Flood Response Preparations (FRP), for public information projects implemented during and after a flood. Data collected under this program can earn up to 20 points under Element 320f, Historical Flood Information, (MI6). It must be easily accessible by community staff and staff must be able to share the information for the purpose of any public inquiry.

- Level of Effort: Low. Any outreach efforts could be tied into other emergency warning or preparation outreach, and can be targeted to specific audiences to earn more points. Including the information into existing flood information and mapping should be simple and straightforward.
- Cross-Credit Opportunities:

- Credit is available in 320f, Historical Flood Information, for tracking historical flood information and informing anyone who asks about an affected property location of its flood history.
- Credit may be available in 330b, Flood Response Preparation, for specific outreach and messages that could be associated with the data collection and recruiting of volunteers.
- Over time, flood depth data maps can be created, earning up to 20 points in Element 320d, Flood Depth Data (MI4).
- The information would contribute to data in a Hazard Mitigation Plan, which can earn or help to earn credit in Sections 510 and 610, but the data itself will not earn any points in these plans.
- If the same social media outlets are used to convey emergency warnings, up to 55 points may be available for 610b, Emergency Warning Dissemination (EWD).

Invest time and effort into maximizing use of FRIS (DCR's Flood Risk Information System) and/or use that data in a public-facing view of VISP.

- CRS Summary: If the state maintains and updates the FIRS and communities use the data layers, it may be possible to earn up to 160 points in Element 440a, Additional Map Data (AMD). North Carolina communities can earn up to 122 points for using the FRIS system, but it is unclear if that is because the FRIS system is based in North Carolina.
- Level of Effort: Low. This will need a more thorough review by ISO, but it may be that community credit and Uniform Minimum Credit is available for the existing website as is.
- Cross-Credit Opportunities
    - Depending what data is made available through the system, points could be earned in the other mapping categories: 320 Map Information Service and 410 Floodplain Mapping.
- Details:
    - The Flood Risk Information System already covers several elements that may earn points in section 440a, Additional Map Data. These include SFHA boundaries, corporate limits, streets, buildings, coastal high-hazard areas, floodways, base flood elevations, and FIRM zone names. These may earn approximately 54 points, and may be eligible for Uniform Minimum Credit.
    - Additional information that could be added and would earn points are parcel or lot boundaries, building outlines or footprints, x-zone elevations or boundaries (current FRIS tells whether a location is in the x-zone, but doesn't show the boundaries or give elevations), other natural hazards, topographic contour lines, include floodplain data in tax assessment database, layers for all FIRMs in effect after the date of the community's CRS application,

other overlays for regulation including Hazus-MH layers, natural floodplain functions, building elevation data
- See section 440 in the CRS Manual for more information.

VIMS RECOMMENDATION

THE STATE SHOULD DEVELOP A COMPREHENSIVE STRATEGY FOR ADDRESSING RECURRENT FLOODING ISSUES THROUGHOUT TIDEWATER VIRGINIA

a. Part of that strategy should include prioritization of areas for flood management actions based (in part) on risk

b. Detailed studies should be done of prioritized areas to determine:

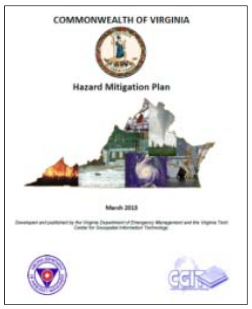
i. Potential adaptation strategies appropriate to the area
ii. Implementation feasibility of identified strategies
iii. Cost/benefit of identified strategies

"PROJECT CRITERION AND PRIORITIZATION"
SUB-PANEL RECOMMENDATIONS

- Develop project and resource prioritization criteria
- Develop funding eligibility criteria
- Have projects / designs / applications prepared in advance for potential, unannounced, short-fused funding opportunities.

BACKGROUND AND EXPLANATIONS

Per the Disaster Mitigation Act of 2000 (addendum to the Robert T. Stafford Act):



§201.4(c)(ii): The State mitigation strategy shall include a] description of State goals to guide the selection of activities to mitigate and reduce potential losses.

§201.4(c)(3)(iii): An identification, evaluation, and prioritization of cost-effective, environmentally sound, and technically feasible mitigation actions and activities the State is considering and an explanation of how each

activity contributes to the overall mitigation strategy. This section should be linked to local plans, where specific local actions and projects are identified.

In order to prioritize projects for a Flood Resilience Action Plan, there must be planning assumptions made – the first of which is…

To what level should the Commonwealth adopt for SLR planning?

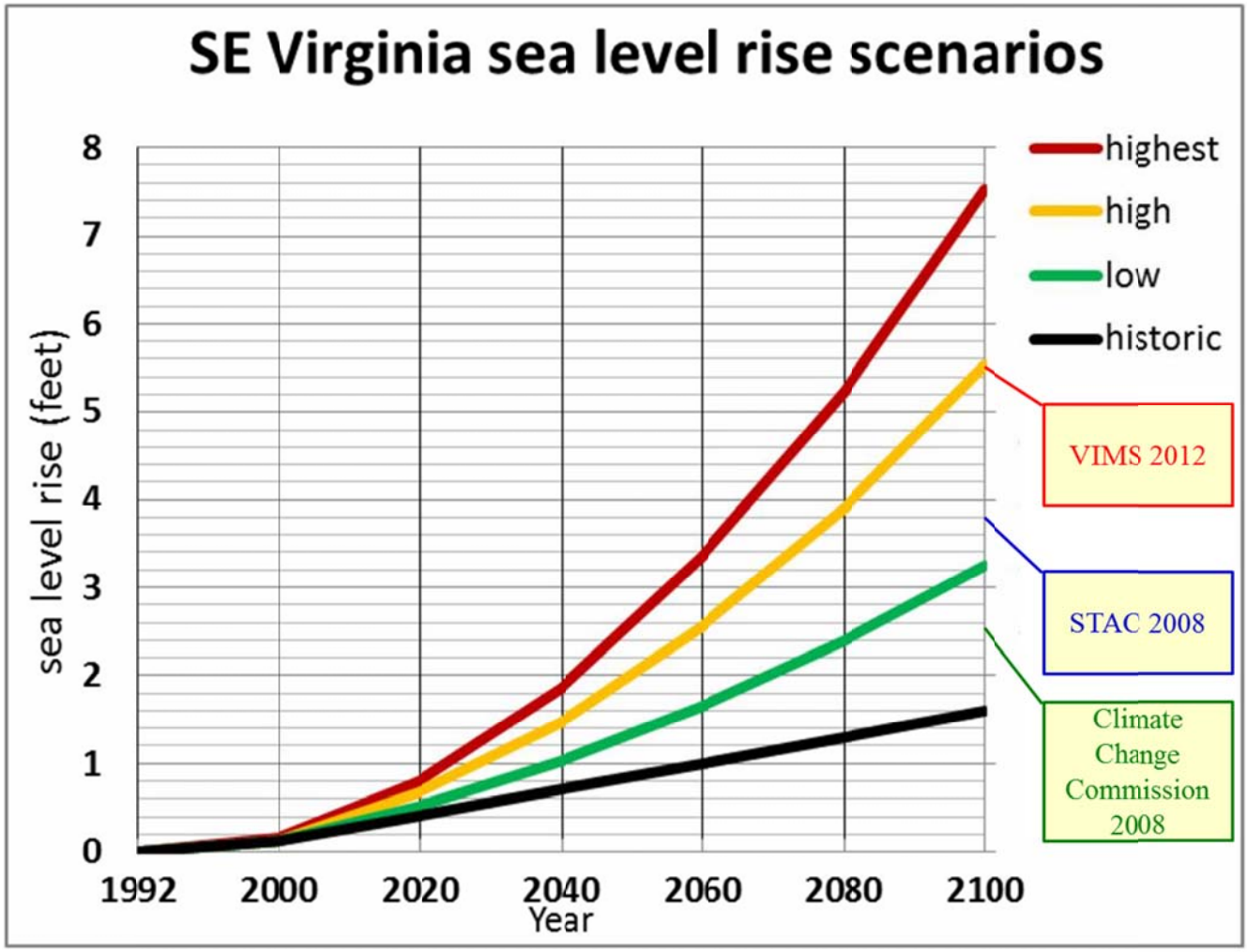
THE Level to Plan for Sea Level Rise

The most oft-asked question, with an even more elusive answer, has been to what level of Sea Level Rise should the Commonwealth and its localities plan. There have been several levels already proposed, two of which come from studies on which this report is based.

- The *2008 Climate Change study recommended 2.4' by 2100;*
- *VIMS: 1.5' over the next 20-50 years*

The most brief and appropriate response is simply *it depends* for a variety of reasons of which one is as follows: "Flooding occurs in all Virginia's coastal localities, but the potential risks from Sea Level Rise and moderate storm surges are not uniformly distributed" (VIMS Recurrent Flooding Study, p. 10).

Rear Admiral David W. Titley (ret.), who led the U.S. Navy's Task Force on Climate Change, a post now held by RADM Jonathan White, spoke at an international conference hosted by Old Dominion University called "Transatlantic Solutions to Sea Level Rise Adaptation: Moving Beyond the Threat." (October 30, 2013). There, RADM Titley encouraged the community to rely on nature to dictate which level and what resources to utilize. For example, rather than expend all limited resources for the worst-case scenario which may or may not happen, instead plan for the most likely and mitigate in such a way as to leave the opportunity to add to the measure at a later date (see Adaptive Management Approach, p. 33-34). This type of approach is prudent and will be recommended; however, still there must be a number Virginia recognizes as the standard. To achieve this, the Sub-Panel had to rely on the most recent information available:



Source: Dr. Carl Hershner, Virginia Institute of Marine Science, 2012

Based on the graph above, there seems to be the greatest level of confidence in VIMS' 1.5' rise in sea level by the year 2040. (Note: 4-6' expected by 2100…). This was proposed by VIMS *(p. 13)* and is in line with the National Climate Assessment. Therefore, this is the proposed level to which Coastal areas of the Commonwealth should plan. Furthermore, this should be a mandate for any agencies seeking state funding – regardless of sector or level of government.

WARNING: Accepting 1.5' for planning is simply the first step to move toward action. It should be noted, however, the concept of planning for a certain SLR trajectory/level gives the false impression that there is a rational basis for deciding on what is a safe level. The next step is to take a scenario-based and probabilistic approach and using the full spectrum of what might happen in terms of SLR to assess the risk in any given location is a more rational approach to decision-making. It is more complex – much like the issue being addressed - but it can be done.

CAUTION: This 1.5' of Sea Level Rise is <u>inundation</u> <u>only</u>; it is important to remember the increased inundation caused by Sea Level Rise is not the only concern. Along with increased depth, duration and frequency of flooding, the threat includes total anticipated water level from storm surge, tidal activity, waves, freshwater input / precipitation and shoreline erosion. *Note: VIMS applied a 3' storm surge in their Recurrent Flood report (VIMS, p. 8).* Put differently, if using the 1933 Ash Wednesday Storm as the flooding storm of record, add 1 meter (3') to see how much more destructive the storm would have been today, and then in the near future. Additionally, planning and mitigation should be done with the *expectation* water will continue to rise in the future.

CAUTION: Lifespan of a project must be considered! Planning, for example, for a new power plant, a new land fill, other critical infrastructure, new residential areas with lifelines of more than a century, a very different approach is needed than accepting just 1.5' of SLR.

Did You Know? With 2' of Sea Level Rise over 100 years, Virginia stands to lose between 50 and 80 percent of its tidal wetlands." - *Wetlands Watch, 2007*

Scenario Planning

More than relying on one number on which to base planning decisions – which is a critical step to move off dead center - the next crucial step is the use of planning scenarios and incorporating "what-if's." This approach is recommended by the U.S. Army Corps of Engineers in their Sandy Comprehensive Plan, the Strategic Environmental Research and Development Program, the Delta Commission, Old Dominion University and many more. As stated by Dr. Hans-Pete Plag of ODU: "We simply do not know what WILL happen and we cannot predict this. But we know what might happen, and we can assess the risk which each of the possible scenarios.

Army Corps of Engineer's SLR Calculator

Along with a defined level to which the State should accept, one tool to help augment Virginia's planning comes from the U.S. Army Corps of Engineers, which plans for the next 50 years. Per their North Atlantic Coastal Comprehensive Study (NACCS): the USACE utilizes a Sea Level Change Curve Calculator which takes into account the following:

- *USACE SLC Coefficients*
- *Base Year (Mid Point of NTDE)*
- *Project Start Year*
- *Rate of Eustatic Sea Level Rise per year in mm*
- *Rate of Subsidence per year in mm*
    - *Land subsidence = 2.7 millimeters/year or about 0.1"/year (VIMS, p. 12)*

- *Closest NOAA gauge station*
    - *Gloucester Point (now located at the Yorktown USCG station)*
    - *Kiptopeke*
    - *Lewisetta*
    - *Portsmouth*
    - *Sewell's Point*
- *FEMA Base Flood Elevation*
- *Project End Year*

The Sub-Panel recommends the use of a Sea Level Rise projection calculator which allows for the projection of multiple curves based on different rates of Sea Level Rise. The USACE calculator is an appropriate template for Virginia to use; however, it should be informed with the latest scientific understanding of global Sea Level Rise as well as regional subsidence. It is recommended the values used in the Virginia calculator be updated on a regular basis by a scientific committee consisting of experts from the Commonwealth (ala those agencies in the Planning Section.

Develop project prioritization criteria to foster the ability to identify Virginia's highest-priority needs. (JLARC, p. 25).

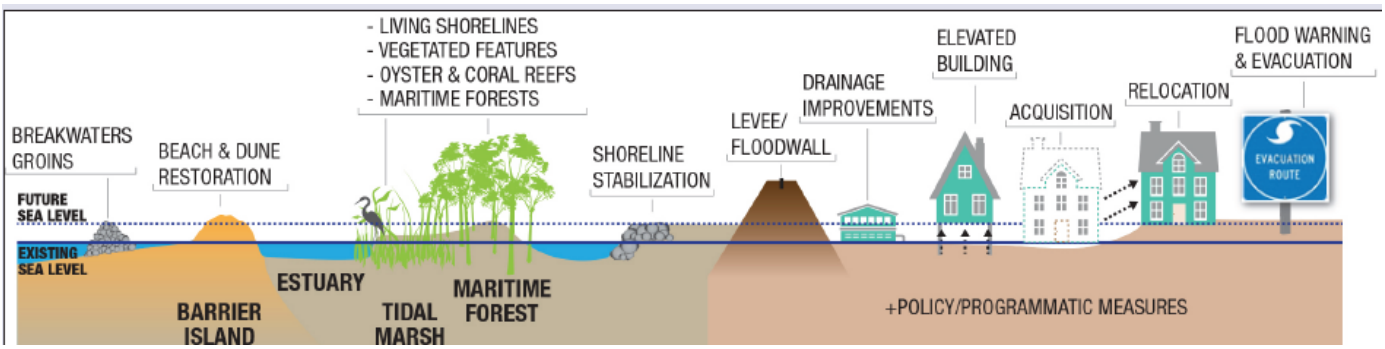
'State Lacks Mechanism for Evaluating the Need of Proposed Projects' (JLARC, p. 106)

Project Prioritization Criterion

In addition to a SLR planning range, additional criteria are needed in order to establish not only the effectiveness of the action and return on investment, but in determining the prioritization of the projects as well. List of potential mitigation actions are included in Appendix II of this report. A brief bulleted summary of these measures is as follows:

- *Natural and Nature-Based Measures*
    - *Dunes and Beaches*
    - *Salt Marshes, Wetlands, Submerged Aquatic Vegetation (SAV)*
    - *Oyster and Coral Reefs*
    - *Barrier Islands*
    - *Maritime Forests/Shrub Communities*
- *Nonstructural Measures*
    - *Floodplain Policy and Management*
    - *Floodproofing and Impact Reduction*
    - *Flood Warning and Preparedness*
    - *Relocation*

- *Structural Measures*
    - *Levees*
    - *Storm Surge Barriers*
    - *Seawalls and Revetments*
    - *Groins*
    - *Detached Breakwaters*



Graphic from USACE NACCS, p. 7

With so many stakeholders and so many potential projects, it can be difficult to determine which projects require the most immediate attention while also mitigating any unacceptable adverse impacts on the environment or neighboring areas. A thorough, fair and equitable vetting process is needed. This is not only to mitigate those localities with the most resources receiving the most attention, but that those areas in all of coastal Virginia receive equal consideration and only those with the greatest need across a number of factors most crucial to the Commonwealth – *and most preferably at the regional or watershed level* - are addressed accordingly.

Some criteria to prioritize and support such actions should include:

- *Risk Exposure and Vulnerability*
    - *Regional / Watershed approach versus Locality*
    - *Social Impact*
    - *Economic Impact (utilizing <u>updated</u> HAZUS information)*
    - *Impacts to Critical Infrastructure / Key Resources*
- *Appropriate / Effectiveness of Mitigation Action based on Shoreline Type, etc…*
    - *At regional / watershed level versus locality*
    - *Include USACE SLR Calculation Results*
    - *Adverse Impact(s)*
- *Opportunities to partner with and leverage private sector resources*
- *Opportunities to incorporate strategies to limit excessive water run-off, such as impervious surfaces, roof gardens, etc.*
- *Life Expectancy of the Project*
- *Is the action in line with the priorities of the Mayors, County Executives and City Managers?*

- *Available Funding*
- *Cost / Benefit Analysis*
    - *Maintenance / Sustainment*
    - *Return on Investment*
        - *Including Community Rating System (CRS) points*

Based on the project criterion, a multi-criteria decision analysis should be utilized to help determine the greatest need based on point values. This is done with the Hampton Roads Transportation Planning Organization for the prioritization of transportation projects. Old Dominion University's Virginia Modeling, Analysis and Simulations Center has also established processes by which projects are prioritized based on impartial point values. They currently do this for the Virginia Department of Emergency Management in prioritizing State Homeland Security Grant Program projects as well as for the Hampton Roads Urban Area Security Initiative investments.

the heartbeat of HAMPTON ROADS TPO
TRANSPORTATION PLANNING ORGANIZATION

Projects Scores and Prioritization under Climate-Change Scenarios

Projects Scores

Below are the scores (out of 100, with 100 being the best) that each project received under the baseline and each scenario.

Projects ...

Scenarios

Project Scores

	HRBT/1 - 64 (9 - lane)	Third Crossing: Craney Island Connec	Third Crossing: Complete Implementa	Third Crossing: East - West Bridge	Third Crossing	Third Cro	HRBT/1	I - 64 So	Midtown	Dominion	MLK Free	Route 60 John Lesner Bridge (Shor	Fort Eustis Blvd Bridge Re	Route 17 (Bridg	Kings
	Brid	Brid	Brid	Brid	Brid	Brid	Brid	Brid	Brid	Brid	Brid	Brid	Brid	Brid	Brid
	Inte	Inte	Inte	Inte	Inte	Inte	Inte	Inte	Prim	Prim	Prim	Urb	Urb	Urb	Urb
Baseline	207	202	201	190	187	178	171	160	242	220	176	173	165	150	139
S1. Scenario 1	207	202	201	190	187	178	171	160	242	220	176	173	165	150	139
[illegible]	206	202	201	188	185	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	163	150	140
[illegible]	207	202	201	190	187	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	165	150	139
S4. Scenario 4	207	202	201	190	187	178	171	160	242	220	176	173	165	150	139
S5. Scenario 5	211	202	201	173	170	167	174	147	231	212	183	160	157	148	130
Base Score	211	202	201	190	187	178	174	160	242	220	183	173	165	150	140

Those projects studied and proposed by the Planning Section and approved by the Resilience Coordinator to be accomplished over the next operational period (the next four years) will be listed in the Flood Resilience Action Plan – as part of the updated Floodplain Management Plan for the Commonwealth of Virginia. Furthermore, the Commonwealth must have project investments ready to go in the event funding comes available unexpectedly through funding reallocations, philanthropic generosity or other sources.

Where to Start Identifying Potential Projects?
A list of potential projects proposed for the Commonwealth of Virginia is available in Virginia's Natural Hazard Mitigation Plan, the Floodplain Management Plan for the Commonwealth of Virginia as well as the Corps of Engineers North Atlantic Coastal Comprehensive Study (NACCS, Appendix O, p. 91-92).

Per Sec. 100216, section (d) of the Biggert-Waters Act, once a mitigation project is completed, a review / update of the area's flood mapping should be conducted. These actions should provide flood insurance relief for those property owners in the areas mitigated.

The Sub-Panel also recommends the identification of State facilities as well as critical infrastructure in the Commonwealth and begin to prioritize for mitigation/adaptation action.

What authority does the Commonwealth have to ensure critical infrastructure owned by the private sector also takes SLR into account in their preparedness activities?

Critical Infrastructure and Key Resources are defined by the Department of Homeland Security as "the assets, systems, and networks, whether physical or virtual, so vital to the United States that their incapacitation or destruction would have a debilitating effect on security, national economic security, public health or safety, or any combination thereof" (Critical Infrastructure) and "Publicly or privately controlled resources essential to the minimal operations of the economy and government" (Key Resources).

With the fact over 80% of the nation's critical infrastructure / key resources (CI/KR) is owned and operated by the private sector; the Federal Government has made the protection of the nation's CI/KR a national priority through Presidential Policy Directives and other legislation.

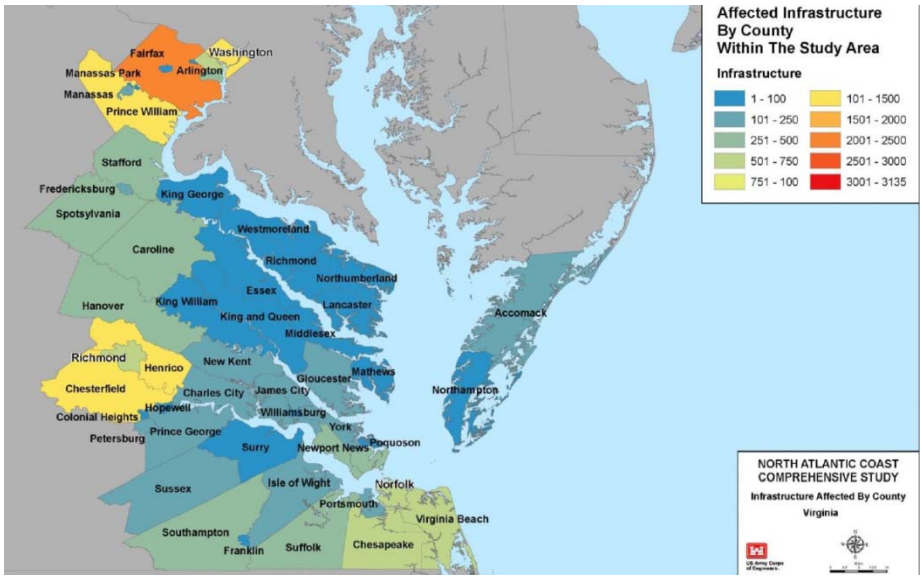
Presidential Policy Directive (PPD) 21
This directive establishes national policy on critical infrastructure security and resilience. This endeavor is a shared responsibility among the Federal, state, local, tribal, and territorial (SLTT) entities, and public and private owners and operators of critical infrastructure (herein referred to as "critical infrastructure owners and operators"). This directive also refines and clarifies the critical infrastructure-related functions, roles, and responsibilities across the Federal Government, as well as enhances overall coordination and collaboration. The Federal Government also has a responsibility to strengthen the security and resilience of its own critical infrastructure, for the continuity of national essential functions, and to organize itself to partner effectively with and add value to the security and resilience efforts of critical infrastructure owners and operators.

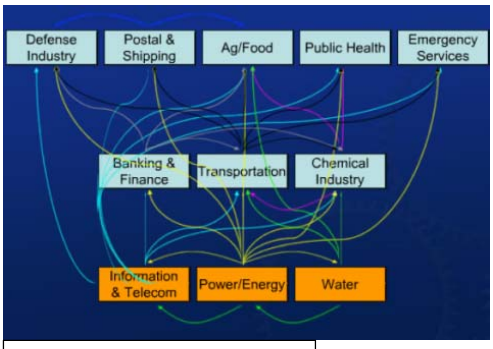
Post-Katrina Emergency Reform Act of 2006 (PKEMRA)
Directs that risk-based targets include "variables of threat, vulnerability, and consequences related to population, as well as areas of high population density, ***critical infrastructure***, coastline, and international borders."

Virginia Code: § 44-146.22. Part B: Development of measures to prevent or reduce harmful consequences of disasters; disclosure of information - involves the protection of the nation's critical infrastructure sectors and components that are located in Virginia.

Virginia, and Coastal Virginia in particular, is home to numerous CI/KR vulnerable to Recurrent Flooding and Sea Level Rise. Some of these vulnerabilities are well known and some are not. This graphic and the following table reflect the amount of infrastructure by county in Coastal Virginia and vulnerable to flooding.

Type of Infrastructure	Total		Type of Infrastructure	Total
Amtrak Station	60		Nursing Home	428
Bottled Water Manufacturer	21		Oil/Gas Interconnection	7
Bus Station	474		Oil Refinery	1
Cell Tower	588		Petroleum Pump Station	1
Electric Gen Units	913		Pharmacies	903
Electric Power Substation	499		Pol Terminal Storage	39
Ferry	13		Port	138
Fire Station	436		Power Generation Plant	73
Gas Station	1684		Prison	67
Historic Site	57		Private School	463
Hospital	57		Rail Bridge	537
Ice Manufacturer	9		Rail Station	47
Law Enforcement	225		Receiving Hospital	9
Local Emergency Operations Center	61		Road/Rail Bridge	6245
Natural Gas Receipt/Delivery Facility	28		Service Provider	4
Natural Gas Storage Facility	1		State Emergency Operations Center	1
Emergency Shelter	325		Urgent Care Center	103
Nuclear Power Plant	1		Wastewater Treatment Plant	30





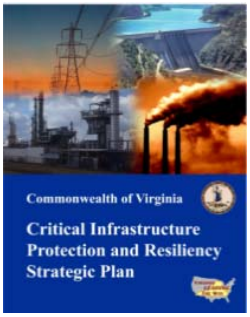
Graphic by Ted G. Lewis, Ph.D.
Prof. Computer Science
Naval Post-Graduate School

"When there is a shared understanding of our interdependencies, a dialogue about resilience of the broader system we all are a part of can facilitate bringing different stakeholders closer together and identifying where interests are aligned" (Turbulence, p. 34).

Protection of Critical Infrastructure and Key Resources

The question about what authority the State, and specifically the State Corporation Commission (SCC), has over a private utility is not new. In fact, it was the focus of a previous Sub-Panel for the Secure Commonwealth Panel: the E9-1-1 Sub-Panel, led by Panel Member Dario Marquez (report submitted May 6, 2013). Prior to this, it was a recommendation of Governor Kaine's 2008 Climate Change Commission report. In all instances, it appears SCC authority is "limited and mainly advisory in nature." W&M Law School's VCPC Legal Research Assistant Chric Olcott suggests the SCC "may plausibly require some hardening or resilience measures for the construction of new electricity generation facilities under its statutory mandate to monitor such capital projects to ensure they are being performed in an "economical, efficient and expeditious manner."

It is worthy to note SB381 was signed by Governor McAuliffe on April 2, 2014 effectively realigning state roles and responsibilities and renaming two new secretariats: Secretary of Veterans and Defense Affairs and the Secretary of Public Safety and Homeland Security. Per the Governor's press release, one of the charges under the Secretary of Public Safety and Homeland Security is *ensuring development and implementation of plans for protecting public critical infrastructure*.



Virginia currently maintains a plan focused on the protection of the Commonwealth's Critical Infrastructure: Commonwealth of Virginia Critical Infrastructure and Resiliency Strategic Plan. Furthermore, critical components of this plan, similar to the National Infrastructure Protection Plan (NIPP), are sector-specific plans which serve to assist the various infrastructure sectors to take measure to protect their assets. The opportunity exists to bring those critical infrastructure / key resource partners – especially those "lifeline sectors" like water, power, health and medical and telecommunications - to discuss the criticality of the Commonwealth's critical services being resilient and to plan for Sea Level Rise. With so much reliance on these services, it is important not only to trust these reliable partners, but to verify their preparedness as well.

Of course, there is added value for the Virginia's private sector partners. The Department of Homeland Security has Protective Security Advisors throughout the Commonwealth and the nation to include Puerto Rico. Their key mission is the security and resiliency of nationally

significant critical infrastructure. They have tools available to assist with this mission such as the Enhanced Critical Infrastructure Protection (ECIP) initiative, the Infrastructure Survey Tool (IST) and the Special Event and Domestic Incident Tracker (SEDIT), a web-based tool used to enhance steady state, special event and domestic incident support capabilities.

Likewise, the Virginia Department of Emergency Management (VDEM) has a Private Sector Liaison which serves as "a vital link between the private sector and the Commonwealth's emergency management community, including members of the Virginia Emergency Response Team (VERT) and the applicable Emergency Support Functions."

Roles of this position include:

- Facilitates situational awareness between the private and public sectors
- Fosters partnerships that result in a higher level of preparedness, response, and recovery for the citizens and businesses of the Commonwealth
- Gives recognition to the private sector's ability to become key players in the state's disaster management activities
- Serves as an advocate for Virginia industry, within the context of emergency management

http://www.vaemergency.gov/sites/default/files/PSL%20Handout.pdf

Critical infrastructure partners are also encouraged to work with their Protective Security Advisor, their local emergency manager, and the U.S. Corps of Engineers (USACE) to conduct a USACE Emergency Power Facility Assessment Tool. This collects the emergency power needs for a given facility to help expedite an urgent emergency power/generator need during a disaster – a process which typically take days to accomplish.

BEST PRACTICE- Approaching private industry with a focus on regulation rather than partnership should be avoided. Many utilities understand their roles and have expressed an interest in not only ensuring their investments are resilient, but that they too are part of the overall solution. One approach then, mentioned in the report: *Turbulence: A Corporate Perspective on Collaborating for Resilience* is rather than "giving orders," start issuing *challenges*. Create an environment of collaboration, creativity and to borrow Old Dominion University's motto: "Idea Fusion."

The threat of flooding and sea level rise can have equally devastating impacts to military facilities and operations. Furthermore, the threat of rising seas is not limited to just the installation; rather, it crosses the fence line into the localities as well as their critical infrastructure. To help combat this hazard, the Department of Defense has developed a roadmap which includes the following:

> *The Department of Defense (DoD) Climate Change Adaptation Roadmap (CCAR) fulfills a requirement of Executive Order 13514, Federal Leadership in Environmental, Energy and Economic Performance. All Federal Departments and Agencies should evaluate climate change risks and vulnerabilities to manage both the short- and long-term effect of climate change on the agency's mission*

and operations, and include an adaptation planning document as an appendix to its annual Strategic Sustainability Performance Plan. (DOD Roadmap, p. 1)

The Military Services are beginning to explore incorporating climate risk/vulnerability factors into installation development planning processes. At the DoD level, United Facilities Criteria (UFC) 2-100-01, paragraph 3-5.6.2.3 requires master planners to consider climatic changes (including but not limited to: changes in land use and population density in the vicinity of installations; changes in climatic conditions such as temperature, rainfall patterns, storm frequency and intensity and water levels) when crafting long-range installation infrastructure master plans. UFC 2-100-01, paragraph 3-5.6.2.3 specifically calls out the National Climate Assessment as a source for reliable and authorized climate change scenarios. The Department's Natural Resources Conservation Program Instruction (DoDI 4715.03) requires installation natural resources management plans (INRMP) to assess the potential impacts of climate change on natural resources and to adaptively manage such resources to minimize adverse mission impacts. (DoD Roadmap, p.

Climate-related effects already are being observed at DoD installations throughout the U.S. and overseas. The physical changes are projected to include rising temperature and sea level and increases in both heavy downpours and the extent of drought. These will cause effects such as more rapid coastal erosion, shifts in growing seasons, and changing water tables. (DOD Roadmap, p. 2)

Potential Impacts Due To Rising Sea Levels and Associates Storm Surge:

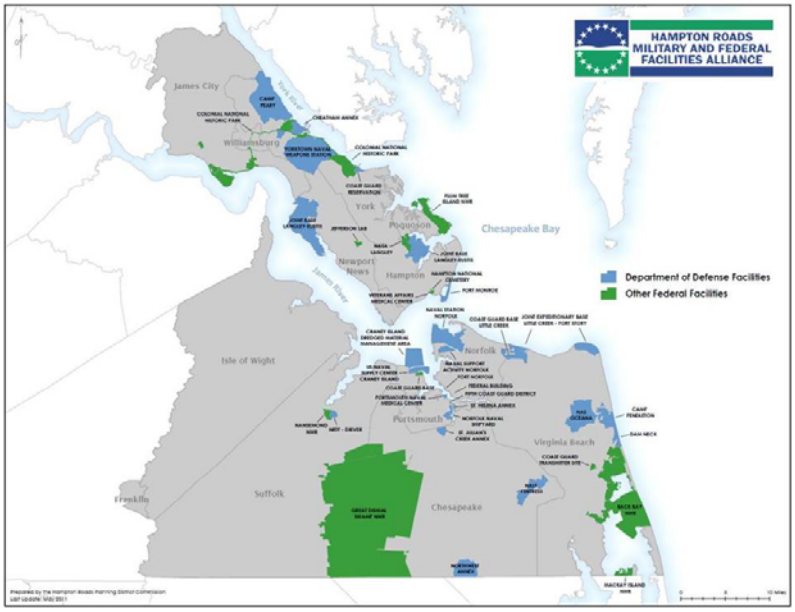
- *Loss of coastal land;*
- *damage to physical infrastructure (roads, targets, ranges) and protected ecosystem resources;*
- *saltwater intrusion;*
- *reduced capacity of protective barrier islands and coastal wetlands*

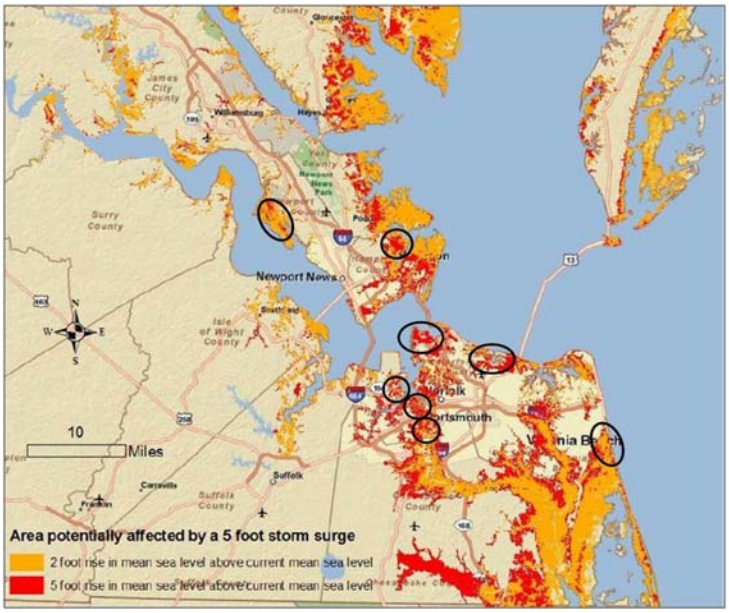
Potential Mission Vulnerabilities Due To Rising Sea Levels and Associates Storm Surge:

- *Degradation or loss of coastal areas and infrastructure;*
- *increased cost of infrastructure reinforcement to withstand increased storm intensities;*
- *increased cost of infrastructure modification (e.g., raising pier heights);*
- *impacts to littoral and shore training and ranges;*
- *increased regulatory constraints on training land access;*
- *impacts on supply chain from potential shipping interruptions;*
- *increased demand for freshwater resources and associated increased cost of saltwater intrusion countermeasures;*

- *impact to future land availability and siting of new construction*

(DOD Roadmap, p. 4)





These recommendations in this section are in line with:

2008 Climate Change Commission Report

- Direct all Commonwealth agencies to adopt preparedness and resilience plans
- Require Sea Level Rise be addressed in transportation planning and funding decisions
- Require Sea Level Rise be addressed in all local infrastructure plans in Coastal Virginia for which the Commonwealth provides funding.
- Grant the State Corporation Commission authority to mandate preparedness and resilience standards for privately owned critical infrastructure

U.S. Army Corps of Engineers "Sandy Comprehensive Plan"

- NACCS Coastal Storm Risk Management Framework Development Process (Main Report, p. 19)
- NACCS Exposure Assessment (Main Report, p. 36 and Appendix O, p. 22)
- NACCS Vulnerability Assessment (Appendix O, p. 48-63)

Commonwealth of Virginia Hazard Mitigation Plan

- Incorporate Hazard Mitigation into Data Collection Processes for State Facilities and Assets (MH-22)
- Hazard Evaluation of Critical and State-Owned Facilities in Coastal Areas (FL-16)

- Incorporate More Detailed Building Descriptive Into Department of Treasury's Virginia Agency Property System (VAPS) Reporting Requirements (FL-25) *https://www.trs.virginia.gov/drm/vaps.aspx*
- Use State Facility HIRA to Attempt to Reduce Insurance Premiums for State Owned Facilities (MH-30)

Floodplain Management Plan of the Commonwealth of Virginia

- Principle #3: Flood Hazards within the State Must be Identified and the Flood Risks Assessed (p. 6-11)
- Principle #4: Natural Floodplain Functions and Resources throughout the State need to be respected (p. 6-11)

Joint Legislative Audit and Review Commission Report

- Goal 10: Enhance Critical Infrastructure / Key Resources protection and resiliency to ensure that government missions, state services and economic functions are maintained

Community Rating System Analysis

In order to earn credit, regulations must use at least a mean projection (where multiple curves are offered) that reaches out to 2100. Each community needs to map this level of sea level rise and regulate to those maps. Uniform Minimum Credit could be available if maps were created for the whole coastal zone and localities were required to use them when regulating development. If this were done, up to 160 points may be available in Element 410d, Higher Study Standards.

Level of Effort: Medium - High. Maps must be created showing a high relative sea level rise projection out to 2100, which could be created by VIMS on a statewide basis if funded, or by each community (not all communities have GIS capabilities). If maps already exist using high projections of sea level rise out to 2100, they need to be adopted and used for regulation. Creating the maps should not be difficult pending funding, but requiring them to be used for regulation will be difficult.

Cross-credit opportunities:

- If the sea level rise maps are publicly available and are searchable by address, an additional 20 points may be earned under element 320c, Other Flood Problems Not Shown on FIRM (MI3).
- If the state mandates regulating to sea level rise projections, coastal communities could earn up to 20 points in element 420n, State-Mandated Standards. This would also earn Uniform Minimum Credit for coastal communities.
- If localities create their own maps and the state creates a policy to review them, up to an additional 60 points may be available for

those participating localities. The review program would need to be reviewed for CRS credit, but once approved, all participating localities would be eligible.

- Details:
    - While this is a regulation-based item, credit actually comes from the maps used for regulation. Maps must be created that show sea level rise projections out to 2100 on top of the 100-year-storm. They must be adopted by the community and the higher BFEs created by these maps must be used for regulatory purposes. These new BFEs would replace existing BFEs from FIRMs.
    - To make calculating new BFEs easier, water levels should be tied to the same datum as the FIRM map – NAVD88 in most cases.
    - The Recurrent Flooding Study from VIMS has been approved as a source of sea level rise projections to be used to receive credit under this element.
    - Consult Section 410d (page 410-18) of the CRS Manual for more information.

Planning for protecting critical facilities can earn up to a total of 150 points: 5 points in Section 510, Floodplain Management Planning, up to 75 points in Element 610d, Critical Facilities Planning (CFP), up to 30 points in Element 620e, Levee Failure Critical Facilities Planning (LCF), and up to 20 points in Element 630e, Dam Failure Critical Facilities (DCF).

Level of Effort: Low. Simply including some basic information in the community's warning and response plan earns some credit. If a community does not have such a plan, the level of effort increases because of the need to create one.

Cross-Credit Opportunities:

- Requirements for 620e, Levee Failure Critical Facilities (LCF) and 630e, Dam Failure Critical Facilities (DCF), are the same as 610d, Critical Facilities Planning. The same information can be used for all three elements if properly structured with a relatively low level of effort.
- If critical facilities are prohibited in the floodplain or subject to higher flood protection standards, up to 80 points are available from Element 430f, Protection of Critical Facilities (PCF).
- If critical facilities are acquired or relocated outside of the floodplain and the land left as open space, a bonus can be added to the credit earned for open space preservation equal to double the credit for a non-critical facility structure removed from the floodplain.

        - If critical facilities are floodproofed to the 500-year flood level, double credit is available in Section 530, Flood Protection.
    - Details:
        - In Element 510a, Floodplain Management Planning, 5 points are awarded for a description of the impact that hazards identified in the associated Hazard Assessment have on critical facilities and infrastructure.
        - For 610d, Critical Facilities Planning (CFP), critical facilities must be coordinated with the community's warning and response program. All prerequisites discussed for the Incident Action Plan must also be met for CFP credit. For 25 points, the plan must list facilities considered critical in a flood, the names and phone numbers of all operators, and arrange for any special warning procedures if necessary. The additional 50 points are available if each critical facility has its own plan associated with the community; partial credit is available if not all facilities have their own plans.
        - For 620, critical facilities should be considered in all planning for levee failures. This should be closely coordinated with the work done for 610d and emergency warning and response preparation. The credit opportunities for 620e are the same as for 610d, but the prerequisites do not apply.
        - Fro 630, critical facilities should be considered in all planning for dam failures. This should be closely coordination with the work done for 610d and emergency warning and response preparation. The credit opportunities for 630e are the same as for 610d and 620e, but the prerequisites for 610d do not apply.
        - Consult the CRS Manual for the definition of critical facilities and further details.
        - Critical infrastructure planning can also contribute to earning credit in Element 610c, Flood Response Operations Plan (FRO).

Additional Sub-Panel Recommendation: Outreach and Education

RECURRENT FLOODING SUB-PANEL RECOMMENDATIONS

- Establish communication / information sharing plan. Outreach materials, etc… - all using the same information if not consolidating into one effort.
- Consider modification to Real Estate disclosures to include flood-related damages
- Invest in the education of Virginia's youth and college graduates – the Commonwealth's future scientists and planners.

- Schedule cross-discipline training to ensure consistency in information among various departments, agencies, organizations and associations; tie them to continuing education credits.
- Maintain a comprehensive website with not only access to all flood-related materials, plans and resources, but a list of all past, current and proposed flood mitigation projects.
- Rely on the creativity of the entire Commonwealth through challenges, competitions and hackathons.

BACKGROUND AND EXPLANATIONS

> *"… in 2007 we reported that limited public awareness may also be a result of the complexity of the information that is needed for individuals to understand their hazard risks. We concluded that for local decision makers to develop mitigation strategies for their communities they need appropriate and easily understandable information about the probability of natural hazards and that efforts to improve public awareness and education are long-term and require sustained effort. Similarly, in our February 2014 testimony on limiting fiscal exposure from and increasing resilience to climate change, we noted that local decision makers need expert assistance translating climate change information into something that is locally relevant."*

GAO-14-603T: Disaster Resilience: Actions Are Underway, but Federal Fiscal Exposure Highlights the Need for Continued Attention to Longstanding Challenges, pages 6,7

"…during Hurricane Irene in 2011, citizens had difficulty understanding storm surge maps and did not realize they lived in a storm surge zone. Such confusion over storm surge zones could have resulted in citizens not evacuating when ordered, according to the Hurricane Irene After Action Report."
JLARC Study – p. 59

Goal #8: "Increase the number of Virginians who are prepared for natural and human-caused emergencies"
JLARC Study, p. 10

Messaging

Whether communicating to a homeowner, a business (current or potential) or any stakeholder, the Sub-Panel felt there are four critical components to messaging pertaining to recurrent flooding and sea level rise.

1. ***Tailored to the audience,***
   It was understood by the Sub-Panel one message for all is not sufficient as people with varying backgrounds and experiences receive and interpret information differently. To best ensure the effectiveness of the message is not stifled or otherwise misinterpreted, focus must remain on the threat and not the politics. Polarizing words and references must be excluded.

"We have also reported that the availability of federal assistance may inhibit actions to mitigate disaster losses. As long ago as 1980, we reported that individuals may not act to protect themselves from the effects of severe weather if they believe the federal government will eventually help pay for their losses. The 1993 National Performance Review also found that the availability of post-disaster federal funds may reduce incentives for mitigation" (page 5) http://www.gao.gov/assets/670/663179.pdf

BEST PRACTICE: *To better articulate the message, the Accomack-Northampton Planning District Commission posted personal stories in the Virginia Coastal Geospatial and Educational Mapping System (GEMS, www.coastalgems.org) website from real people whose homes have been directly impacted by Sea Level Rise.*

There is a similar initiative which Virginia could reach out to partner called StoryCorps. The mission of StoryCorps is to "provide people of all backgrounds and beliefs with the opportunity to record, share and preserve the stories of our lives. We do this to remind one another of our shared humanity, to strengthen and build the connections between people, to teach the value of listening, and to weave into the fabric of our culture the understanding that everyone's story matters. At the same time, we are creating an invaluable archive for future generations" *(http://storycorps.org/, Sample Story: http://storycorps.org/?s=flooding&term=story)*

Likewise, information should be tailored or otherwise made available which provide actionable results that focus on common questions or needs. For example:

- *Cost of elevation versus damages, flood insurance; Explain cost of money saved over the length of time vs money spent not to elevate…*
- *There is a 26% chance of home being flooded in a 30-year mortgage.*
- *Flood Insurance has a significant impact on reverse mortgages*
- *The Floodplain Management Plan for the Commonwealth of Virginia also mentions renters as particularly vulnerable and poorly informed of the threat (p. 3-26).*

It was also mentioned to be successful, more than just outreach and education, a true marketing and advertisement campaign is needed – something folks can identify and rally behind very similar to Smokey the Bear, the Crying Indian (pollution campaign). and others.

2. ***Honest with realistic expectations,***
   Equally important to personalizing the message that is factually accurate is communicating *realistic expectations as well*. The challenges of adaptation to flooding and Sea Level Rise will not be overcome or achieved overnight. The first step is merely an accurate understanding of the issue, the mitigation and adaptation strategies for the long-term.

   > *"while strengthening building codes results in more resilient buildings, it has no impact on existing structures. Because the average life expectancy of a house is on the scale of a century, it will take many years for new code changes to be significantly incorporated into the building stock." (Stiles, p. 21).*
   >
   > *"Review of global flood and Sea Level Rise management strategies suggests that it is possible for Virginia to have an effective response to increasing flood issues BUT it takes time (20-30 years) to effectively plan and implement many of the adaptation strategies" (VIMS Report, Exec Summary, p. vi).*

3. **Avoid gloom and doom**
   It is important to acknowledge the risk, but equally so to present possible solutions with a sensitivity of unintended consequences of poor messaging.

How data is presented is critical! Information can impact economic development, tax assessments, and the viability of the market. Be cautious of the unanticipated consequences.

The message can easily be lost if the message focuses strictly on the forecasts, impacts and complexities of the threat. If focusing only on the challenges while ignoring the

opportunities for an adaptive response in which all within communities and the Commonwealth can take – all that can be accomplished by working together - Virginia will fail.

"People can either accept responsibility for a problem and its consequences with an optimistic attitude that will enable them to persist in solving it, or can view it with a pessimistic attitude that defeats them before they start"
Kouzes & Posner - Credibility: How Leaders Gain and Lose It, Why People Demand It, p. 231.

4. ***Where they can go to get information/resources.***
   See page 80 of this section: "Access to Information: Virginia Flood Website"

WHRO's *Hearsay with Cathy Lewis* has done a tremendous job communicating the threat of sea level rise as well as what is being done in Hampton Roads to address it. As a result, the team deservedly won a Virginia Association of Broadcaster's Award for Best News Series for their coverage on the topic.

Real Estate Disclosure Requirements

One fact which has gone un-noticed for quite some time has been the requirement – or lack thereof – to disclose flood damages while selling a property. As one participant stated: "You have to disclose termite damage, but not flood damage." Because some regions have such a transient population with little knowledge of the area, the group asked the Virginia Coastal Policy Clinic to research that which is required, what is not and what best practices might there be elsewhere throughout the nation. Post-Graduate Fellow Mary-Carson Stiff presented the following findings:

- The Virginia Residential Property Disclosure Act does not require that sellers disclose a property's location in the floodplain/flood zone or the potential risk of flooding. Therefore, sellers are not required to disclose information on flood risks to a buyer of real estate.
- To require sellers to disclose information regarding location of property in the floodplain, required purchase of flood insurance, and potential risk of flooding, the General Assembly must amend the Virginia Residential Property Disclosure Act.
- To require real estate companies include flood-related information as part of the real estate transaction, the General Assembly would have to amend the Virginia Residential Property Disclosure Act. Alternatively, regional or statewide associations of realtors could encourage businesses to pledge to adopt such a standard and implement it on an individual company level.

Private Sector

While discussing the private sector, one resounding message was the thought there is no sense to spend funds on a future disaster since it does not reflect on the bottom line now - that money in the future is worth less than money in the present. In other words, there is so much uncertainty in information surrounding Sea Level Rise businesses are unable to correctly assess risks; therefore, it does not make sense to pay for something today when it presumably would cost less to do so in the future.

As stated in the aforementioned Turbulence report: "…companies are very large institutions, which also need time to absorb a new idea and work out how it can make a difference in practice…The challenge of understanding and designing resilience solutions is one for the long haul, which will require deep engagement of substantial parts of the institutions" (p. 7). Therefore, to shift the current paradigm, the Sub-Panel believed more focus should be given to the business community. Offering credible and reliable mapping and simulation tools similar to those proposed in the Data / Mapping recommendations is a start. In fact, there was general consensus the private sector (and many others) would be more receptive of the message if the impacts to their insurance were clearly communicated. In other words, how does Recurrent Flooding affect them, their insurance and their bottom line? What about their workforce?

The Commonwealth, and particularly the proposed Command Structure, can help by providing businesses with short term projections of Sea Level Rise impact, addressing the worst problems first, and looking for cost-effective solutions. "The business community must be engaged and participating in the adaptation conversation" says David Bailey, Element VI Consulting, former chief of climate policy for ExxonMobil (VCPC, p. 7). The Turbulence report goes on to say "…with increasing levels and/or persistence of turbulence, benefits will outweigh costs. Hence, a resilient approach will turn out to be the most economic one – for those who are in for the long run, at least" (Kupers, p. 17).

The Sub-Panel felt it was important to engage Virginia Economic Development as well as Virginia Economic Development Partnership to demonstrate that it's better for business sustainability to have risks known and identified with solutions in place:
http://www.sba.gov/content/disaster-planning

Investments in K-12 and Higher Education

Virginia has an opportunity to not only address the threat of Recurrent Flooding and Sea Level Rise in the present, but to raise awareness of Virginia's youth and otherwise invest in its future scientists and planners as well. Along with established agencies and homeowners, the group felt the issue of Recurrent Flooding and Sea Level Rise – and the science behind it – should also be shared with the Commonwealth's school students (middle and high school students). Models and projections suggest the issue will continue to worsen; it will be a challenge to be shared with today's youth and beyond.

At the most elementary level, age-appropriate educational materials can be developed to teach about the issues in activity books which can be fun to a child. At the K-12 level, resources, speakers, field trips and sample lesson plans in line with Virginia's Standards of Learning can be available to educators in public and private schools.

"Sixteen teachers from all around Virginia got together to learn about and explore coastal change at the 2014 Virginia Coastal Ecosystems Field Course. The Virginia Sea Grant funded workshop took place from July 7-12. Through hands-on activities and lectures given by scientists and National Science Foundation GK12 fellows, the teachers learned about coastal field work."

http://vaseagrant.vims.edu/category/education/

The Sub-Panel recommends including the threat of Sea Level Rise in Virginia's Science Standards of Learning Curriculum.

At the higher education level, there might be opportunities to retain promising young men and women with incentives and scholarships in programs focused on studying Adaptation Sea Level Rise and coastal resilience. Stakeholder agencies can accommodate internships for these students, and likewise, Old Dominion University shows the value of partnering with countries across the Atlantic through a student exchange program focused on the issue in an effort to share opportunities and information.

- ODU Graduate Student Fellowships for PhD studies related to adaptation to local sea level rise (https://www.odu.edu/research/initiatives/ccslri)
- VIMS: http://www.vims.edu/cbnerr/research/graduate_research_fellowships/index.php
- VCPC: http://vaseagrant.vims.edu/summer-law-fellows-join-coastal-policy-clinic/
- NOAA: http://www.csc.noaa.gov/cms/fellows/grad_opportunities.html

Governor McAullife Announces Research Collaboration with NASA Langley Research Center ("DEVELOP") ***to engage students, recent graduates, early career professionals, and veterans to work in applied Earth science research projects to benefit the Commonwealth***

Governor McAullife Press Release, April 15, 2014

https://governor.virginia.gov/news/newsarticle?articleId=3870

The opportunity may exist for qualified and energized students to work closely with the proposed Resilience Coordinator, to be fully immersed in the process of challenges,

collaboration, planning and solutions. Furthermore, the Resilience Coordinator might consider further partnering with Virginia's institutions of higher learning to tap into the talents and energy of their **Community Engagement programs,** particularly when conducting outreach, training or other events in their respective regions.

Christopher Newport University:
http://cnu.edu/engage/
The Center for Community Engagement develops and facilitates academically grounded, developmental, reciprocal, and sustainable community partnerships that connect students, faculty, and community members with the strengths and needs of the Newport News community and beyond.

Old Dominion University
https://www.odu.edu/life/gettinginvolved/service
Community engagement is a keystone of the University's mission and a tenant in its strategic plan which focuses the University on building strong civic and community partnerships, applying our expertise to community betterment, providing new opportunities for service learning and a place for solutions

Virginia Commonwealth University
http://www.community.vcu.edu/
The mission of the VCU Division of Community Engagement is to mobilize university-community partnerships that generate innovative solutions to societal challenges and prepares the engaged citizens of tomorrow.

The College of William and Mary
http://www.wm.edu/offices/oce/
William and Mary's Office of Community Engagement connects the College and community to support student's development as active and educated citizens and to promote positive, community-driven social change.

George Mason University:
http://sail.gmu.edu/
Social Action and Integrative Learning (SAIL) is an evolving community of Mason students, faculty, administrators, alumni, and community partners who are active and passionate collaborators in effecting positive social change. SAIL fosters integrative, innovative, and experiential learning opportunities on campus, regionally, and globally that educate and activate towards a more equitable, just, nonviolent, and sustainable world.

University of Virginia
http://www.virginia.edu/publicservice/
Learning in Action – From Classrooms to Communities is the front door to public service at the University of Virginia, designed to connect students, faculty and community partners to social entrepreneurship, community engagement and co–curricular service opportunities.

Virginia Tech
http://www.engage.vt.edu/
The mission of Virginia Tech's VT Engage program is two-fold: to foster authentic civic partnerships by connecting the human and intellectual capital of Virginia Tech with local and global publics and to cultivate social and ethical responsibility through engaged learning and reflection.

Another consideration pertaining to Virginia's higher education institution is to build on the collaborative relationships which already exist and create a strong Inter-University Collaboration Initiative (similar to http://water.usgs.gov/wrri/2011grants/2011DC124B.html) to maximize information, studies, research and ideas (as well as to mitigate the potential duplication of efforts and multiple survey polling of Virginia's residents). Such unity of effort is already occurring through the Virginia Sea Grant, which is a consortium of William and Mary, Old Dominion University, Virginia Commonwealth University, George Mason University, University of Virginia and Virginia Tech and should be fully supported in their collaborative work.

> ***This approach falls in line with the information sharing necessary in an Incident Command System; higher education partners would play a critical role in the Planning Section efforts.***

Gaming

Gaming was identified as a useful tool for public education and decision makers with proper scope and planning. Virginia Universities and non-profit partners may also prove to be a valuable asset in support of this effort. Some games which already exist and could be emulated come from the University of Virginia's Bay Game (http://www.virginia.edu/baygame/), the Red Cross / Red Crescent (http://www.climatecentre.org/site/games) as well as the "Disaster Watch" available at globalgang.org.uk.

At the policy and planning level, simulation-like environments were discussed as a potential for problem solving. One such

game is mentioned in the report, *Turbulence: A Corporate Perspective on Collaborating for Resilience*, and is called "Nexus!", a board game which teaches players the importance and benefits of cooperation. (http://s07.static-shell.com/content/dam/shell-new/local/corporate/corporate/downloads/pdf/powering-progress-together/ppt-rotterdam-2014-event-report-240614.pdf). While Nexus! is designed at the global level, the opportunity might exist to tailor it to the region, state and national level.

Another game, from which Nexus! drew some of its ideas, is the "Perspectivity Game", where "players face the crucial trade-off between long-term sustainability and short-term economic growth."www.perspectivity.org/game

Dr. Joe Bouchard mentioned a previous attempt to deploy a gaming strategy in the Hampton Roads region (a day-long event and after editing, broadcast on WHRO), but reported it was unsuccessful due to lack of awareness of the issue as well as funding. The Sub-Panel felt this concept should be re-evaluated.

Training

The Sub-Panel recognized the need for training on the threat of Sea Level Rise and Recurrent Flooding and its impacts. Additionally, to ensure a common understanding, training must be inclusive, crossing disciplines to ensure a better understanding of the tertiary affects beyond one particular agency.

In line with Presidential Preparedness Directive #8 and its focus on a whole community approach to national security, the following organizations should be invited and encouraged (particularly with continuing training credits) to participate in future training opportunities:

- American Planning Association, Virginia Chapter
- American Public Works Association, Mid-Atlantic Chapter
- Virginia 1st (Banking Sector focused on disaster planning)
- Virginia Banker's Association
- Virginia Association of Realtors
- Virginia Association of Zoning Officials
- Virginia Floodplain Management Association
- Virginia Housing Commission
- Virginia Property Insurance Association
- Mortgage Bankers Association / Lenders
- Appraisers
- Insurance Sector
- Developers

Potential Certification Program

One idea being considered by Old Dominion University and William and Mary's Virginia Coastal Policy Clinic is a certificate program whereby a curriculum

developed and delivered by ODU, VCPC, VIMS, and others in an effort to share a common, cross-discipline understanding and awareness of the issues.

Additional agencies and institutions offering training and seminars on a regular basis:

- NOAA Chesapeake Bay
  http://chesapeakebay.noaa.gov/education01-08-10
- NOAA Climate Adaptation for Coastal Communities
  http://csc.noaa.gov/digitalcoast/training/climate-adaptation
- Old Dominion University's Hampton Roads Sea Level/Flooding Adaptation Forums
  https://www.odu.edu/research/initiatives/ccslri/2013
  - November 2012- State of the science, explore regional concerns
  - March 2013- International, national and regional efforts to assess vulnerability and develop solutions
  - July 2013 - Communicating climate change and adaptation
  - October 2013- Risks to Naval Station Norfolk, Legal and Planning Issues for Adaptation, FEMA SLR Mapping
  - March 2014- Floodplain management, FEMA maps and Community Rating System
- Old Dominion University's Mitigation and Adaptation Research Institute (MARI), Leadership Program: http://www.mari.odu.edu
- Virginia Coastal Policy Clinic Conferences and Symposiums
  http://law.wm.edu/academics/programs/jd/electives/clinics/vacoastal/conferences/index.php
- Virginia Department of Conservation and Recreation Environmental Education
  http://www.dcr.virginia.gov/environmental_education/index.shtml
  - Report: Community Environmental Education in Virginia (December 2010)
- Virginia Institute of Marine Science (VIMS) After Hours Lecture Series
  https://events.wm.edu/calendar/upcoming/vimsafterhours
- Virginia Sea Grant

There is excellent training also available at no cost (with the exception of meals) which would be appropriate for (and would benefit from) a blended group as listed in this report. Some of these courses are available through FEMA's Emergency Management Institute:

- Executive Orders 11988 and 11990: Floodplain Management and Wetlands Protection (E0727)
- Hazus Multi-Hazard for Flood (E0172)
- Hazus Multi-Hazard for Floodplain Managers (E0176)
- Residential Coastal Construction (E0386)
- Retrofitting Flood-Prone Residential Buildings (E0279)
- Digital Flood Insurance Rate Maps (G0284.4)

- Disconnects Between the National Flood Insurance Program Regulations and Insurance (G0284.2)
- Higher Standards in Floodplain Management (G0282.1)
- National Flood Insurance Program Flood Insurance Principles (G0282.3)
- National Flood Insurance Program/Community Rating System (E0278)
- National Flood Insurance Program Rules and Regulations in Depth (G0194.2) *http://training.fema.gov/EMICourses/docs/FY14%20Catalog.pdf*

Note: Virginia could host many of these courses in the coastal regions to decrease the burden of travel.

The Sub-Panel recommends a Virginia Symposium in which stakeholders can hear from industry leaders who, together, offer and benefit from various perspectives. This can be built from those events which already exist. Outside general sessions, training and discipline-specific tracts could be established for more detailed planning and discussions.

This could be the venue by which the accomplishments of the previous Flood Resilience Action Plan is discussed and the upcoming 4-year Action Plan presented.

ACCESS TO INFORMATION: VIRGINIA FLOOD ACTION AND RESOURCE WEBSITE

As previously stated in this report, valuable information can be useless if it can't be accessed. One way the Commonwealth can communicate and otherwise keep Virginians (present and future) informed is by maintaining an effective Virginia Flooding Action and Resource website (which could also expand to overall resilience at a later date).

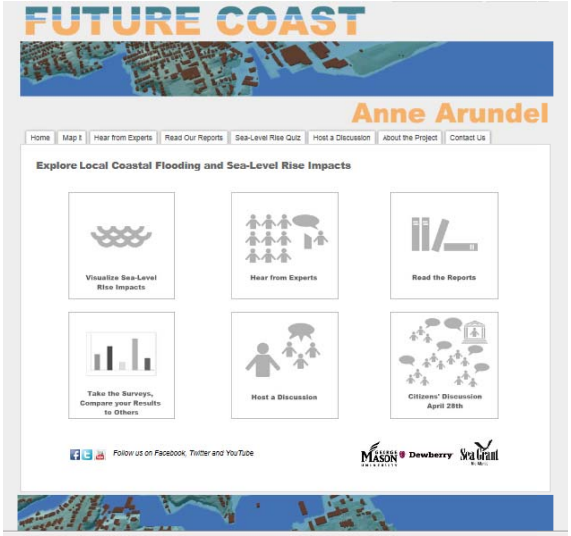
Certainly referencing VDEM's site which offers preparedness tips for flooding (http://www.vaemergency.gov/readyvirginia/stayinformed/floods), the proposed site should offer much more to include:

- The 4-year Incident Action Plan
    - This includes a list and map of all past, current and future flood adaptation projects and their statuses using something similar to VDOT's progress dashboard

- Calendar of events for upcoming meetings, presentations, training, conferences and symposiums.
    - Including links to podcasts and materials from past events
- Property information tool – perhaps linking to Virginia's Flood Risk Information System (FRIS)
- A link to VISP/VIISE for the central data and mapping source for planners, property and business owners – available at the most basic level with the opportunity to dive further for more technical detail.
- Information distribution strategy
    - A bulletin board on the homepage of information disseminated by various floodplain management and mitigation groups.
        - As information is posted, notifications made by Facebook, Twitter and Emails (via subscription process).
- Education sources for educators and students
    - Announcements for internships, fellowships and other academic pursuits.
    - Various coastal resilience-related newsletters from all stakeholder agencies
- Frequently Asked Questions and Top 10 lists
    - Ability for visitors to ask questions or offer ideas
- Chat room to openly share comments, observations and ideas regarding publications, reports and studies.
- Library of Resources: Reports, studies, links and products categorized by the eight coastal planning district commissions / regions (see Appendix IV)

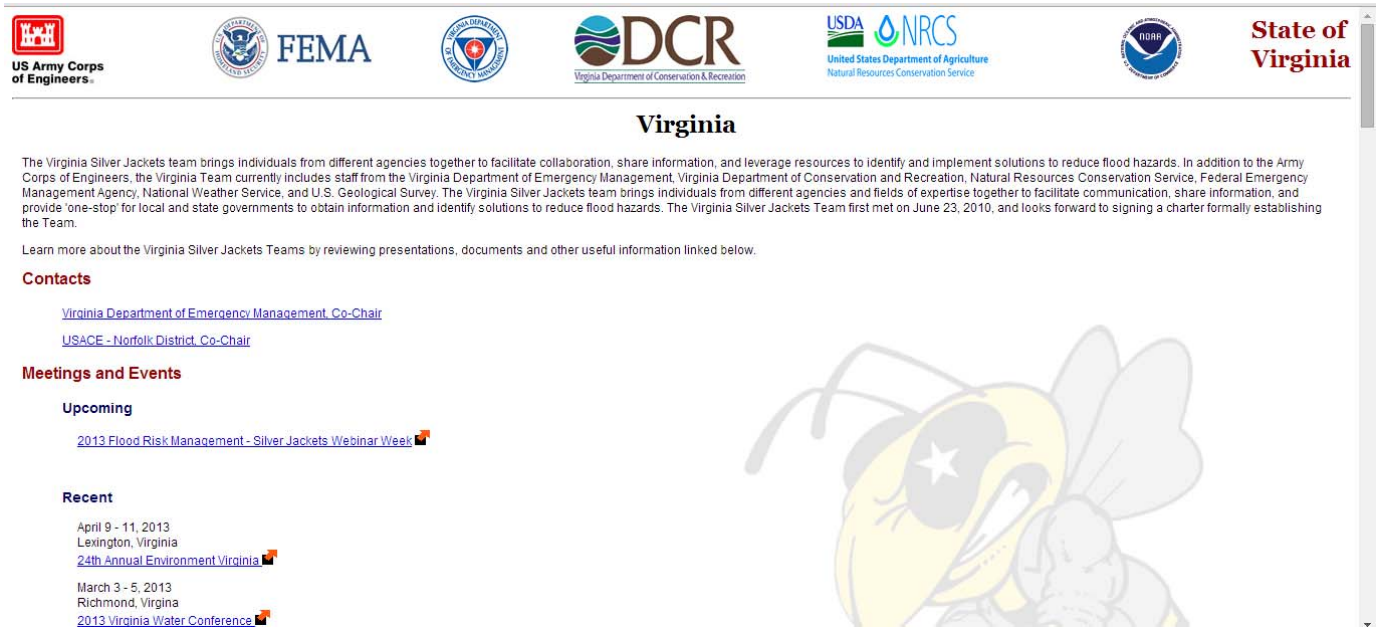
Best Practice: "Future Coast"
http://www.futurecoast.info/

Working with the Mid-Atlantic Sea Grant and multiple partner agencies, Dr. Karen Akerlof of George Mason University served as project manager for this Future Coast site for Anne Arundel. The Citizens' Discussion and data visualization tools developed for the Future Coast initiative have been designed to make them easily adaptable for other areas. The program's final project report outlines how other communities could employ this model to engage citizens in discussions on local coastal flooding and long-term policy responses.



To host the Virginia Flooding Action and Resource website, a decision must be made to keep it on the State government site (which is vulnerable to changing Administrations). Other options including higher education (a unified site among the proposed Inter-University Collaboration), develop something similar to "Future Coast," consider partnering with Virginia Sea Grant or

leverage the pre-existing U.S. Corps of Engineer's Silver Jackets program who has already agreed to host on their site. (http://www.nfrmp.us/state/factVirginia.cfm).



US Army Corps of Engineers | FEMA | DCR Virginia Department of Conservation & Recreation | USDA NRCS United States Department of Agriculture Natural Resources Conservation Service | State of Virginia

Virginia

The Virginia Silver Jackets team brings individuals from different agencies together to facilitate collaboration, share information, and leverage resources to identify and implement solutions to reduce flood hazards. In addition to the Army Corps of Engineers, the Virginia Team currently includes staff from the Virginia Department of Emergency Management, Virginia Department of Conservation and Recreation, Natural Resources Conservation Service, Federal Emergency Management Agency, National Weather Service, and U.S. Geological Survey. The Virginia Silver Jackets team brings individuals from different agencies and fields of expertise together to facilitate communication, share information, and provide 'one-stop' for local and state governments to obtain information and identify solutions to reduce flood hazards. The Virginia Silver Jackets Team first met on June 23, 2010, and looks forward to signing a charter formally establishing the Team.

Learn more about the Virginia Silver Jackets Teams by reviewing presentations, documents and other useful information linked below.

Contacts

Virginia Department of Emergency Management, Co-Chair

USACE - Norfolk District, Co-Chair

Meetings and Events

Upcoming

2013 Flood Risk Management - Silver Jackets Webinar Week

Recent

April 9 - 11, 2013
Lexington, Virginia
24th Annual Environment Virginia

March 3 - 5, 2013
Richmond, Virgina
2013 Virginia Water Conference

Creativity of the Commonwealth

Lastly, and most importantly, Virginia must never stop studying, researching and finding new, creative, cost-effective and environmentally responsible ways to adapt to the threat of Sea Level Rise. No one person or agency has all the answers. Virginia must rely on the creativity of the entire Commonwealth through inclusive planning, challenges, competitions and hackathons.

"Success may come from unexpected directions. Be ready to embrace, and build on it"
(Kupers, p. 83)

Perhaps annually, or a component of the proposed 4-year Flood Resilience Action Plan, a "Governor's Challenge" could be issued for creative ideas to adapt to sea level rise. Such competitions have been performed successfully in places like New York City, where they challenged individuals to propose plans and designs to address cantankerous issues such as post-disaster provisional housing.
http://www.nyc.gov/html/whatifnyc/html/competition_archive/competition_archive.shtml

Project and judging criteria would be very much in line with the issues and concerns outlined in Virginia's project criterion and prioritization standards.

Hackathons are another great way to collaborate with those who are more than technically proficient, who can create ways in which to harness and otherwise leverage technology to achieve a proposed mission. One such hackathon is to be put on by the Chesapeake Conservancy:

> *In support of the White House Climate Data Initiative, the Conservancy will partner with Intel and the White House to put together a Chesapeake Hackathon in 2014 to pilot the application of public data related to climate change resilience. A hackathon (or codefest) is an event where computer programmers and other professionals collaborate intensively on targeted software projects.*
>
> *Through the Chesapeake Hackathon, the partners intend to facilitate the development of "apps" and other tools to help our community better understand the potential impacts of land use decisions, and better prepare for the impacts of climate change.*
>
> *"Our intention with the Chesapeake Hackathon is to enable innovation by encouraging creativity, making information easily accessible and ramping up motivation through collaboration across the public, private, non-profit and academic sectors" [Joel] Dunn [Executive Director of the Chesapeake Conservancy] said. "We want to turn data into insight and ensure that existing sea level rise projections and land-use planning objectives will culminate in communities that are more resilient to climate change."*
>
> *http://www.chesapeakeconservancy.org/News/chesapeake-conservancy-joins-with-white-house--intel-on-climate-data-initiative*

These recommendations are in line with:

2008 Climate Change Commission Report

- Virginia will educate the public about climate change and the actions necessary to address it (p. 33)
- Encourage all local jurisdictions in Coastal Virginia to achieve Community Rating System level 8 or better – and provide the support they need to accomplish this.

U.S. Army Corps of Engineers "Sandy Comprehensive Plan"

- Addressing coastal storm risk is a shared responsibility (Main Report, p. 7)
- Opportunities: Dynamic collaboration (Main Report, p. 9)
- Opportunities: Creative incentives (Main Report, p. 9)

Commonwealth of Virginia Hazard Mitigation Plan

- Encourage NFIP Participation (FL-17)
- Encourage Participation in the Community Rating System (FL-21)
- Develop Flood Mitigation Workshop for Businesses (FL-22)

Floodplain Management Plan of the Commonwealth of Virginia

- Information and Education, p. 4-9
- Community Education and Training, p. 6-2
- Principle #7: The State's people need to be informed about flood hazards and mitigation options (p. 6-13)
- Principle #8: Training and Technical Assistance in Floodplain management need to be available to State's communities (p. 6-13)
- Strategy #3: Broaden and Deepen Floodplain Management Education and Training (p. 6-25)

Joint Legislative Audit and Review Commission Report

- Goal 8: Increase number of Virginians who are prepared for natural and human-caused emergencies.

Community Rating System Analysis

Currently there is no credit for general training, but up to 25 points are available for the number of CFMs on staff and Emergency Management Institute classes attended by staff in Element 430o, Regulations Administration (RA). It is possible that because Wetlands Watch is undertaking a coastal-zone-wide training effort, credit may be provided as if it were EMI class credit. CFM attendees can be counted twice in certain situations. Level of Effort: Low.

Credit may be available in section 330, Outreach Projects. Credit is likely to be 2 points per topic, but may be increased depending on who delivers the training and whether the community has a Program for Public Information. Additional points may be available if attendees agree to share information with their clients.

Level of Effort: Medium, but once the trainings are established the additional work to get CRS credit is minimal.

Details: Trainings must be at least annual to receive credit. See Section 330 of the CRS Manual for more information.

Real Estate disclosure modification strategy.

CRS Summary: Up to 80 points are available in Section 340, Hazard Disclosure, for various hazard disclosure activities. These include real estate agents disclosing when properties are located in the SFHA and the mandatory purchase requirement, handouts and brochures, and disclosing other hazards such as sea level rise. If disclosure were required by state law, Uniform Minimum Credit would be available. Most states do earn Uniform Minimum Credit for disclosure laws; Virginia is one of few without any rules.

Level of Effort: Medium – High. Primarily for political reasons, it may be difficult to impose such a requirement or get companies to agree voluntarily. But once this is accomplished, earning CRS credit is relatively easy.

Training Workshops

CRS Summary: Credit may be available in section 330a, Outreach Projects (OP). Credit is likely to be 2 points per topic, but may be increased depending on who delivers the training and whether the community has a Program for Public Information. Additional points may be available if attendees agree to share information with their clients.

- Level of Effort: Medium, but once the trainings are established the additional work to get CRS credit is minimal.
- Details: Trainings must be at least annual to receive credit. See Section 330 of the CRS Manual for more information.

Website:

CRS Summary: A website with flood protection information can earn up to 105 points in 350c, Flood Protection Information Website (WEB). It can be used as a public information and outreach platform as well under section 330, Outreach Projects.

- Level of Effort: Medium. Gathering information and creating the website will be a lot of up-front work, but maintenance should be relatively easy.
- Cross-Credit Opportunities:
  - Credit is earned under 350c, Website, for a website with flood protection information.
  - Credit is earned under 330, Outreach Projects, for public information and outreach projects. Use of a website to share this information earns additional credit.
  - Credit is earned under 320, Map Information Service, for having a website with publicly accessible flood data and parcel information.
  - The FRIS system can earn up to 160 points under 440a, Additional Map Data.

CONCLUSION

There is no secret the threat of recurrent flooding and sea level rise is real; in fact, many of the recommendations of this report have been made before. Fortunately, Virginia is primed with the leadership, stakeholders, expertise and resources to address this threat proactively and effectively. Even at the time of this writing there are initiatives ramping up to collectively address the challenges.

General Assembly Joint Commission to Formulate Recommendations to Address Recurrent Flooding: *http://studies.virginiageneralassembly.gov/studies/339*
As a result of House Joint Resolution 50 and Senate Joint Resolution 76 (2012), this Joint Commission (House Joint Resolution No. 16) was developed to formulate recommendations for the development of a comprehensive and coordinated planning effort to address recurrent flooding. In conducting its review, the joint subcommittee

shall recommend short-term and long-term strategies for minimizing the impact of recurrent flooding. Report Date: November 30, 2014 & November 30, 2015. **This group is poised to address those policy recommendations outline in this Sub-Panel Report.**

Governor's Climate Change Commission; 2008 Report Update
https://governor.virginia.gov/news/newsarticle?articleId=5342
On July 1, 2014, Governor McAuliffe signed Executive Order 19, convening the Governor's Climate Change and Resiliency Update Commission. Leveraging the findings by this Sub-Panel as it pertains to Sea Level Rise, this Commission will tackle the bigger picture of Climate Change – further answering "why" the climate is changing and what can be done to alter the impacts now and in the future. The Commission will evaluate the recommendations made by then-Governor Kaine's Climate Commission, determine what actions were taken on those recommendations, and issue an updated final report. The Executive Order gives the Commission one year to complete its work.

Old Dominion University's Hampton Roads Sea Level Rise Preparedness and Resilience Intergovernmental Planning Pilot Project
http://www.centerforsealevelrise.org/
Led by Vice Admiral Dave Architzel (USN, Ret.) and CAPT Ray Toll (USN, Ret.), the Hampton Roads Sea Level Rise Preparedness and Resilience Intergovernmental Planning Pilot Project is a two-year project which seeks to develop adaptive planning for sea level rise by combining the efforts of federal, state and local agencies with private industries and researchers. Using a collaborative approach, this pilot project will serve as a template for affected regions across the United States with the development of an intergovernmental planning body starting in 2016. **This project is in position to take that which is proposed throughout this report and apply it in a laboratory that is Hampton Roads.**

Hampton Roads Planning District Commission's Special Committee on Recurrent Flooding and Sea Level Rise
https://hrpdcva.gov/news/index/view/id/1641/
In response to a recommendation by the City of Virginia Beach, this Committee was established and will be responsible for developing policy and other recommendations for local governments, advocating for state and federal support, and serving as the primary regional contact for coordinating efforts with academic institutions and federal and state agencies. Initially, the members of the Committee will be local government staff from across Hampton Roads representing various departments (such planning, public works, and economic development). Other stakeholders, such as the military, will be invited and encouraged to participate. One such initiative to be implemented by this Committee will be the Dutch Dialogues.

Dutch Dialogues in Hampton Roads
http://www.hrpdcva.gov/uploads/docs/07172014-PDC-AN4.pdf
http://dutchdialogues.com/

Dutch Dialogues is a multi-disciplinary 2-3 day workshops involving Dutch experts and local counterparts looking at focus areas such as Recurrent Flooding, Sea Level Rise, groundwater and storm water management in various localities throughout the Hampton Roads region.

The first Dutch Dialogues were held in New Orleans, Louisiana, and were the result of a series of interactions between Dutch technical experts, New Orleans designers, the Dutch Embassy, and the American Planning Association. The goal of this effort was to improve the region's approach to water management through learning about the Dutch perspective on "living with water." The first event was held in March 2008 and was followed by a second event in October 2008. Additional efforts have been held in other cities around the world. Attendees have included architects, landscape architects, engineers, urban designers and planners, geologists, hydrologists, and others.

In addition to these aforementioned projects, the Sub-Panel also believes work must continue, expanding beyond the immediate Coastal regions and into those areas which experience riverine flooding as well. Furthermore, there must be additional focus in collaboration with geologists and hydrologists on the issue of subsidence and to quantify subsidence rates in different areas so planners understand where to focus mitigation work.

If done in a coordinated manner, all of this work will serve to strengthen Virginia's level of resilience. It will make the Commonwealth more efficient with its limited resources and effective through relationships. In essence, Virginia will be a place where its communities, businesses and government are safer, more secure and better prepared.

"If you feel strongly about anything, and it's something that will ultimately benefit your community and your country, don't hold back"
Kouzes and Posner's The Leadership Challenge, p. 388

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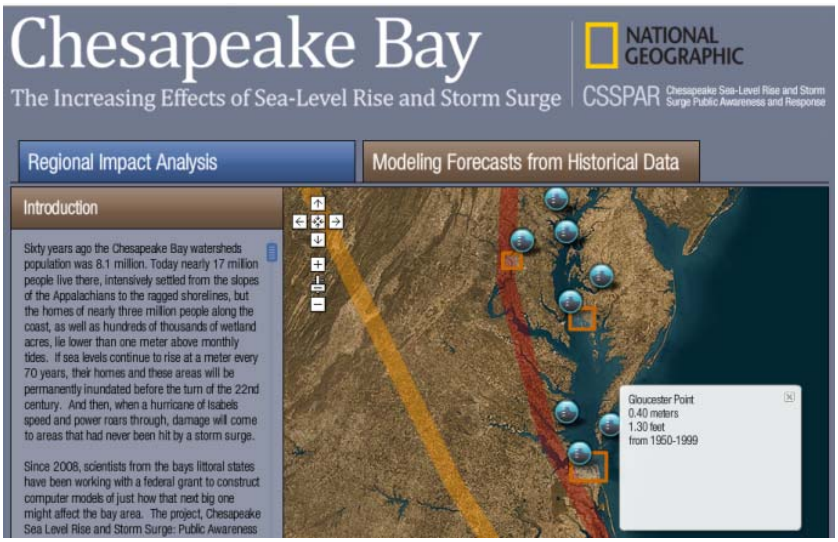
APPENDIX I

A. CURRENT PLANNING / ENVIRONMENTAL INTELLIGENCE TOOLS AND THEIR DESCRIPTIONS ARE AS FOLLOWS:

A-NPDC Coastal Change Archive (to be completed by 2014) is a web-based mapping tool illustrating accounts of changes to the natural landscape in response to Sea Level Rise/climate change experienced by local residents on the Eastern Shore. The A-NPDC project is one of more than a dozen climate adaptation projects funded through the Virginia CZM Program and that information on these projects is available on the Virginia CZM Website - http://www.deq.virginia.gov/Programs/CoastalZoneManagement/CZMIssuesInitiatives/ClimateChange.aspx

Chesapeake Bay CSSPAR

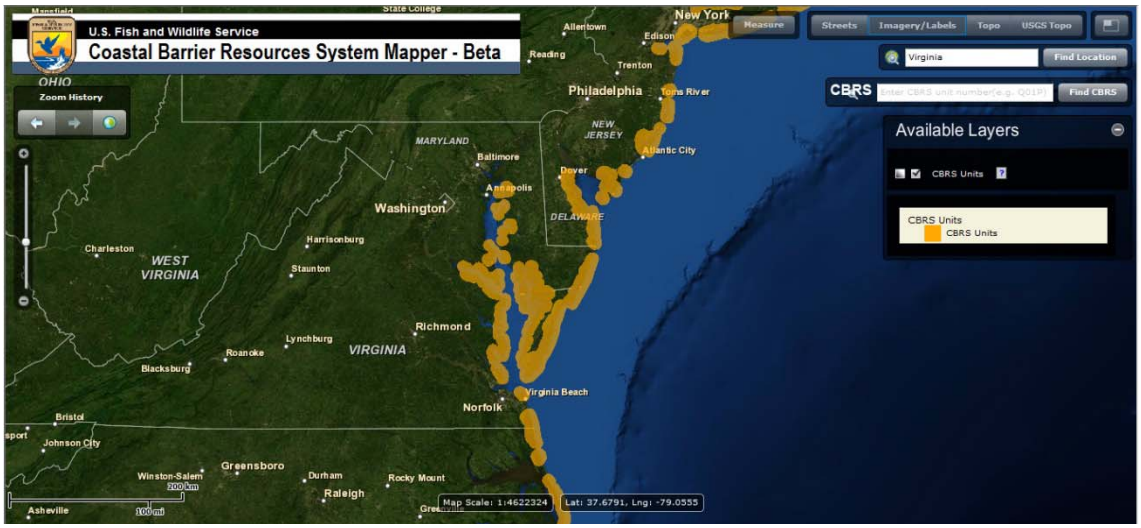
Chesapeake Sea-Level Rise and Storm Surge Public Awareness and Response
http://www.chesapeakeadaptation.org/



Coastal Barrier Resources System Mapper

U.S. Fish and Wildlife Services
http://www.fws.gov/cbra/CBRS-Mapper.html

Coastal Barrier Resources System (CBRS) Mapper is available to the public. The mapper can be used to help property owners, local, State, and Federal stakeholders, and the public determine whether or not properties or project sites may be affected by CBRA. The Coastal Barrier Resources System (CBRS) boundaries depicted in the mapper are



representations of the controlling CBRS boundaries, which are shown on the official CBRS maps. The boundaries depicted in the mapper are not to be considered authoritative for in/out determinations close to a CBRS boundary (i.e. the area depicted within the "CBRS Buffer Zone").

The CBRS Mapper integrates digital map data with other resource information to produce timely and relevant management and decision support tools.
VA-Specific Hardcopy Map at http://www.fws.gov/cbra/Maps/Locator/VA.pdf

Coastal Modeling System (CSM)

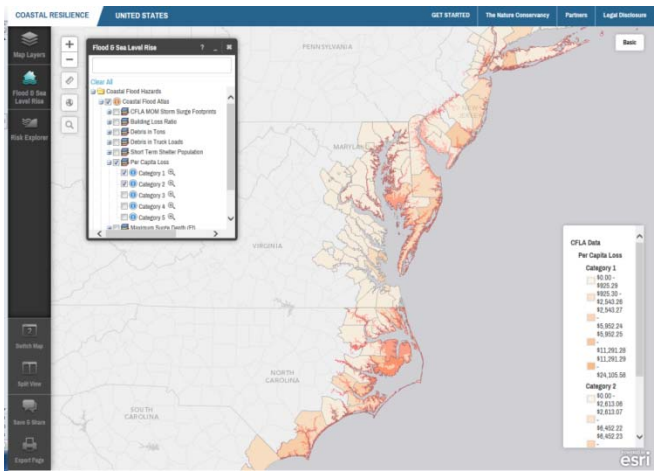
U.S. Army Corps of Engineers

CMS simulates waves, current, water level, sediment transport and morphology change at coastal inlets and entrances. These simulations produce information and tools which help assist researchers at CHL, engineers, scientists and planners at the US Army Corps of Engineers District offices **solve engineering and science problems at coastal zones** throughout the United States.
http://www.erdc.usace.army.mil/Media/FactSheets/FactSheetArticleView/tabid/9254/Article/6417/coastal-modeling-system.aspx

USACE Planning Community Toolbox: http://planning.usace.army.mil/toolbox/

USACE Planning for Changing Sea Levels: http://www.corpsclimate.us/Sandy/

USACE Engineer Research and Development Center: http://www.erdc.usace.army.mil/Home/EnhanceWaterResources.aspx



Nature Conservancy Coastal Resilience 2.0

http://maps.coastalresilience.org/us/#

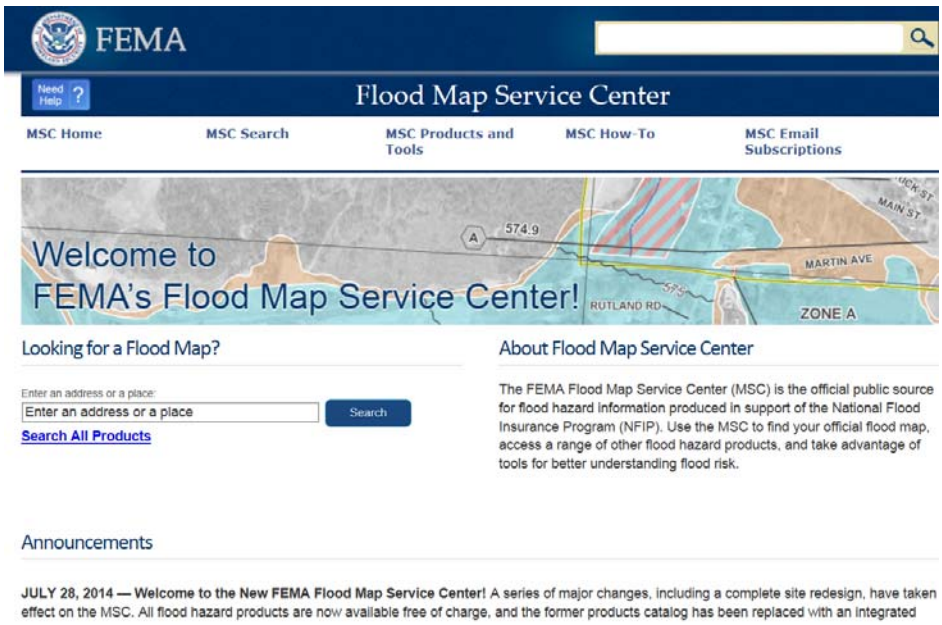
The US Coastal Resilience tools provide support for decision-makers working in the continental US identify solutions for risk reduction and conservation. They build from critical resources provided by many

groups and agencies including NOAA, USGS, FEMA, USFWS, TNC and the Natural Capital Project.

FEMA Map Service Center

https://msc.fema.gov/webapp/wcs/stores/servlet/FemaWelcomeView?storeId=10001&catalogId=10001&langId=-1 and https://msc.fema.gov/portal

The Federal Emergency Management Agency's (FEMA) Map Service Center (MSC) is the official government distribution center for digital flood hazard mapping products. In order to help communities, the public, and other FEMA stakeholders manage and reduce flood risk, FEMA provides a suite of user-friendly tools that support the needs of the public in viewing, analyzing, and printing flood hazard maps.



FEMA Modeling Task Force Hurricane Sandy Impact Analysis

http://fema.maps.arcgis.com/home/webmap/viewer.html?webmap=307dd522499d4a44a33d7296a5da5ea0

FEMA Region III Coastal Analysis and Mapping

http://www.r3coastal.com/home/storm-surge-study/storm-selection-parameters

The two primary goals of the National Flood Insurance Program (NFIP) are to provide an insurance mechanism for those at risk from flooding and to reduce flood losses through sound floodplain management practices. To achieve these goals, the Federal Emergency Management Agency (FEMA) has produced and continues to maintain Flood Insurance Rate Maps (FIRMs).

These maps show the extent of the 1% annual chance floodplain, also known as the Special Flood Hazard Area (SFHA). Within the SFHA, floodplain management regulations apply, and flood insurance is required for all property in the SFHA used to secure federally backed loans.

Along rivers, streams, and lakes within the United States, flood elevations are computed and used to delineate the extent of SFHAs. These elevations are a function of the amount of water expected to enter a particular system by means of precipitation and runoff. In coastal areas, however, it is storm surge, not precipitation and runoff that controls flood elevations. Furthermore, waves and other phenomena are expected to contribute significantly to coastal flood elevations.

FEMA Risk Mapping

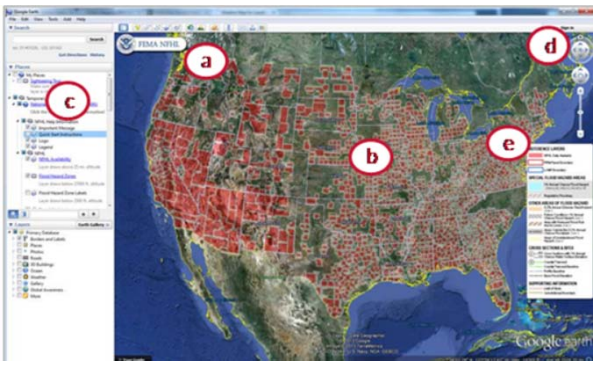
https://www.rampp-team.com/va.htm

FEMA Stay Dry (Version 3.0) and NFHL

Using Google Earth

"Stay Dry" is a focused application that provides basic flood hazard map information from FEMA's National Flood Hazard Layer for an address. It allows you to view flood hazard zones and Flood Insurance Rate Map numbers and boundaries.

"FEMA NFHL" is a general application that provides for the display of flood hazard zones and labels, floodways, Coastal Barrier Resources System and Otherwise Protected Area units, community boundaries and names, base flood elevations, cross sections and coastal transects and their labels, hydraulic and flood control structures, flood profile baselines, coastal transect baselines, limit of moderate wave action lines, river mile markers, and Flood Insurance Rate Map and Letter of Map Revision boundaries and numbers. Additional reference layers include the status of NFHL data availability, point locations for Letters of Map Amendment (LOMAs) and Letters of Map Revision Based on Fill (LOMR–Fs). You control the information displayed by turning layers on and off. A basic knowledge of Google Earth and FEMA flood hazard information will help users of this application.
https://hazards.fema.gov/femaportal/wps/portal/NFHLWMSkmzdownload



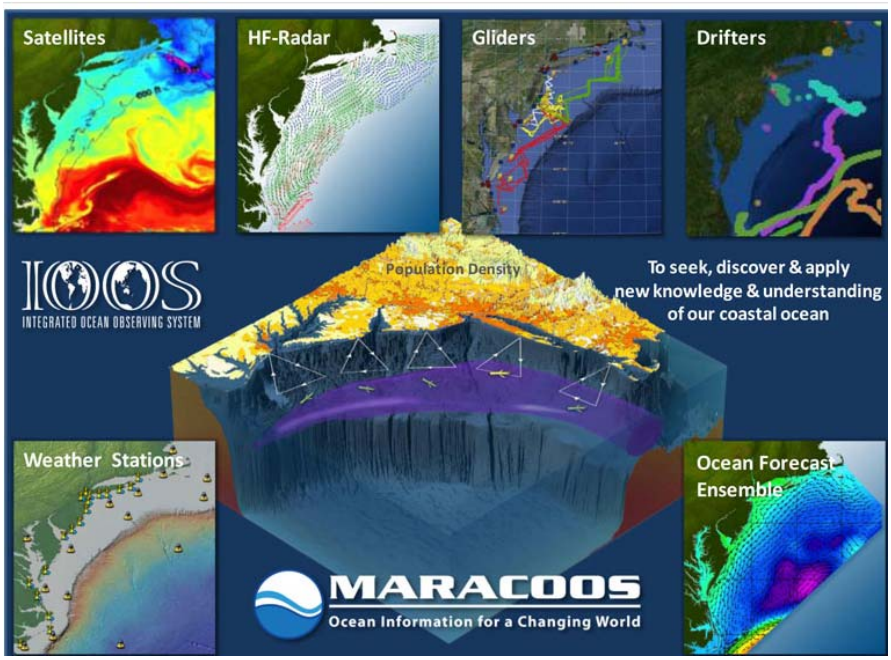
HAZUS

http://www.fema.gov/hazus

Used by FEMA among other Federal, State and Local agencies, particularly for mitigation planning, HAZUS is used to run models for estimating potential impacts (economic and social) from flooding (as well as earthquakes and hurricanes).

Mid-Atlantic Regional Association Coastal Ocean Observing System (Maracoos): Integrated Ocean Observation System

http://maracoos.org/



Marine InVEST

http://www.naturalcapitalproject.org/download.html

InVEST is family of models to measure ecosystem service benefits and tradeoffs between spatial planning scenarios at a regional scale with local data. InVEST enables decision makers to assess quantified tradeoffs associated with alternative management choices and to identify areas where investment in natural capital can enhance human development and conservation.

Who should use InVEST? Governments, companies, non-profits, and multilateral development institutions that manage natural resources employ InVEST to evaluate the impact of their decisions on the environment and on human well-being, and to inform planning efforts.

Mid-Atlantic Ocean Data Portal (MARCO)

http://portal.midatlanticocean.org/portal/

The portal is a project undertaken by MARCO, the Mid Atlantic Regional Council on the Ocean, which includes the states of New York, New Jersey, Delaware, Maryland and Virginia. Staff from the Virginia CZM Program participates in MARCO's Climate Change Action Team, which is currently working with Rutgers University to identify climate change impacts of regional significance.

Part of MARCO's mission as it pertains to Sea Level Rise is as follows:

1. Identify key infrastructure vulnerable to Sea Level Rise and flood hazards at a coarse scale.
2. Acquire data to assess regional vulnerability to climate change and Sea Level Rise impacts to infrastructure and coastal habitats.
3. Create a regional/ national GIS.
4. Facilitate information exchange.
5. Initiate Sea Level Rise adaptation measures to collectively reduce the region's vulnerability.

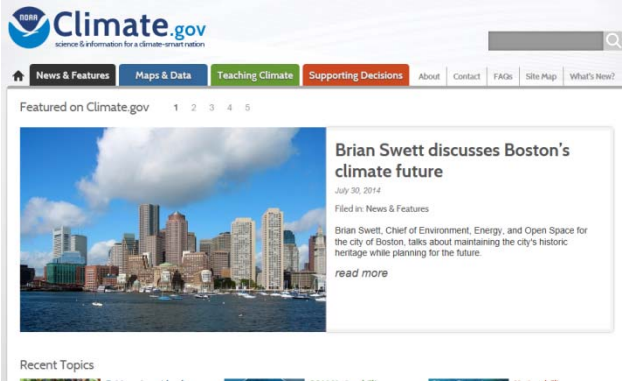
The MARCO Portal is an online toolkit and resource center that consolidates available data and enables state, federal and local users to visualize and analyze ocean resources and human use information such as fishing grounds, recreational areas, shipping lanes, habitat areas, and energy sites, among others.

The Portal serves as a platform to engage all stakeholders in ocean planning from the five-state Mid-Atlantic region—putting all of the essential data and state-of-the-art mapping and visualization technology into the hands of the agencies, industry, and community leaders engaged in ocean planning

NOAA Climate.gov

http://www.climate.gov/

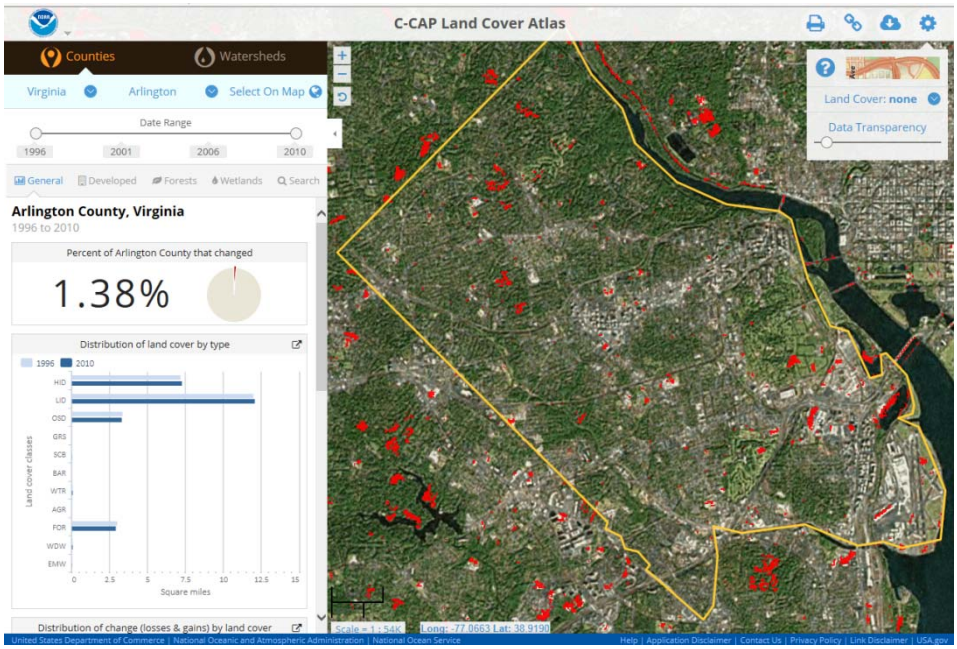
Includes data and mapping sources, education and decision tools.



NOAA Coastal Change Analysis Program (C-CAP) Regional Land Cover

http://www.csc.noaa.gov/ccapatlas/

Referenced in the VIMS Recurrent Flooding study (p. 102), the Coastal Change Analysis Program is a national standardized dataset of land cover and land use changes.



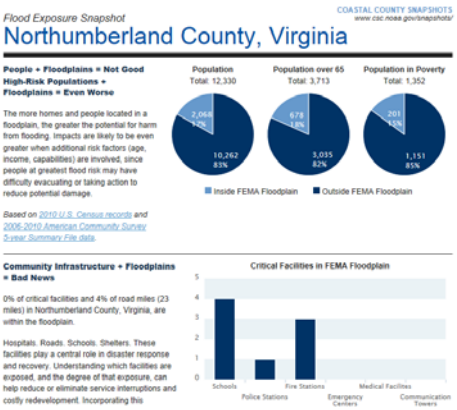
NOAA Coastal County Snapshots

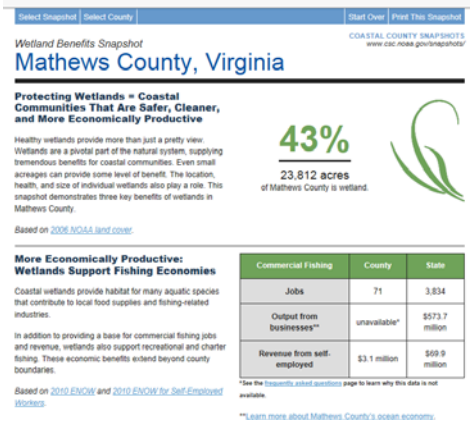
http://www.csc.noaa.gov/snapshots/

The **Flood Snapshot** provides local officials with a quick look at a county's demographics, infrastructure, and environment within the flood zone.

The **Wetland Benefits Snapshot** provides a quick look at how wetlands contribute to safer, cleaner, and more economically productive coastal communities

Critical Facilities Exposure: http://www.csc.noaa.gov/criticalfacilities/





NOAA Coastal Inundation Dashboard

http://testbed.sura.org/inundationfrontpage

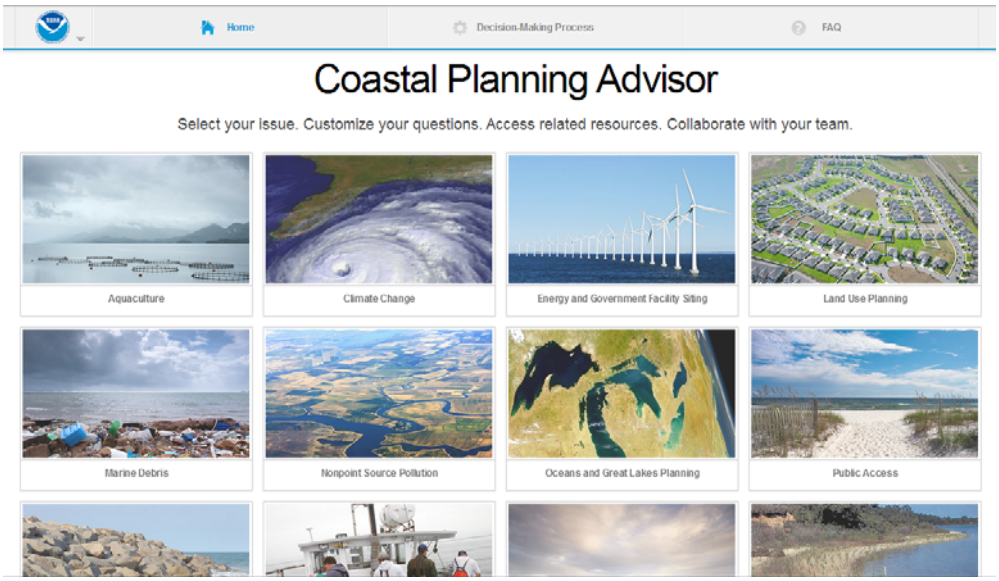
[UNDER DEVELOPMENT]

NOAA Coastal Planning Advisor

http://www.csc.noaa.gov/coastalplanningadvisor/#/

This tool will enable users to:

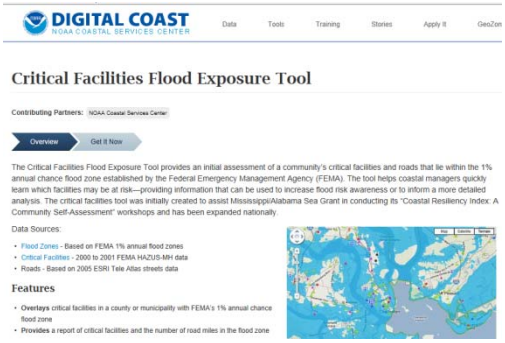
a) Assemble the data and information needed for effective decision making related to a coastal issue(s).
b) Plan for and collect answers to the essential issue-based questions in each step of the process.
c) Recognize how the coastal zone management program in their state can support their efforts.
d) Identify helpful strategies and techniques in case studies that exemplify coastal decision making.
e) Locate issue based resources that support the decision making process.



NOAA Coastal Services Critical Facilities Flood Exposure

http://www.csc.noaa.gov/digitalcoast/tools/criticalfacilities

- Relies on 2000-2001 HAZUS Information…



NOAA Digital Coast CanVis

http://www.csc.noaa.gov/digitalcoast/tools/canvis

CanVis is a visualization program used to "see" potential impacts from coastal development or Sea Level Rise. Users can download background pictures and insert the objects (hotel, house, marina, or other objects) of their choosing. The software is used by municipalities to brainstorm new ideas and policies, undertake project planning, and make presentations.

NOAA Digital Coast Coastal LiDAR

http://www.csc.noaa.gov/digitalcoast/data/coastallidar/

WHAT IS LiDAR??

LiDAR *(Light Detection And Ranging)* systems allow scientists and mapping professionals to examine both natural and manmade environments with accuracy, precision, and flexibility. Scientists use LIDAR to produce more accurate shoreline maps, make digital elevation models for use in geographic information systems, to assist in emergency response operations, and in many other applications.

"Put simply, a LiDAR scanner sends laser beams towards a target (i.e. landscape) and receives multiple return signals, recording information about the reflection."

- *George McLeod, Old Dominion University*

More information can be found online at
http://www.csc.noaa.gov/digitalcoast/_/elearning/intro-lidar/player.html

Most all of coastal Virginia has access to LiDAR data (see attached map) and more is planned throughout the State. Additionally, multiple agencies have the capability to capture LiDAR (and standard depth) data including USACE, NOAA, USGS, VDCR, VGIN, VIMS, …).

Capture current status of who has it, who needs it and at what level.

- go to http://vgin.maps.arcgis.com and just type in "lidar" in the search box. No need to sign in. When the web page returns the results, you want to make sure you have checked the box on the left under "Show" that says "Show all ArcGIS Desktop Content".

"Data are often lacking for comprehensive and/or fine resolution analysis of flood risks in the region."

Utilize "Quality Level 2" from the National Enhanced Elevation Dataset assessment (0.7meters horizontal point spacing, 9.25cm Vertical Accuracy) with the additional requirement of tide coordination within +/- 2 hours of predicted low tide. Source: http://www.dewberry.com/Consultants/GeospatialMapping/FinalReport-NationalEnhancedElevationAssessment

Also a recommendation of 2008 Climate Change Commission: "Complete LiDAR mapping and incorporate into GIS standardized across of Coastal Virginia."

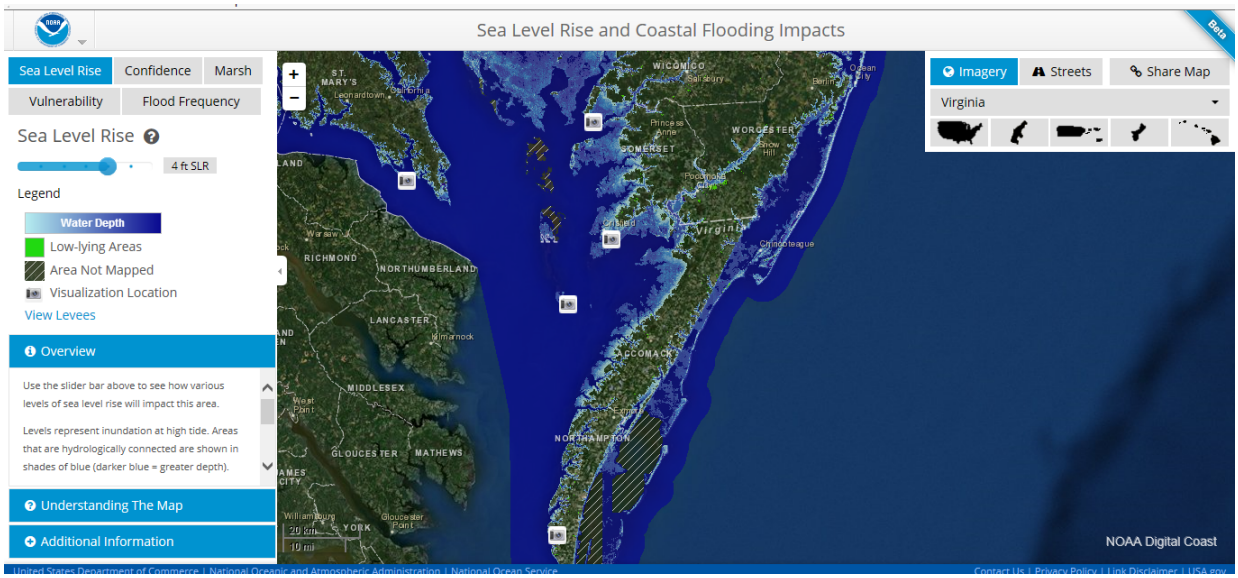
NOAA Digital Coast: Sea Level Rise and Coastal Flooding Impacts Viewer

http://csc.noaa.gov/digitalcoast/tools/slrviewer (mentioned in SERDP, p. 8)

Being able to visualize potential impacts from Sea Level Rise is a powerful teaching and planning tool, and the Sea Level Rise Viewer brings this capability to coastal communities. A slider bar is used to show how various levels of Sea Level Rise will impact coastal communities. Additional coastal counties will be added in the near future.

Features

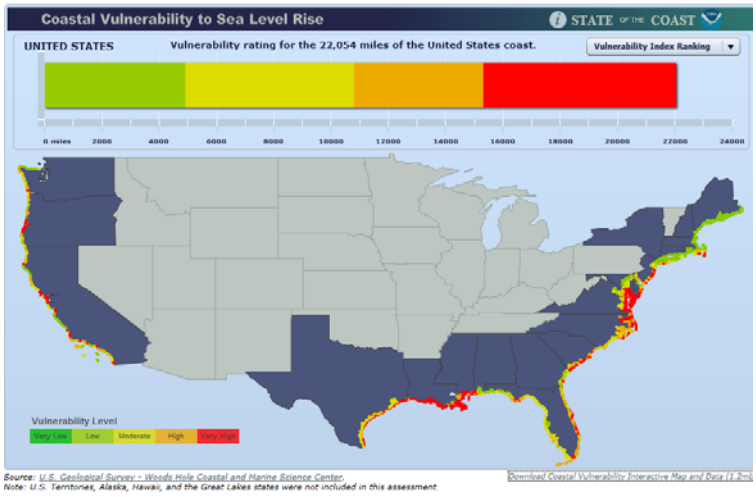
a) Displays potential future sea levels
b) Provides simulations of Sea Level Rise at local landmarks
c) Communicates the spatial uncertainty of mapped sea levels
d) Models potential marsh migration due to Sea Level Rise
e) Overlays social and economic data onto potential Sea Level Rise
f) Examines how tidal flooding will become more frequent with Sea Level Rise.



NOAA Coastal Vulnerability Interactive Map and Data

http://stateofthecoast.noaa.gov/vulnerability/welcome.html

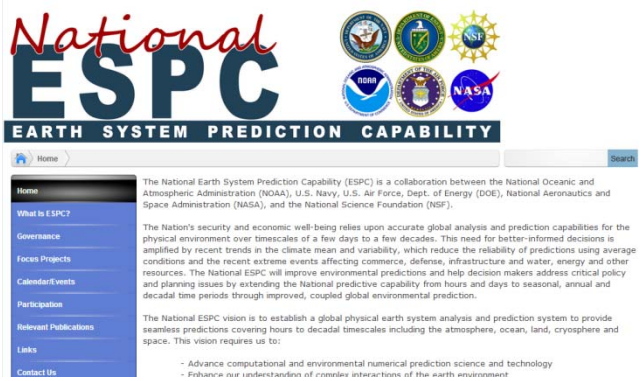
…the SOTC Web site first offers quick facts and more detailed statistics through interactive indicator visualizations that provide highlights of what we know about coastal communities, coastal ecosystems, and the coastal economy and about how climate change might impact the coast. This approach provides insights to the story of the coast's extraordinary benefits to our nation, but also the degraded state of our nation's coast and the continuing threats to its health.



NOAA Earth System Prediction Capability

http://espc.oar.noaa.gov/

"DoD collaborates with the National Oceanic and Atmospheric Administration on the development and operational implementation of a national Earth System Prediction Capability." (DoD Roadmap, p. 7)

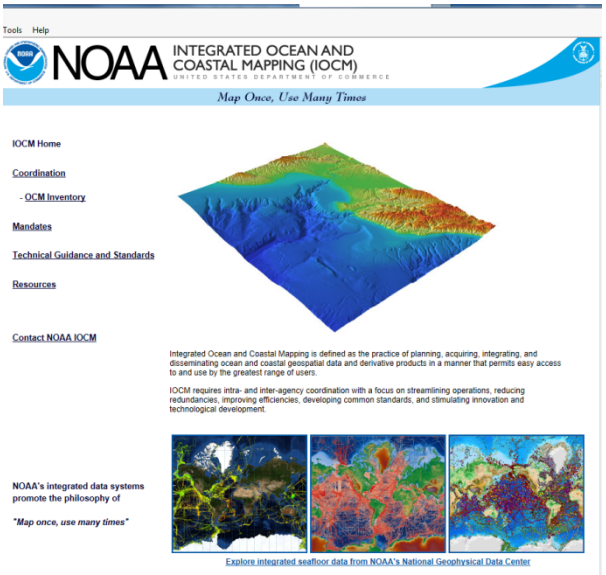


NOAA Integrated Ocean and Coastal Mapping (IOCM)

http://www.iocm.noaa.gov/

Integrated Ocean and Coastal Mapping is defined as the practice of planning, acquiring, integrating, and disseminating ocean and coastal geospatial data and derivative products in a manner that permits easy access to and use by the greatest range of users.

IOCM requires intra- and inter-agency coordination with a focus on streamlining operations, reducing redundancies, improving efficiencies, developing common standards, and stimulating innovation and technological development.



NOAA National Ocean Service Chesapeake Bay Sentinel Sites

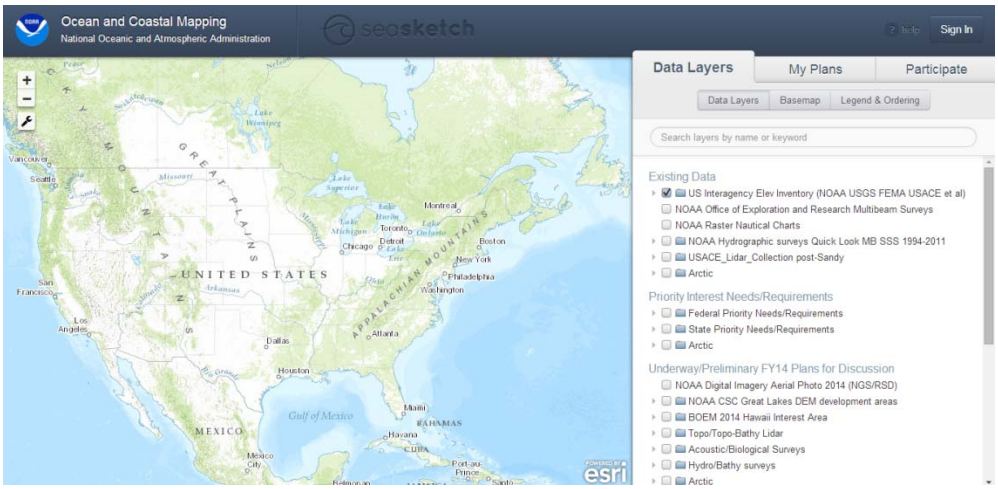
http://oceanservice.noaa.gov/sentinelsites/chesapeake.html

The Chesapeake Bay Sentinel Site Cooperative provides integrated observations across a host of environmental monitoring programs within the Bay area. The goal of the cooperative is to provide information to Chesapeake Bay communities and managers who need to address challenges such as storm flooding, long term, local Sea Level Rise, barrier island movement, degraded water quality, and wetland loss. The information will also be useful to federal and state restoration planners and living resource managers who are addressing these challenges.

Focus Areas include monitoring surface elevation, subsidence rates, water quality, vegetation, and living resources at sentinel sites; networking sentinel site data with Bay-wide monitoring stations; Sea Level Rise prediction and planning tools; community education and outreach.

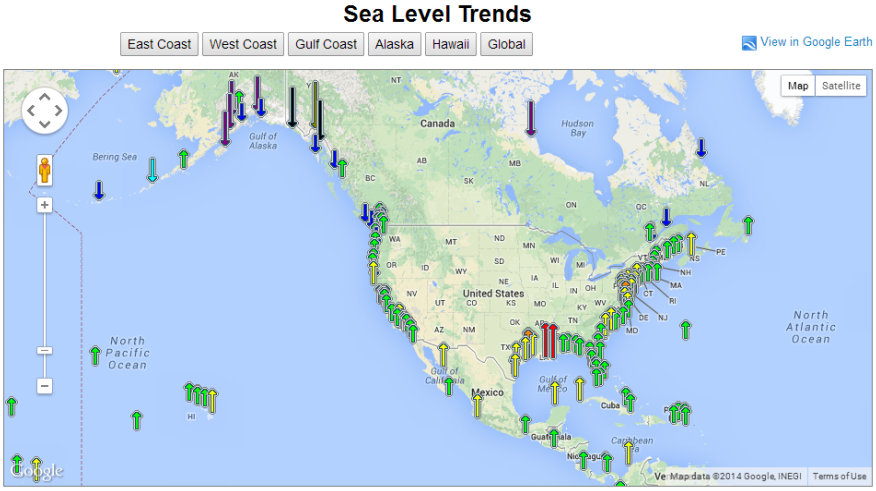
NOAA Ocean and Coastal Mapping Sandy Coordination

http://www.seasketch.org/#projecthomepage/510a7b17b64014e92e298ce2



NOAA National Water Level Observation Network (NWLON)

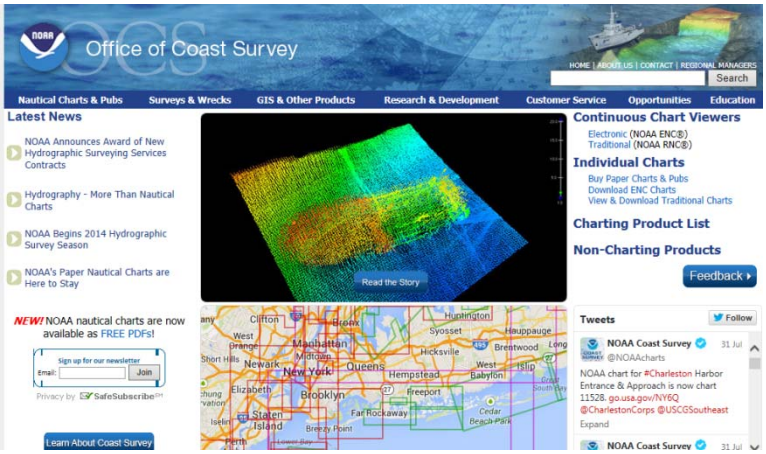
http://tidesandcurrents.noaa.gov/nwlon.html



The map above illustrates regional trends in sea level, with arrows representing the direction and magnitude of change. Click on an arrow to access additional information about that station.

NOAA Office of Coast Survey

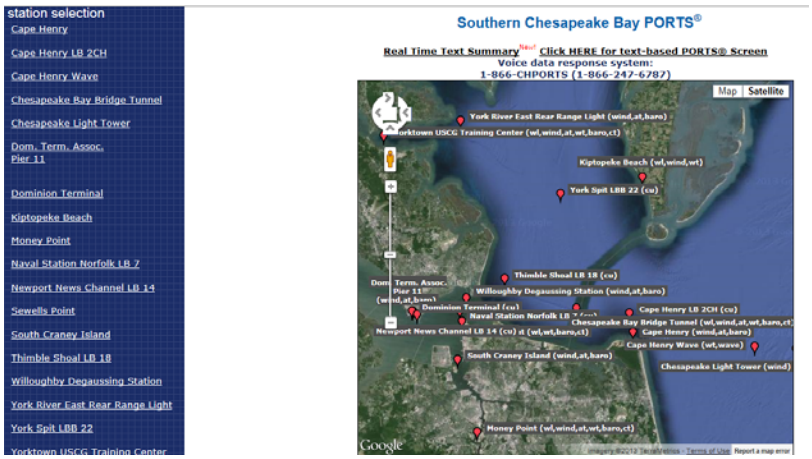
http://www.nauticalcharts.noaa.gov/



NOAA Physical Oceanographic Real-Time System (PORTS®)

http://tidesandcurrents.noaa.gov/ports.html

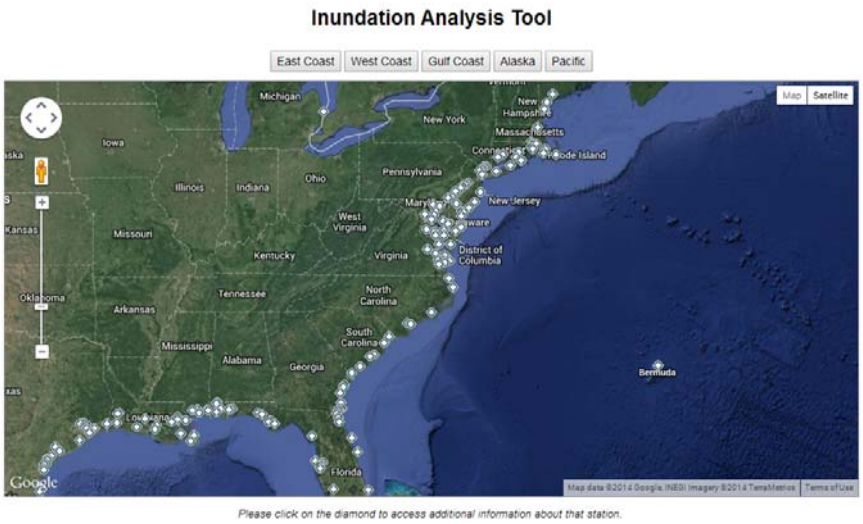
PORTS® is a decision support tool that improves the safety and efficiency of maritime commerce and coastal resource management through the integration of real-time environmental observations, forecasts and other geospatial information. PORTS® measures and disseminates observations and predictions of water levels, currents, salinity, and



meteorological parameters (e.g., winds, atmospheric pressure, air and water temperatures) that mariners need to navigate safely.

NOAA Storm Surge and Coastal Inundation

http://tidesandcurrents.noaa.gov/inundation/



Sea Level Affecting Marshes Model (SLAMM)

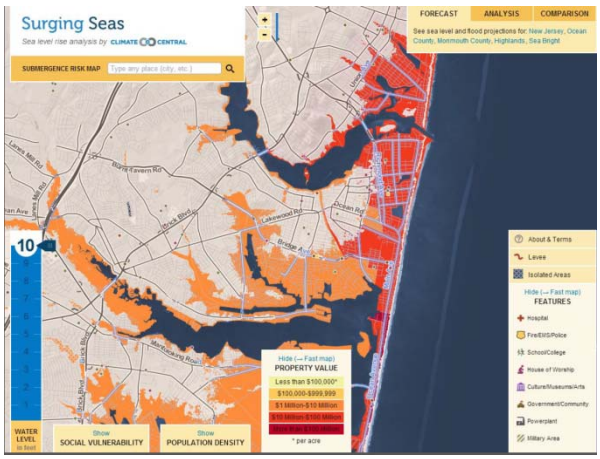
http://www.warrenpinnacle.com/prof/SLAMM/

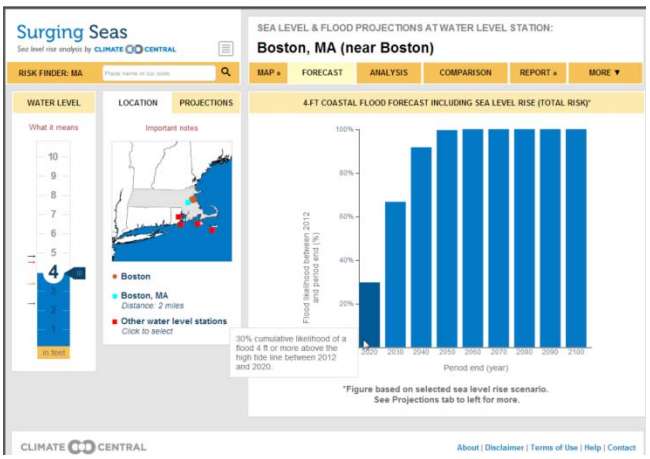
Also referenced in the VIMS Recurrent Flooding report (P. 99), SLAMM was designed to model the effect of long-term sea level rise on wetland conversion and shoreline modifications.

Surging Seas Risk Finder

Climate Central

http://sealevel.climatecentral.org/surgingseas/place/states/VA#show=cities&center=7/38.018/-79.421





Integrated Ocean Observation System

Quality Assurance of Real Time Ocean Data (QARTOD)

http://www.ioos.noaa.gov/qartod/welcome.html

U.S. Interagency Elevation Inventory

http://www.csc.noaa.gov/inventory/#

Existing imagery / data

VIMS Center for Coastal Resource Management

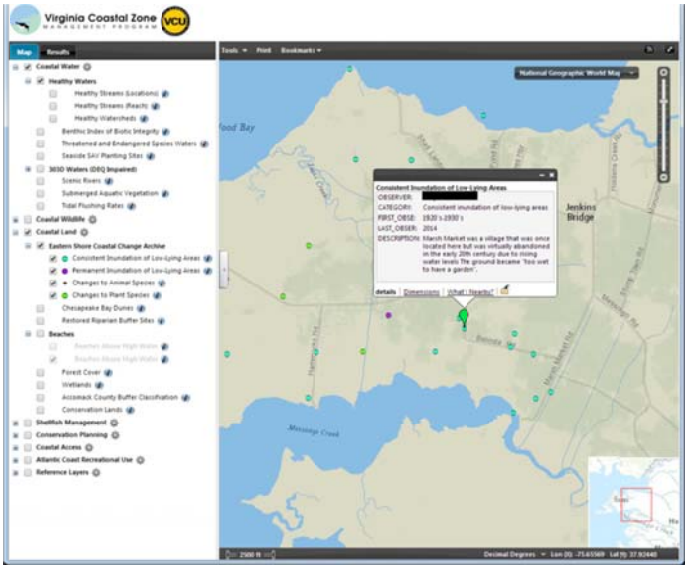
http://ccrm.vims.edu/coastal_zone/climate_change/index.html

Coastal Geospatial and Educational Mapping System (GEMS)

Virginia Coastal Zone Management Program

http://coastalgems.org/

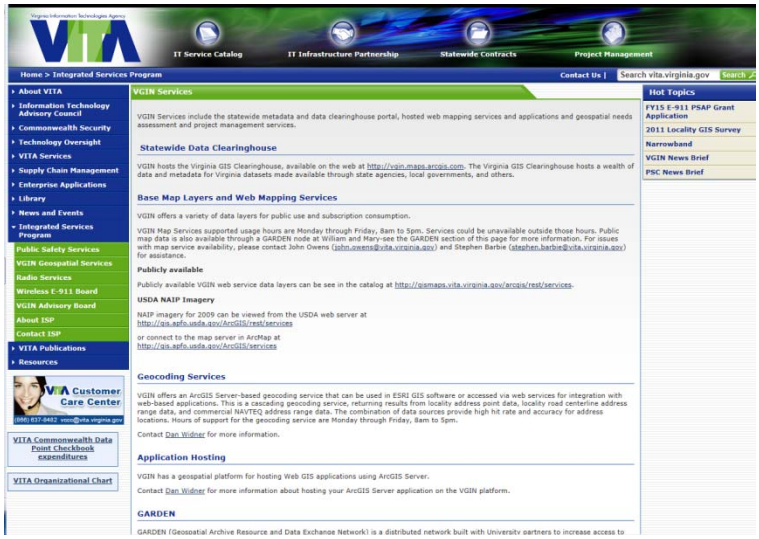
This site includes personal stories in text of individuals within the Accomack-Northampton Planning District whose properties have been directly impacted by Sea Level Rise.



Virginia Current Weather Hazards: Virginia Flood Information

Virginia Department of Emergency Management GIS

https://vdemgis.maps.arcgis.com/apps/PublicGallery/index.html?appid=d7eab74601724b0d8ef9df7cf78926b2&group=9b40487161254134bdd90ac988a52e97



Virginia Geographic Information Network (VGIN)

http://www.vita.virginia.gov/isp/default.aspx?id=12104

Virginia GIS Clearinghouse
Virginia Geographic Information Network (VGIN)

http://vgin.maps.arcgis.com/home/

Mr. Dan Widner of VGIN offers the following on this tool: Much of the information and data in the VGIN's ArcGIS Online organizational account does not need an user account to be accessed. The part that requires a user account is when one is connecting your "organization" and its content to another organization, its content and thus its members. The way we have structured this is by broad stakeholder groups such as federal, state, regional, local government, universities, private sector and non-profits. We did it this way due to use cases that defined, for example, where government entities may want to share data only with

another government entity.

A good example of no account necessary is if you go to http://vgin.maps.arcgis.com and just type in “lidar” in the search box. No need to sign in. When the web page returns the results, you want to make sure you have checked the box on the left under “Show” that says “Show all ArcGIS Desktop Content”.

Virginia Tech Center for Geospatial Information Technology

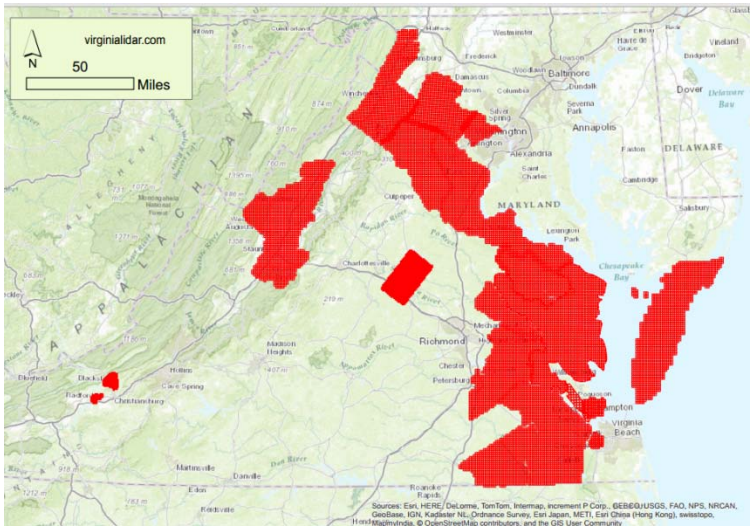
http://www.cgit.vt.edu/

VT-CGIT has expertise in gathering, analyzing, compiling, and processing geospatial data from watersheds and communities in Virginia that is related to the identification and mapping of flood hazards.

VT-CGIT has an extensive database available for structures that are at-risk for flood hazards because of on-going work with VDEM (Floodplain Mgmt Plan, p. 6-28)

William and Mary Geospatial Analysis

http://www.wm.edu/as/cga/VALIDAR/index.php



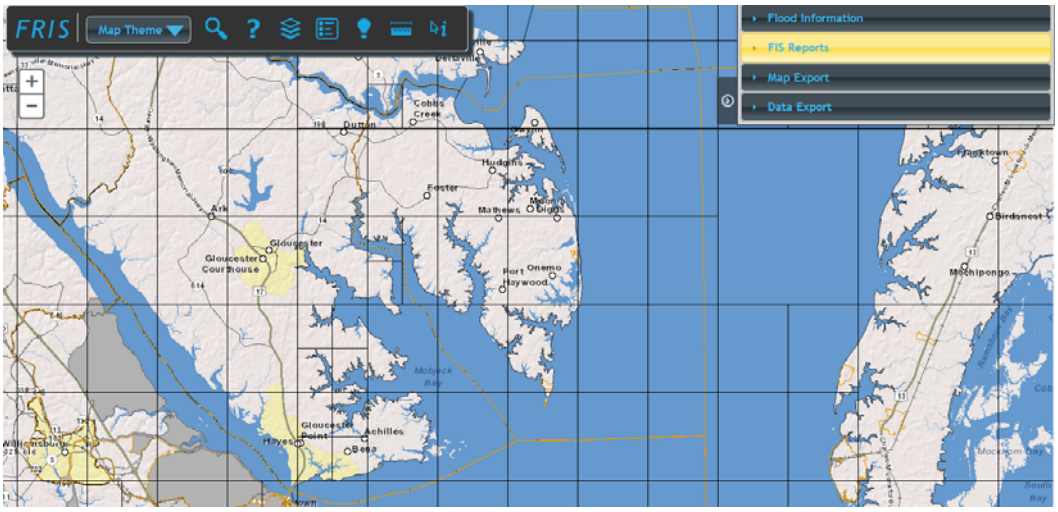
Virginia Flood Risk Information System (FRIS)

http://rfris.nc.gov/fris/?ST=VA

Citizens will be able to input the address of any property into the website to identify its location on a Digital National Flood Insurance Rate Map and determine if the property is in a Special Flood Hazard Area. Homebuyers will be able to make more informed decisions regarding flood risk when purchasing or building a home. Local governments, responsible for

enforcing floodplain ordinances to enable their citizens to qualify for National Flood Insurance, will benefit from the statewide accessibility of digital maps and data. Local and state emergency responders also will benefit from easy access to seamless information to better protect lives and property.

In the future, as data becomes available, the website will allow users to estimate flood damage and costs to properties from various storms on an individual and community-wide basis. The data will be used to support and prioritize mitigation actions and increase education about hazard mitigation options to reduce flood danger and losses.



Virtual USA

Virtual USA was built from the ground up by a partnership of practitioners who own these responsibilities. Together, they defined:

- how shared information should be documented and described
- the technical tools necessary to share information
- agreements needed to set standards for sharing
- the partners that should join the sharing consortium, and
- how access to the system would be controlled

Virtual USA gives emergency managers transparency into the information that is shared, as well as control over who has access to it, where, and for how long. All shared information lists a personal point of contact, so users know who to call with questions.

This site is a prototype. As better geospatial technology spreads across the country and experience grows, the Virtual USA system will evolve and mature along with it.

Virtual USA Implementation Tool

The Virtual USA Implementation Tool is a methodology for agencies to plan and implement a geospatial information-sharing capability in line with the Virtual USA model.

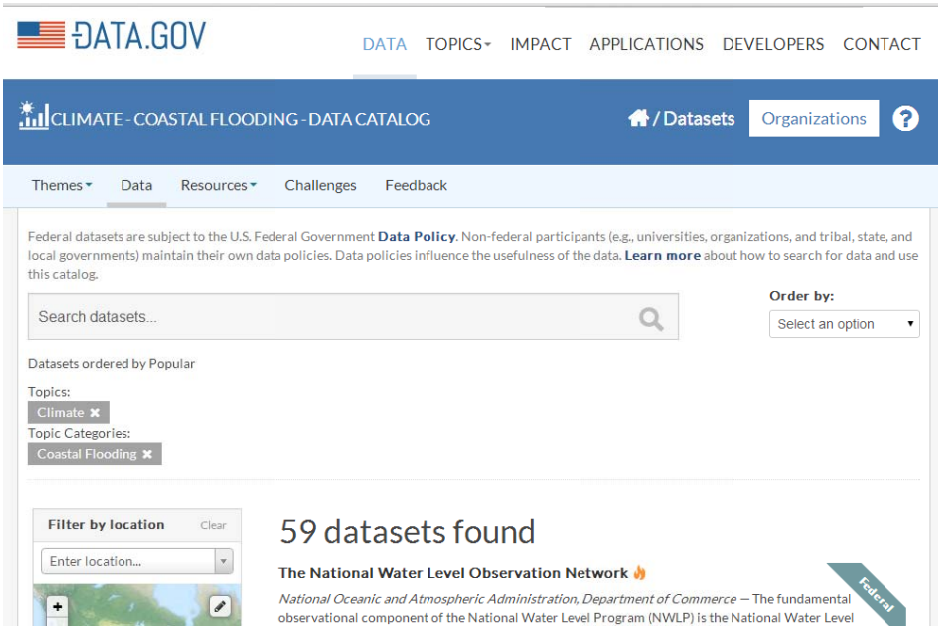
White House Open Data Initiative

http://www.data.gov/

The home of the U.S. Government's open data. Here you will find data, tools, and resources to conduct research, develop web and mobile applications, design data visualizations, and more.

The intent is to leverage and otherwise make available all non-sensitive data captured by all federal agencies and make it available to State and Local partners as well as property owners. Additionally, he mentioned private sector leaders such as Google Earth Engine, ESRI and Intel are also part of the effort as to use their computing resources to effectively turn massive amounts of data into understandable information.

The Initiative announced the Department of Homeland Security, the Department of Defense, the National Geospatial-Intelligence Agency, and the U.S. Geological Survey released a collection of non-sensitive datasets containing mapping information on hundreds of thousands of the Nation's infrastructure units and geographical features, including bridges, roads, railroad tunnels, canals, and river gauges

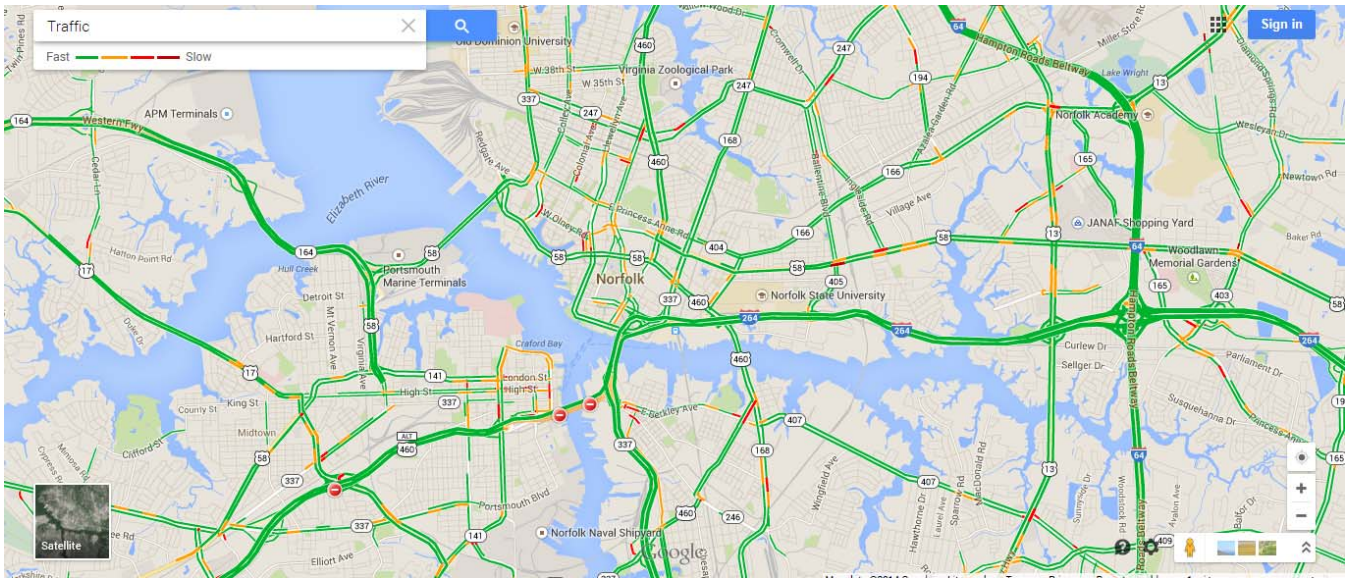


B. SITUATIONAL AWARENESS / RESPONSE TOOLS *(see also p. 99 of VIMS)*

While many tools are used for planning purposes, some are needed in real-time situational awareness in response to a storm or flood-related incident. Some of these tools are listed in this section.

Google Traffic

https://maps.google.com/

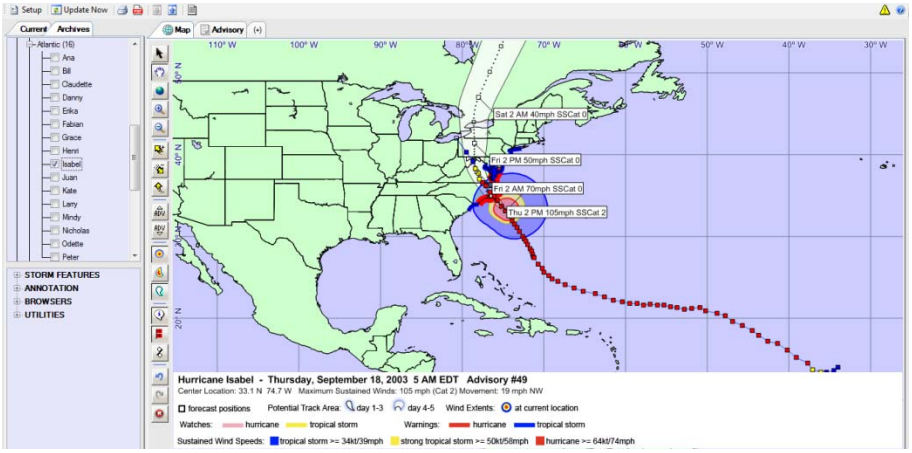


HURREVAC

http://www.hurrevac.com/

HURREVAC is the decision support tool of the National Hurricane Program, administered by FEMA, the USACE, and the NOAA National Hurricane Center.

This web site provides program access and technical support for eligible users in government emergency management. It is maintained by Sea Island Software, the contractor tasked with development, operation, and maintenance of the HURREVAC program.

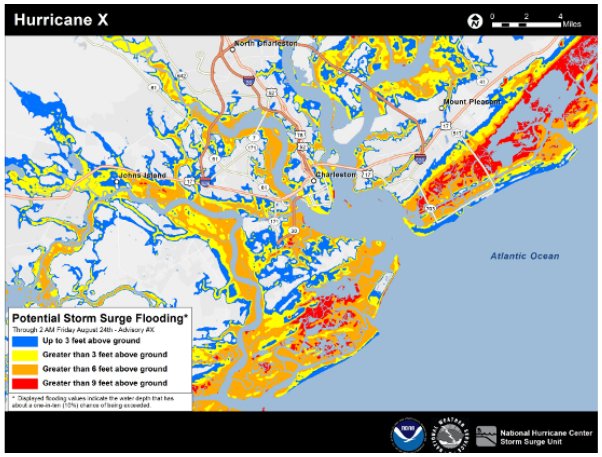


NASA Weather and Climate Toolkit

http://gcmd.nasa.gov/KeywordSearch/Metadata.do?Portal=GCMD&MetadataType=1&MetadataView=Full&KeywordPath=&EntryId=NOAA_NCDC_WCT

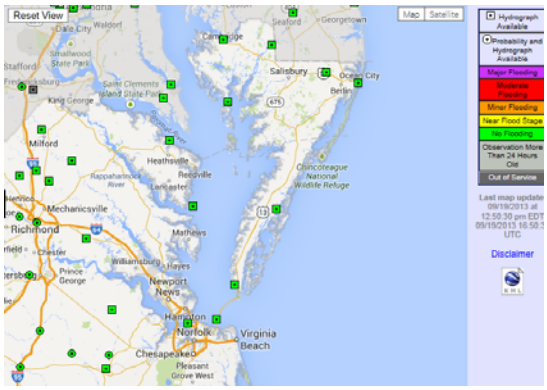
National Hurricane Center Experimental Potential Storm Surge Flooding Map:

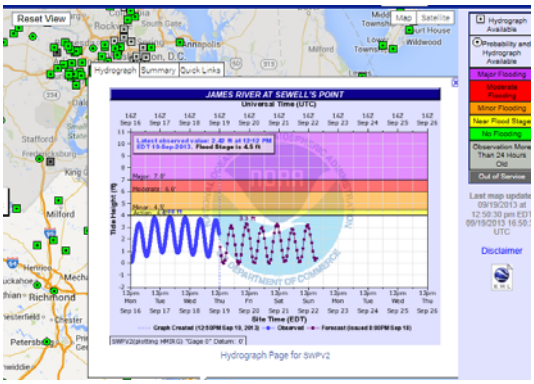
http://www.nhc.noaa.gov/experimental/inundation/



NOAA / NWS Advanced Hydrologic Prediction Service

http://water.weather.gov/ahps2/index.php?wfo=akq

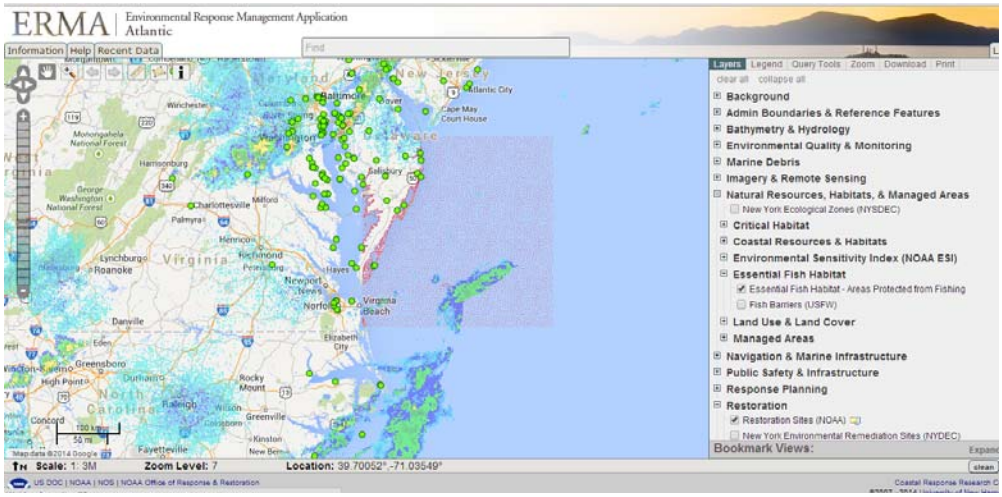




NOAA ERMA (Environmental Response Management Application)

https://www.erma.unh.edu/atlantic/erma.html#/x=-76.02328&y=37.41128&z=7&layers=12970+250+12954+13924 *and*

http://response.restoration.noaa.gov/maps-and-spatial-data/environmental-response-management-application-erma/atlantic-erma.html



NOAA National Climate Data Center: Global Climate Change Indicators

http://ncdc.noaa.gov/indicators/

NOAA Storm Surge Modeling (SLOSH and P-Surge)

SLOSH: Sea, Lake, and Overland Surges from Hurricanes
http://www.nhc.noaa.gov/surge/slosh.php

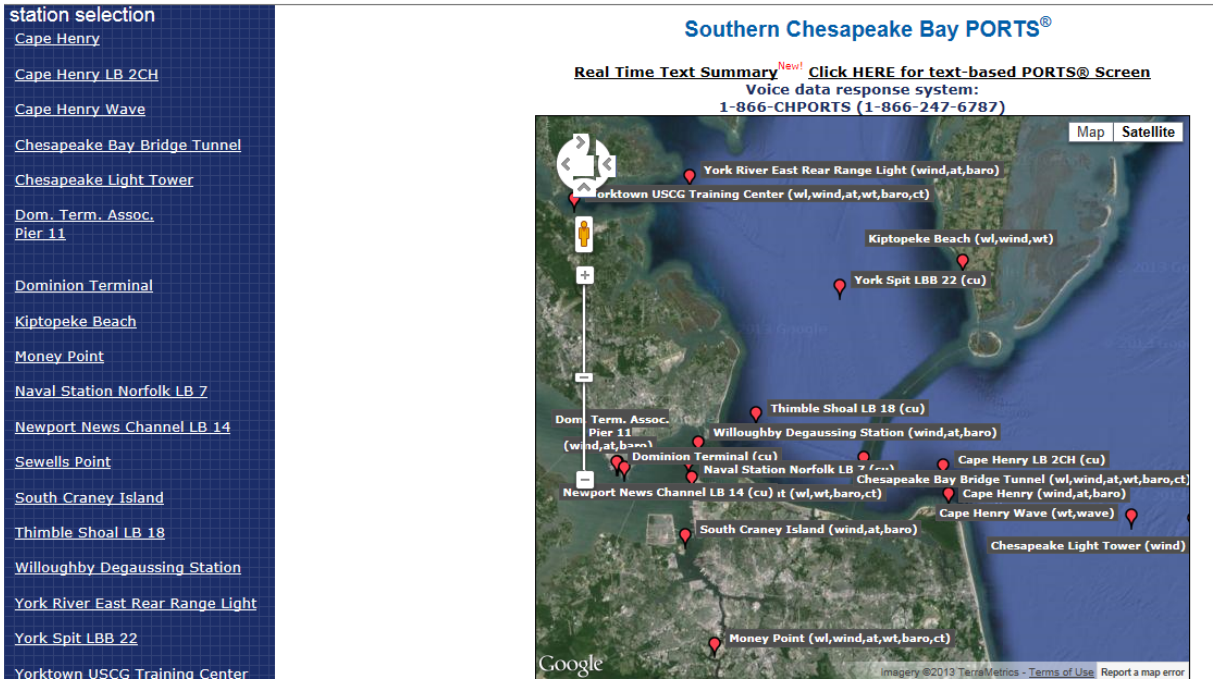
MOMS, MEOWS, P-SURGE… (include timelines)

- *P-Surge include flood depth*

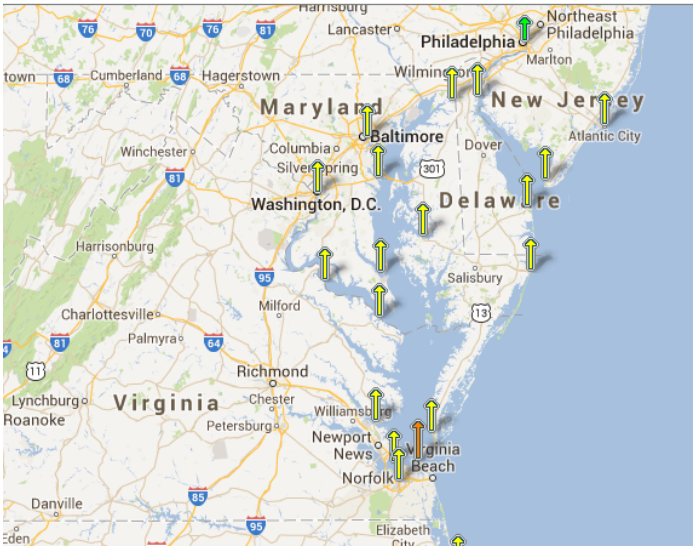
NOAA Physical Oceanographic Real-Time System (PORTS®)

http://tidesandcurrents.noaa.gov/ports.html

PORTS® is a decision support tool that improves the safety and efficiency of maritime commerce and coastal resource management through the integration of real-time environmental observations, forecasts and other geospatial information. PORTS® measures and disseminates observations and predictions of water levels, currents, salinity, and meteorological parameters (e.g., winds, atmospheric pressure, air and water temperatures) that mariners need to navigate safely.

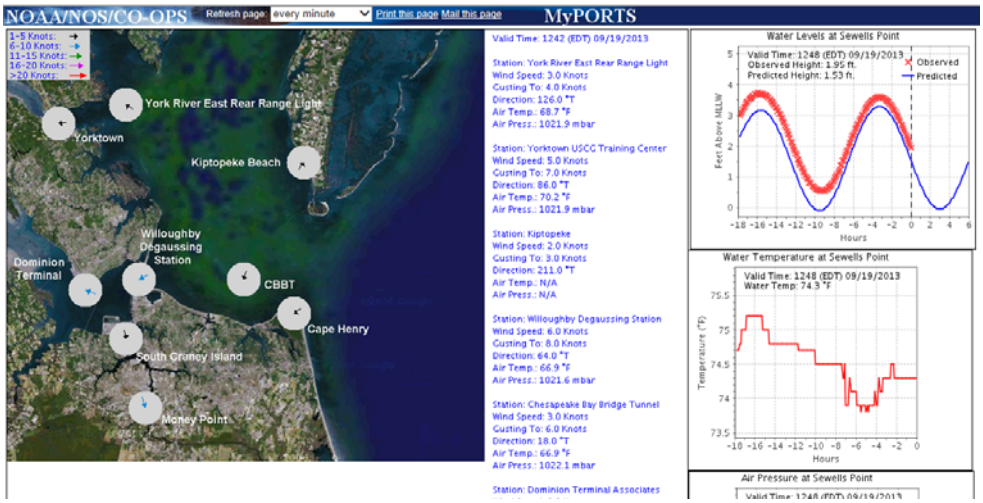


NOAA Tides and Currents:
http://tidesandcurrents.noaa.gov/sltrends/



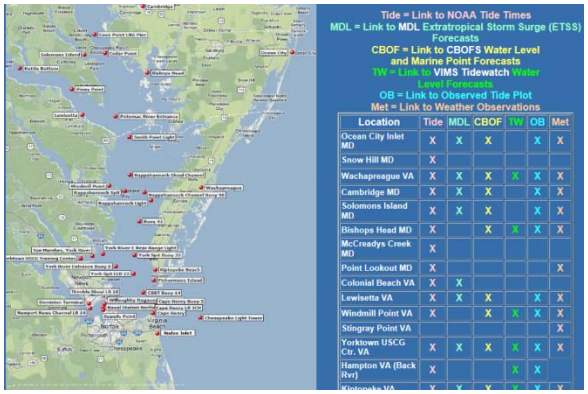
NOAA / NOS / CO-OPS

http://tidesandcurrents.noaa.gov/cgi-bin/customview.pl?screen=mcUCeMsU



NOAA / NWS Tides and Tidal Flooding Information:

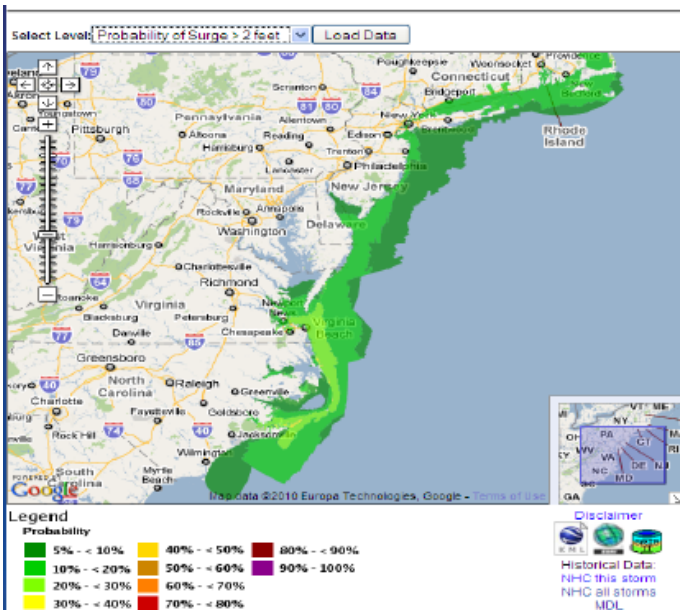
http://www.erh.noaa.gov/er/akq/brief/tides.php



Location	Tide	MDL	CBOF	TW	OB	Met
Ocean City Inlet MD	X	X	X		X	X
Snow Hill MD	X					
Wachapreague VA	X	X	X	X	X	X
Cambridge MD	X	X	X		X	X
Solomons Island MD	X	X	X		X	X
Bishops Head MD	X		X	X	X	X
McCreadys Creek MD	X					
Point Lookout MD	X					X
Colonial Beach VA	X	X				
Lewisetta VA	X	X	X		X	X
Windmill Point VA	X		X	X	X	X
Stingray Point VA						X
Yorktown USCG Ctr, VA	X	X	X	X	X	X
Hampton VA (Back Rvr)	X			X	X	
Kiptopeke VA	X	X	X	X	X	X

NOAA / NWS Probability Storm Surge (P-Surge)

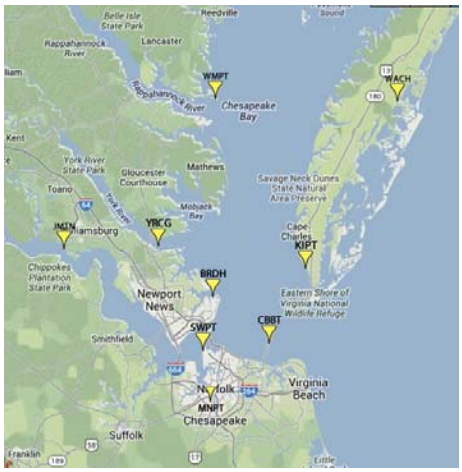
http://www.nws.noaa.gov/mdl/psurge/

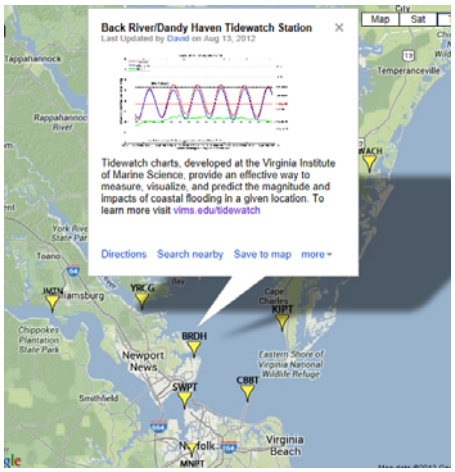


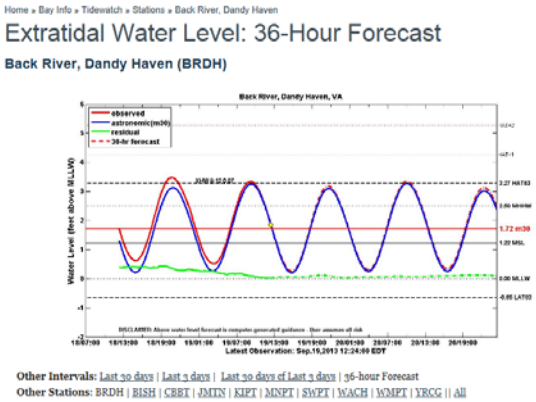
VIMS TideWatch and Real-Time Storm Tide Observation and Forecast System (Rstofs):

http://www.vims.edu/bayinfo/tidewatch/index.php

The Tidewatch system generates 36-hour forecasts for 10 water-level stations







Virginia Department of Transportation (Road Conditions/Closures)
http://www.511virginia.org/

Note: the VDOT map shows only state-maintained roadways; flood location data for locally maintained roads are not consistently available.

APPENDIX IIa

Natural and Nature-Based Infrastructure at a Glance

GENERAL COASTAL RISK REDUCTION PERFORMANCE FACTORS:
STORM INTENSITY, TRACK, AND FORWARD SPEED, AND SURROUNDING LOCAL BATHYMETRY AND TOPOGRAPHY

Dunes and Beaches

Benefits/Processes

Break offshore waves

Attenuate wave energy

Slow inland water transfer

Performance Factors

Berm height and width

Beach Slope

Sediment grain size and supply

Dune height, crest, width

Presence of vegetation

Vegetated Features: Salt Marshes, Wetlands, Submerged Aquatic Vegetation (SAV)

Benefits/Processes

Break offshore waves

Attenuate wave energy

Slow inland water transfer

Increase infiltration

Performance Factors

Marsh, wetland, or SAV elevation and continuity

Vegetation type and density

Oyster and Coral Reefs

Benefits/Processes

Break offshore waves

Attenuate wave energy

Slow inland water transfer

Performance Factors

Reef width, elevation and roughness

Barrier Islands

Benefits/Processes

Wave attenuation and/or dissipation

Sediment stabilization

Performance Factors

Island elevation, length, and width

Land cover

Breach susceptibility

Proximity to mainland shore

Maritime Forests/Shrub Communities

Benefits/Processes

Wave attenuation and/or dissipation

Shoreline erosion stabilization

Soil retention

Performance Factors

Vegetation height and density

Forest dimension

Sediment composition

Platform elevation

APPENDIX IIa

Nonstructural Measures at a Glance

APPENDIX IIb

GENERAL COASTAL RISK REDUCTION PERFORMANCE FACTORS:
COLLABORATION AND SHARED RESPONSIBILITY FRAMEWORK, WAVE HEIGHT, WATER LEVEL, STORM DURATION

Floodplain Policy & Management

Benefits/Processes

Improved and controlled floodplain development

Reduced opportunity for damages

Improved natural coast environment

Performance Factors

Wave height

Water level

Storm Duration

Agency Collaboration

Floodproofing and Impact Reduction

Benefits/Processes

Reduced opportunity for damages

Increased community resiliency

Does not increase flood potential elsewhere

Performance Factors

Wave height

Water level

Storm Duration

Flood Warning & Preparedness

Benefits/Processes

Reduced opportunity for damages

Increased community resiliency

Improved public awareness and responsibility

Performance Factors

Wave height

Water level

Storm Duration

Relocation

Benefits/Processes

Reduced opportunity for damages

Does not increase flood potential elsewhere

Improved natural coast environment

Performance Factors

Wave height

Water level

Storm Duration

APPENDIX IIb

APPENDIX IIc

Structural Measures at a Glance

GENERAL COASTAL RISK REDUCTION PERFORMANCE FACTORS:
STORM SURGE AND WAVE HEIGHT/PERIOD, WATER LEVEL

Levees

Benefits/ Processes

Surge and Wave attenuation and/or dissipation

Reduce Flooding

Risk Reduction for vulnerable areas

Performance Factors

Levee height, crest width, and slope

Wave height and period

Water level

Storm Surge Barriers

Benefits/ Processes

Surge and Wave attenuation

Reduced Salinity Intrusion

Performance Factors

Barrier height

Wave height

Wave period

Water level

Seawalls and Revetments

Benefits/Processes

Reduce flooding

Reduce wave overtopping

Shoreline stabilization behind structure

Performance Factors

Wave height

Wave period

Water level

Scour protection

Groins

Benefits/ Processes

Shoreline stabilization

Performance Factors

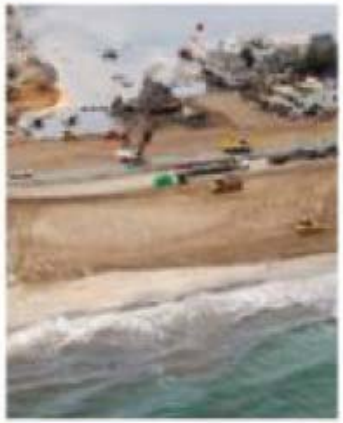
Groin length, height, orientation, permeability and spacing

Depth at seaward end

Wave height

Water level

Longshore transportation rates and distribution



Detached Breakwaters

Benefits/Processes

Shoreline stabilization behind structure

Wave attenuation

Performance Factors

Breakwater height and width.

Breakwater permeability, proximity to shoreline, orientation and spacing

APPENDIX IIc

APPENDIX IV
Sample Resource Materials for Flood Action and Resource Website

Local / Regional / State

- A-NPDC Transportation Infrastructure Inundation Vulnerability Assessment (in progress, to be completed during 2014) will utilize LiDAR-derived road surface elevation to assess vulnerability to inundation for all transportation infrastructure on the Eastern Shore
- ASFPM's No Adverse Impact Resource Page http://www.floods.org/index.asp?menuID=460
- Center of Climate Strategies Adaptation Guidebook: Comprehensive Climate Action (in NOAA folder, Tab 4, with sample adaption policy options)
- CoreLogic Storm Surge Report (2013)
- FEMA 100: A Unified National Program for Floodplain Management
- FEMA 116: Reducing Losses in High Risk Flood Hazard Areas: A Guidebook for Local Officials
- FEMA 257: Mitigation of Flood and Erosion Damage to Residential Buildings in Coastal Areas
- FEMA 268: Protecting Floodplain Resources
- FEMA 511: Reducing Damage From Localized Flooding: A Guide for Communities (June 2005)
- FEMA 386: Integrating Historic Property and Culture Resources Consideratons Into Hazard Mitigation Planning: State and Local Mitigation How-To Guide (May 2005)
- George Mason University: Community Adaptation to Sea-Level Rise and Inundation: Final Project Report – Findings, Lessons Learned, and Replicability of a Model for Sea-Level Rise Public Engagement (CASI, in collabortation with Anne Arundel Community College, Dewberry, NS the U.S. Naval Academy)
- National Academies: Reducing Coastal Risk on the East and Gulf Coast
- Nature Conservancy, The: Using Nature to Reduce Climate and Disaster Risks
- No Adverse Impact: A Toolkit for Common Sense Floodplain Management (ASFPM / NAI, 2003) – in State Folder
- NOAA Coastal Service Center: Incorporating Sea Level Change Scenarios at the Local Level: http://csc.noaa.gov/digitalcoast/publications/slcscenarios

APPENDIX IV

Sample Resource Materials for Flood Action and Resource Website

- NOAA Digital Coast: Introducing Green Infrastructure for Coastal Resilience
  http://www.csc.noaa.gov/digitalcoast/training/green
- NOAA Digital Coast: What Will Adaptation Cost?
  http://www.csc.noaa.gov/digitalcoast/publications/adaptation
- NOAA Technical Report NOS CO-OPS 073: Sea Level Rise and Nuisance Flood Frequency Changes around the United States
- Old Dominion University: Under Water? Sea Level Rise and Environmental Risks
- Open Space Easement Program
  http://www.virginiaoutdoorsfoundation.org/
- Risky Business: The Economic Risks of Climate Change in the United States
- Union of Concerned Scientists: National Landmarks at Risk: How Rising Seas, Floods and Wildfires Are Threatening the United States' Most Cherished Historic Sites
- USACE and NOAA: Infrastructure Systems Rebuilding Principles (April 2013)
- U.S. EPA Flood Resilience Checklist
- USGS: Land Subsidence and Relative Sea-Level Rise in the Southern Chesapeake Bay Region (2013)
- VACO Coastal Insurance Study Task Force Report
  http://www.vaco.org/vaco-coastal-insurance-report/
- VIMS Chesapeake Bay Shoreline Evolution Reports
  http://web.vims.edu/physical/research/shoreline/Publications-Evolution.htm
- VIMS Comprehensive Coastal Resource Management Portal – Guidance for Tidal Shoreline Management Plans in Virginia
  http://www.ccrm.vims.edu/ccrmp/index.html
- VIMS: Vulnerability of Shallow Tidal Water Habitats in Virginia to Climate Change
  http://ccrm.vims.edu/research/climate_change/COASTALHABITATS_FinalReport.pdf
  - Also shows areas of developed lands vulnerable to Sea Level Rise (VIMS, p. 98)
    http://ccrm.vims.edu/research/climate_change/append/AppendixV_VulnerableDevelopedLands.pdf
- Virginia Coastal Zone Management Program has these reports
  http://www.deq.virginia.gov/Programs/CoastalZoneManagement/CZMIssuesInitiatives/ClimateChange.aspx

- Virginia Local Official's Guide to Floodplain Management: Guidance for those regulating development in the floodplain (DCR)
- Virginia Sea Grant Studies http://seagrant.noaa.gov/WhatWeDo/PastFocusAreas(2009-2013)/HazardResilientCoastalCommunities.aspx

Legal Materials

- Virginia Attorney General Legal Opinions
- Virginia Coastal Policy Clinic Whitepapers http://law.wm.edu/academics/programs/jd/electives/clinics/vacoastal/reports/index.php

Individual Resources

- Anchoring Home Fuel Tanks (Public Education Folder)
    - Also at http://www.youtube.com/watch?v=gVTSWXnLmC4
- DEQ's "Introduction to Climate Science for Virginians" which includes a "Liveable Neighborhood Water Stewardship Program: Yard Walkabout (*http://www.deq.virginia.gov/Portals/0/DEQ/CoastalZoneManagement/task4-09.pdf*, p. 47)
- FEMA 114: Design Manual for Retrofitting Floodprone Residential Structures
- FEMA 234: Repairing Your Flooded Home
- FEMA 312: Homeowner's Guide to Retrofitting: Six Ways to Protect Your House from Flooding
- FEMA 347: Above the Flood: Elevating Your Floodprone House
- FEMA Information for Homeowners: http://www.fema.gov/information-homeowners
- Install Sewer Backflow Valves (FEMA)
- Introduction to Building Codes for Property Owners (FEMA Presentation)
- National Flood Insurance Flood Insurance Claims Handbook
- Red Cross / FEMA: Repairing Your Flooded Home
- Virginia Citizen's Guide to Floodplain Management: Guidance for Those Living & Developing in the Floodplain (DRC)

- Virginia's Floodplain Management Program Fact Sheet #2: Preparing for a Flood (DCR)
- Wetlands Watch Summary of Provisions that will Most Affect Property Owners: Homeowner and Flood Insurance Affordability Act of 2013 AKA Grimm-Waters 2013

Businesses

- Climate Change Preparedness and the Small Business Sector
- FEMA 102: Floodproofing Non-Residential Structures
- FEMA 348: Protecting Building Utilities from Flood Damage
    - http://www.fema.gov/library/viewRecord.do?id=1750

Designers, Builders and Developers

- DHS Technical Bulletin 2: Flood Damage-Resistant Materials Requirements for Buildings Located in Special Flood Hazard Areas in accordance with the National Flood Insurance Program (August 2008)
- FEMA 15: Design Guidelines for Flood Damage Reducation
- FEMA 54: Elevated Residential Structures
- FEMA 55: Coastal Construction Manual
- FEMA 85: Manufactured Home Installation in Flood Hazard Areas
- FEMA 259: Engineering Principles and Practices for Retroffiting Flood Prone Residential Buildings
  http://www.fema.gov/library/viewRecord.do?id=1645
- FEMA P-499: Home Builder's Guide to Coastal Construction
  http://www.fema.gov/library/viewRecord.do?id=2138

National Disaster Recovery Framework

- **Overview**
- Community Planning and Capacity Building
- Community Recovery Management Toolkit
- Recovery Support Functions
- Frequently Asked Questions
- Resources
- Recovery Lessons Learned & Information Sharing
- Recovery Leadership Roles and Responsibilities
- Stakeholder Engagement

National Disaster Recovery Framework: Overview

The National Disaster Recovery Framework

The National Disaster Recovery Framework (NDRF) is a conceptual guide designed to ensure coordination and recovery planning at all levels of government before a disaster, and defines how we will work together, following a disaster, to best meet the needs of states, local and tribal governments and communities and individuals in their recoveries. For the first time, the framework establishes coordination structures, defines leadership roles and responsibilities, and guides coordination and recovery planning at all levels of government before a disaster happens. It involves better utilization of existing resources.

Recovery Support Functions

The National Disaster Recovery Framework introduces six recovery support functions that are led by designated federal coordinating agencies. The Recovery Support Functions (RSFs) comprise the coordinating structure for key functional areas of assistance. Their purpose is to support local governments by facilitating problem solving, improving access to resources and fostering coordination among state and federal agencies, nongovernmental partners and stakeholders. The Recovery Support Functions and designated federal coordinating agencies are:

- Urban Search and Rescue
- Disaster Emergency Communications
- Community Emergency Response Teams (CERT)
- Individual Assistance Program Tools
- Public Assistance: Local, State, Tribal and Non-Profit
- Hurricane Sandy Recovery
- Louisiana Recovery
- Mississippi Recovery Office
- Environmental Planning and Historic Preservation Program

- ***Community Planning and Capacity Building:*** *Federal Emergency Management Agency*
- ***Economic:*** *U.S. Department of Commerce*
- ***Health and Social Services:*** *U.S. Department of Health and Human Services*
- ***Housing:*** *U.S. Department of Housing and Urban Development*
- ***Infrastructure Systems:*** *U.S. Army Corps of Engineers*
- ***Natural and Cultural Resources:*** *U.S. Department of Interior*

Leading Recovery

The framework identifies and recommends key recovery positions designed to allow for more concentrated focus on community recovery. These positions include a Federal Disaster Recovery Coordinator (when warranted in large-scale or catastrophic disasters), State/Tribal Disaster Recovery Coordinators and Local Disaster Recovery Managers.

Addressing the Needs of the Whole Community

The framework incorporates whole community values, with emphasis on core principles, such as individual and family empowerment and partnership and inclusiveness. The National Disaster Recovery Framework outlines how important state, local and tribal leadership and participation of community members in decision-making and coordinated engagement of a wide array of supporting organizations is critical for successful recovery.

Stakeholder Review and Comment

The framework was developed in partnership, and through extensive outreach, with Federal, state, local and tribal governments, private and non-profit partners who have a stake in immediate and ongoing recovery following a disaster. Outreach sessions that began in fall 2009 resulted in thousands of comments and recommendations from more than 600 stakeholders representing Federal, Tribal, state and local governments, public and private organizations, including communities recovering from disasters. This feedback informed the development of the draft National Disaster Recovery Framework.

In January 2010, the draft National Disaster Recovery Framework was published in the Federal Register for public comment. FEMA reviewed the more than 2,000 comments to further refine the final version of the National Disaster Recovery Framework.

Summary

This framework, which helps to better define how we, as a Nation, will approach recovery, is not a finish line, but just one part of our ongoing mission to better meet the needs of

disaster survivors. We will continue to work with all of our stakeholders on ways to improve our programs, and better partner with the entire team, in our common goal to support communities as they recover.

FEMA's mission is to support our citizens and first responders to ensure that as a nation we work together to build, sustain, and improve our capability to prepare for, protect against, respond to, recover from, and mitigate all hazards.

Last Updated: 07/24/2014 - 16:00

Visit the DHS Lessons Learned Information System (LLIS.gov) for a one-stop shop of homeland security best practices.

Ready.gov in Spanish has a new look and feel. Visite la nueva página de Listo.gov para obtener consejos de preparación.

Federal Emergency Management Agency
U.S. Department of Homeland Security
500 C Street SW, Washington, DC 20472
General Operator: (202) 646-2500

Register for Disaster Assistance:
(800) 621-3362 / TTY (800) 462-7585

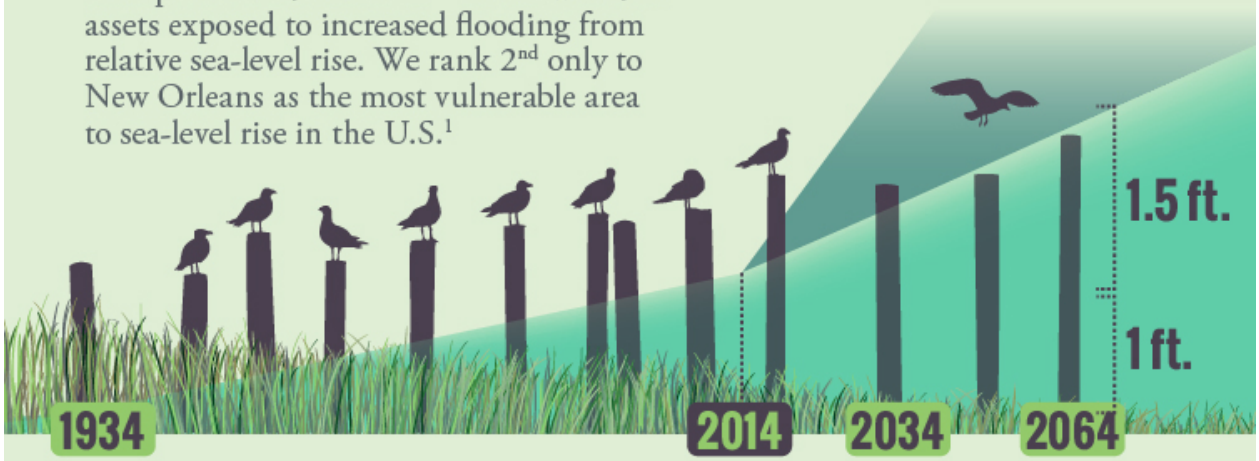
VIRGINIA COASTAL COALITION

VCPC
Virginia Coastal Policy Clinic
William & Mary Law School

HAMPTON ROADS

Risks of Rising Waters

Hampton Roads ranks 10th in the world in assets exposed to increased flooding from relative sea-level rise. We rank 2nd only to New Orleans as the most vulnerable area to sea-level rise in the U.S.[1]



Sea Level to Rise 1-1.5 Feet in 20-50 Years

Water levels in Hampton Roads have risen more than one foot over the past 80 years. Projections indicate that over the next 20-50 years, levels will rise approximately 1.5 feet and over 3 feet by 2100.[2]

Affecting 800 Miles of Roadways

Over 800 miles of roadways in Hampton Roads could be affected by this 3 foot rise in sea-level.[3]

And 3,600 Businesses

Over 3,600 businesses in Hampton Roads could be significantly affected by 3 feet of sea level rise - over 940 businesses in Norfolk and 900 in Virginia Beach.[4]

[1] Georgetown Climate Center (available: http://www.georgetownclimate.org/resources/sea-level-rise-in-hampton-roads).
[2] Recurrent Flooding in Tidewater Virginia, VIMS 2013 (available: http://ccrm.vims.edu/recurrent_flooding/Recurrent_Flooding_Study_web.pdf).
[3] Climate Change in Hampton Roads, HRPDC 2012 (available: http://www.hrpdcva.gov/news/index/view/id/19).
[4] Climate Change in Hampton Roads, HRPDC 2012 (available: http://www.hrpdcva.gov/news/index/view/id/19).