

VIRGINIA
ACCOMPLISHMENTS
SINCE THE 2008
CLIMATE ACTION PLAN
RELEASE

December 2014

Executive Summary

Virginia has undertaken a variety of actions to mitigate the emission of greenhouse gasses and adapt to climate related changes to our weather, wildlife, and sea level. However, these changes have not been undertaken in a coordinated fashion, nor have they been in clear response to the recommendations of any entity that has approached the problem of climate change as a whole.

Greenhouse gas mitigation has taken place in the form of a few policies to capture landfill gas, encourage limited energy efficiency, encourage growth of some renewable energy, and reduce vehicle miles traveled. Additionally, good progress has been made in encouraging natural carbon sinks and increased forest land and land in agricultural production. The bulk of carbon reduction strategies suggested by prior commissions and reports were not implemented.

Adaptation efforts have been more robust. Data collection has been steady and multiple entities including the Secure Commonwealth Panel, the Center for Coastal Resources Management at the Virginia Institute of Marine Science, the Coastal Policy Clinic at William & Mary Law School, Old Dominion University's Whole of Government effort, and many others have all been working to address the challenges of adaptation. These efforts have been fruitful individually but disjointed without a central coordinating body or figure.

While opinions tend differ among stakeholders, there are areas of consensus among nearly all groups who have studied the state's options and made recommendations for future action related to climate change. The consensus recommendations fall into six categories: 1) Identify a single entity to lead VA activities related to Climate Change; 2) Establish a state requirement for climate impact review; 3) Support local governments by establishing clear guidance on authority and liability related to climate adaptation; 4) Develop funding resources to support these efforts; 5) Continue to develop and improve available data; and 6) Conduct widespread and effective climate outreach.

These consensus recommendations likely present an excellent starting point for the work of the Climate Change and Resiliency Commission's work.

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Background

In 2008, the Governor's Commission on Climate Change (GCCC) concluded that "...because the effects of climate change on Virginia will be profound, we cannot wait for the federal government to act." The Climate Action Plan released by the GCCC addressed both mitigation of climate change through reductions in Greenhouse Gas (GHG) emissions and adaptation necessary to deal with unavoidable impacts of climate change. After months of investigation and review, the GCCC developed 16 Findings, 14 General Principles Regarding Strategies, and 15 Recommendations ([Appendix 1](#)). The recommendations included a total of 113 very specific actions that could be taken by either the Governor, state agencies, or the General Assembly.

Since the release of the 2008 Climate Action Plan, the state has yet to develop a comprehensive program designed to respond comprehensively to the recommendations of the Plan. This does not mean that nothing has happened, however.

The 2008 Plan recommended a number of actions that were effectively continuation, enhancement, or refocusing of ongoing programs. Those activities and others have generated some progress toward the objectives in the 2008 Plan, as described in this report. In addition, coastal localities, most notably those in Hampton Roads, have taken action at the local level to address issues of increasingly frequent flooding driven by rising sea level.

In response to the growing local concerns, the 2012 General Assembly directed the Virginia Institute of Marine Science (VIMS) to prepare a report on Recurrent Flooding in Tidewater Virginia. That report was delivered to the 2013 General Assembly. The report contained 4 general findings and 5 broad recommendations ([Appendix 2](#)) that, although independently developed, mirrored and supported those in the 2008 Climate Action Plan.

In response to the 2013 VIMS Recurrent Flooding report, the Virginia Secure Commonwealth Panel (VSCP) concluded that flooding and sea level rise were "...threats like any other for which the Commonwealth plans." The Panel formed a sub-panel on recurrent flooding, and submitted a report to the Virginia Secretary of Public Safety and Homeland Security earlier this year. The report contains 20 recommendations for strategic and tactical responses by the Commonwealth to recurrent flooding and sea level rise ([Appendix 3](#)). The VSCP recommendations are framed around the VIMS report recommendations and reflect much consistency with the 2008 Climate Action Plan recommendations.

Now, at the end of 2014, the Commonwealth has had three formal reviews of climate change and its impacts. While only the 2008 Climate Action Plan addressed the state's role in mitigation of GHG, all three reports have assessed the need and options for adaptation to the unavoidable consequences of climate change. On this subject, all three reports reached similar conclusions with consistent recommendations for state actions (see [Appendices 1-3](#) for a summary of recommendations).

It is worth noting that since the 2008 GCCC met, there has been a continued growth in the scientific understandings of climate change and its impacts. (e.g. (<http://data.globalchange.gov/>)) For example, there has been a significant change in the scientific forecasts for future sea level rise. Based on recent observations and revised models, the rate of rise is even faster than anticipated in 2008. While the science has evolved, the essential adaptation options remain the same – a fact reflected in the consistency of recommendations from the three reports which span the last 6 years.

Accomplishments since 2008 Climate Action Plan Release

This summary is limited to current or completed actions by state government. It is as comprehensive as the report preparation team could manage, but full vetting by all state entities was not possible. Where there are no bullets inventorying actions, no clear evidence of progress was found.

Recommendations that Affect GHG Emissions

The 2008 Climate Action Plan had nine general recommendations that would affect Virginia's greenhouse gas emissions ([Appendix 1](#)). The 2008 Plan reflects that the GCCC anticipated Congress would enact a cap-and-trade program for carbon emissions by 2012. That did not happen and instead the EPA has issued the Clean Power Plan Proposed Rule (<http://www2.epa.gov/carbon-pollution-standards/clean-power-plan-proposed-rule>).

Implementation of this rule will likely impact many of the 2008 Plan objectives addressing GHG emissions, energy efficiency, and energy generation. While implementation of the rule remains incomplete, there have been several state actions related to the 2008 Plan recommendations which are identified below.

Recommendation 1. Virginia will reduce GHG emissions by increasing energy efficiency and conservation.

- According to data available from the EPA Air Markets Program, Virginia power generating facilities reported emitting 38% less CO₂ in 2014 than they did in 2005. (<http://ampd.epa.gov/ampd/>)
- The Virginia Resources Authority uses the Virginia Pooled Financing Program to fund energy efficiency projects in local governments – generally energy performance contracts with private sector providers. (<http://www.virginiaresources.org/pooledfinancing.shtml>)
- The 2014 Virginia Energy Plan, which was released on October 1, 2014, includes a recommendation (5C) to create additional financing for investments in energy efficiency and zero-carbon dioxide emitting renewable energy generation. (http://www.dmme.virginia.gov/DE/LinkDocuments/2014_VirginiaEnergyPlan/18Recommendations.pdf) The plan is summarized in [Appendix 4](#).

- In 2010 the General Assembly approved addition of Landfill Gas Energy Projects to the Virginia Resources Authority loan program areas. (<http://www.virginiareources.org/pdf/VRA%20CAFR%202010%20FINAL.pdf>)
- The Department of Mines, Minerals and Energy operates the Virginia Energy Management Program which works to improve energy efficiency and lower energy procurement costs for state agencies and other public bodies. (<http://www.dmme.virginia.gov/DE/VEMP.shtml>)
- DMME worked with local governments, non-profits, private contractors and other stakeholders to support regional energy alliances that provide “home performance” energy efficiency services to owners and occupants of residential and small commercial properties. (<http://www.dmme.virginia.gov/DE/ResidentialEnergyEfficiency.shtml>)
- In 2008, the Virginia General Assembly directed the State Corporation Commission (SCC) to develop an energy consumer education program to encourage electric energy efficiency and conservation in Virginia households, businesses, and institutions. In 2009, the SCC implemented an integrated statewide consumer education and outreach program called Virginia Energy Sense with the goal to transform the public’s existing general awareness of energy efficiency and conservation into consumer action. (<http://www.VirginiaEnergySense.org>)
- In 2014 the Board of Housing and Community Development adopted the 2012 Uniform Statewide Building Code/2012 International Energy Conservation Code (IECC) requiring all new commercial building to meet energy requirements that are 30% more stringent than the 2006 USBC/IECC. (<http://www.dhcd.virginia.gov/index.php/va-building-codes/building-and-fire-codes/regulations/uniform-statewide-building-code-usbc.html>)

Recommendation 2. Virginia will advocate for federal actions that will reduce net GHG emissions.

Recommendation 3. Virginia will reduce GHG emissions related to vehicle miles traveled through expanded commuter choice, improved transportation system efficiency, and improved community designs.

- The Virginia Department of Human Resource Management has policies that promote general work efficiencies by permitting agencies to designate employees who may utilize flexible work hours (http://www.dhrm.virginia.gov/docs/default-source/hrpolicy/pol1_25hoursofwork.pdf?sfvrsn=2) and/or alternate work locations. (http://www.dhrm.virginia.gov/docs/default-source/hrpolicy/pol1_61.pdf?sfvrsn=2). Both of these policies existed prior to the release of the 2008 Plan.
- The Virginia Resources Authority added a broadband revolving loan fund in 2009. (<http://www.virginiareources.org/pdf/FINAL%20CAFR%202009.pdf>)
- Metropolitan Washington Council of Governments (MWCOG) currently evaluates their Long Range Transportation Plan for greenhouse gas emissions impacts, which includes both the I-95 and I-495 HOT lanes networks. (<http://www.mwcog.org/environment/climate/about.asp>)

- VDOT worked together with the MWCOC to study the public acceptability of congestion pricing in the Metropolitan Washington Region. (<http://www.mwcog.org/uploads/public/documents/pl5cWI820131118131930.pdf>)
- In 2009, VDOT implemented the Secondary Street Acceptance Requirements, which requires new streets intended for state maintenance to include connectivity and pedestrian facilities and allows for narrower paved cross-sections, improving community design. (http://www.vdot.virginia.gov/info/secondary_street_acceptance_requirements.asp)
- VDOT provided planning assistance to localities implementing urban development areas and published the Transportation Efficient Land Use and Design Guide in 2012 to assist localities in planning for more efficient land development patterns. (http://www.vdot.virginia.gov/info/transportation_efficient_land_use_and_design_guide.asp)
- In 2013, VDOT completed a study of park and ride lots across the state to inform future travel demand management investments. (http://www.vdot.virginia.gov/travel/parkride/investment_strategies.asp)
- VDOT provides Congestion, Mitigation, and Air Quality (CMAQ) funding to support commuter choice programs such as RideFinders and Commuter Connections. (<https://www.fhwa.dot.gov/safetealu/factsheets/cmaq.htm>)
- VDOT, working with the Department of Rail and Public Transportation and localities, adopted DRPT's Multimodal System Design Guidelines (<http://www.drpt.virginia.gov/activities/MultimodalSystemDesignGuidelines.aspx>)
- VDOT has a policy and program to promote bicycling and walking (<http://www.virginiadot.org/programs/bk-default.asp>)

Recommendation 4. Virginia will reduce GHG emissions from automobiles and trucks by increasing efficiency of the transportation fleet and use of alternative fuels.

- The General Assembly authorized localities to reduce personal property taxes and/or waive license fees for motor vehicles using clean special fuels as defined in § 46.2-749.3." (<http://leg1.state.va.us/cgi-bin/legp504.exe?000+cod+58.1-3506>)
- In 2011 the General Assembly directed establishment of a plan to introduce vehicles using alternative fuel into the state vehicle fleet. (<http://www.dgs.virginia.gov/OFMSHome/tabid/1253/Default.aspx>)
- VDOT has completely updated its Traffic Engineering Design Manual (<http://www.virginiadot.org/business/locdes/traffic-engineering-manual.asp>) and is in the process of updating its standards and specifications for traffic signals and Intelligent Transportation Systems (ITS) equipment. These updates will standardize the use of new equipment and procedures that can improve traffic signalization timing and intelligence.
 - VDOT is currently migrating nearly half (1,400 out of 3,000) of its legacy traffic signal equipment to a "Next Generation" traffic controller allowing for improved timings, coordination, communications, etc. through upgraded technology.
 - VDOT successfully completed a pilot of Adaptive Signal Control Technology (ASCT) on 13 corridors (113 intersections) across the state.

- VDOT updated its policy on calculating traffic signal Change & Clearance intervals (yellow & all-red) to be more comprehensive and consistent statewide.
- VDOT developed a defined process for implementing the Roundabout Policy.

Recommendation 5. Virginia will reduce GHG emissions through accelerated research and development.

- The Virginia Universities Clean Energy Development and Economic Stimulus Foundation was created in 2010 to, among other things, fund research and development of alternative fuels, clean energy production, and related technologies. (<http://lis.virginia.gov/cgi-bin/legp604.exe?000+cod+23-300>)

Recommendation 6. Virginia will reduce GHG emissions by increasing the proportion of energy demands that are met by renewable sources.

- In 2010 the General Assembly established the Virginia Infrastructure Project Loan Fund, administered by the Virginia Resource Authority. The fund is for financing development of facilities to collect gas from landfills and wastewater treatment plants. (<https://lis.virginia.gov/cgi-bin/legp604.exe?101+ful+CHAP0724>)
- The Department of Mines, Minerals and Energy was authorized in 2014 to re-invigorate a Biofuels Production Incentive Grant Program. The program is now set to end on July 1, 2017. (<https://leg1.state.va.us/cgi-bin/legp504.exe?000+cod+45.1-394>)
- In 2010 the General Assembly created the Virginia Offshore Wind Development Authority. The Authority was established “...for the purposes of facilitating, coordinating, and supporting the development ...of the offshore wind energy industry, offshore wind energy projects, and associated supply chain vendors...” (<http://leg1.state.va.us/cgi-bin/legp504.exe?101+ful+CHAP0507>)
- In 2011 the General Assembly directed the Virginia Economic Development Partnership Authority to manage the newly created Clean Energy Manufacturing Incentive Grant program (CEMIG). (<http://lis.virginia.gov/cgi-bin/legp604.exe?111+ful+CHAP0815>) CEMIG is an economic development incentive tool to attract manufacturers of equipment, systems or products used to produce renewable energy, nuclear energy or biofuels, or products used for energy conservation, storage, or grid efficiency purposes.
- In 2010 the General Assembly established a Green Job Tax Credit to stimulate job creation in industries related to renewable and alternative energies. The credit expires January 1, 2015. (<http://lis.virginia.gov/cgi-bin/legp604.exe?000+cod+58.1-439.12C05>)

Recommendation 7. Virginia will reduce GHG emissions by increasing the proportion of electricity generation provided by emissions-free sources of energy.

- While not explicitly directed to consider GHG emissions, the State Corporation Commission has been directed to consider environmental, economic and improvements in service reliability factors in approving construction of electrical utility facilities and transmission lines. (<http://law.lis.virginia.gov/vacode/56-46.1/>)
- In 2013 the General Assembly created the Virginia Nuclear Energy Consortium Authority for the purposes of making the Commonwealth a national and global leader in nuclear

energy and serving as an interdisciplinary study, research and information resource on nuclear energy issues. (<http://lis.virginia.gov/cgi-bin/legp604.exe?131+ful+CHAP0057>)

- Since 2007, Dominion Virginia Power has made improvements to several nuclear generation units, increasing efficiency, reducing down time and increasing capacity. (http://www.dmme.virginia.gov/DE/LinkDocuments/2014_VirginiaEnergyPlan/11Section5NuclearPower.pdf)
- The State Corporation Commission has approved several applications for generation additions, acquisitions, or major unit modifications of gas-fired generating units since 2008 that have displaced more heavily emitting sources and thus, reduced GHG. The Commission also approved of transmission projects designed to permit the retirement of coal-fired generation. (https://www.scc.virginia.gov/comm/reports/2014_veur.pdf)

Recommendation 8. Virginia will reduce net GHG emissions by protecting/enhancing natural carbon sequestration capacity and researching/promoting carbon capture and storage technology.

- While not explicitly focused on carbon capture and sequestration research, the Virginia Universities Clean Energy Development and Economic Stimulus Foundation was established to fund closely related activities. (<http://lis.virginia.gov/cgi-bin/legp604.exe?000+cod+23-300>)
- Again, while not created specifically for carbon sequestration benefits, the state does have several programs designed to enhance the viability of agriculture in the Commonwealth. These include:
 - The Virginia Department of Agriculture and Consumer Services' Agriculture and Forestry Development Services (AFDS) which exists specifically to assist agribusinesses. (<http://www.vdacs.virginia.gov/agribusiness/index.shtml>).
 - The Governor's Agriculture and Forestry Industries Development Fund which was established in 2012. (<http://lis.virginia.gov/cgi-bin/legp604.exe?000+cod+3.2-304>)
- The Department of Conservation and Recreation operates the Virginia Resource Management Planning program which promotes the use of conservation practices in farming that can have beneficial impacts on energy and fertilizer use. (http://www.dcr.virginia.gov/soil_and_water/rmp.shtml)
- As part of the Chesapeake Bay Program, Virginia had committed to preservation of 20% of the lands in Virginia's portion of the Bay watershed. That goal has now been increased by Governor McAuliffe and progress is tracked by the Department of Conservation and Recreation. (http://www.dcr.virginia.gov/natural_heritage/clinfo.shtml)

Recommendation 9. The Commonwealth and local governments will lead by example by implementing practices that will reduce GHG emissions.

- Governor McAuliffe's Executive Order 31 (2014) directs all state agencies to proactively pursue energy efficiency measures that, among other things, "...increase Virginians' quality of life through lower carbon emissions polluting the atmosphere."

(<https://governor.virginia.gov/executive-actions/executive-orders/eo-31/>) (Appendix 5a)

- Governor McDonnell’s Executive Order 19 (2010) directed the Governor’s Secretaries and executive branch agencies and institutions to operate in accordance with guidelines that seek to “... maximize efficiency and conservation, and minimize waste and the impact of operations on the environment.” (Appendix 5b)
- Governor Kaines’s Executive Order 82 (2009) directed “...the Governor’s Secretaries and all executive branch agencies and institutions to increase the use of sustainability practices...” (Appendix 5c)

Recommendation 10. Virginia should consider a more aggressive GHG reduction goal.

Recommendations that Address Steps Virginia Should Take to Plan For and Adapt to Climate Change Impacts that are Likely Unavoidable

Recommendation 11. Virginia will focus and expand state capacity to ensure implementation of the Climate Change Action Plan.

Recommendation 12. Virginia will educate the public about climate change and the actions necessary to address it.

- There are a wide variety of organizations involved in educating the public about sea level rise impacts. They include academic organizations, non-governmental organizations, state agencies and federal agencies. A list of some of the principal organizations working in Virginia is included in Appendix 6.

Recommendation 13. Virginia will continually monitor, track, and report on GHG emissions and the impacts of climate change.

- The Virginia Department of Environmental Quality has the responsibility for monitoring air quality and emissions.
 - In 2008 the Virginia Department of Environmental Quality prepared an *Inventory and Projection of Greenhouse Gas Emissions (2000-2025)*. The report identified four broad GHG source categories: energy (power generation and transportation), industrial processes, waste management, and agriculture. A fifth sector, land use change and forest management, was assessed to have a net carbon sequestration effect, offsetting some of the emissions from other sectors. The report forecast an increase in GHG emissions driven by increased demand for power and transportation.
- (http://www.sealevelrisevirginia.net/docs/homepage/GHG_Inventory_final_draft.pdf)

- The Virginia Department of Environmental Quality has updated the GHG emissions inventory several times since 2008. The most recent update summary is attached in [Appendix 7](#).
- As part of routine harmful algal bloom (HAB) surveillance activities, the Virginia Department of Health monitors trends in HAB frequency, toxicity, and geography, including maintaining a public map and toll-free hotline.
(<http://www.vdh.virginia.gov/epidemiology/DEE/HABS/HABmap.htm>)
- Scientists at both the Virginia Institute of Marine Science and Old Dominion University have been tracking and reporting historic rates of sea level rise in Virginia. They are currently collaborating to develop a protocol for developing regional sea level rise forecasts for localities and state agencies.
- Researchers at Virginia universities are investigating the impacts of rising sea level on Commonwealth wetlands. (e.g.
(http://ccrm.vims.edu/gis_data_maps/static_maps/lynnhaven_project/index.html))
- Virginia's Department of Environmental Quality's Office of Water Supply has been conducting research on land subsidence due to groundwater pumping, which contributes to locally high relative rates of sea level rise.
(<http://www.deq.virginia.gov/Portals/0/DEQ/PollutionPrevention/VEEP/Presentations/Kudlas.pdf>)

Recommendation 14. Virginia state agencies and local governments will prepare for and adapt to the impacts of climate change that cannot be prevented.

- Under direction from the General Assembly, the Center for Coastal Resources Management at the Virginia Institute of Marine Science has begun to create coastal management materials for Tidewater localities which include information on sea level rise. (<http://ccrm.vims.edu/ccrmp/index.html>)
- The Virginia Geographic Information Network has been working to develop high resolution land cover data for the Commonwealth. Currently, LiDAR data has been developed for the coastal zone.
(<http://www.vita.virginia.gov/isp/default.aspx?id=12092>)
- The Institute for Environmental Negotiation at the University of Virginia has been conducting community focus groups and listening sessions.
(http://ien.arch.virginia.edu/clients/educational_institutions/virginia-sea-level-rise)
- The Virginia Coastal and Policy Clinic at the College of William and Mary Law School, in collaboration with Wetland's Watch and in cooperation with Virginia's Department of Conservation and Recreation's Floodplain Management Program, has been exploring ways to use the National Flood Insurance Program's Community Rating System to help localities prepare for sea level rise.
(<http://law.wm.edu/academics/programs/id/electives/clinics/vacoastal/index.php>)
- Old Dominion University, Hampton Roads Planning District Commission and Virginia Sea Grant have been hosting a Hampton Roads Adaptation Forum, which facilitates the flow of information and provides a venue for the coordination of adaptation efforts in Hampton Roads. (<http://www.odu.edu/research/initiatives/ccsri/2013>)

- The Virginia Coastal Coalition has been engaging with the business and environmental communities to ensure the flow of critical information for economic viability with sea level rise. (<http://vacoastal.org/>)
- Restoration projects and living shoreline construction projects: The Back Bay Restoration Foundation, The Nature Conservancy, City of Norfolk, James City County, City of Hampton, Gloucester County, Jamestown 4-H, Elizabeth River Project, and others.
- Lynnhaven River Now's Marsh Island Resiliency Task Force plans to test methodologies to increase the resiliency of Lynnhaven marsh islands being threatened by sea level rise through experimentation with multiple restoration techniques.
- Some localities (including, Norfolk, Hampton, Portsmouth and Virginia Beach) are actively considering sea level rise in their planning efforts.
Norfolk: <http://www.norfolk.gov/index.aspx?nid=1712>
Hampton: <http://hampton.gov/index.aspx?nid=1747>
Portsmouth: <http://www.portsmouthva.gov/dna/flood-program.aspx>
Virginia Beach: <http://www.vbgov.com/government/offices/green/land-development/Pages/floodplain-management.aspx>
- Hampton Roads military bases and NASA facilities have engaged in planning efforts specifically for increasing the resilience of their facilities in the face of recurrent flooding.
- Establishment of the Dam Safety, Flood Prevention and Protection Assistance Fund in 2008 (§ [10.1-603.17](#)). Non-reverting appropriations each year have enabled DCR to offer assistance for dam and flooding projects.
- Virginia Department of Conservation and Recreation has worked with the North Carolina Floodplain Mapping Program (FRIS) to create the Virginia Flood Risk Information System (<http://fris.nc.gov/fris/Home.aspx?ST=VA>)
- Virginia's coastal Planning District Commissions, under grants from the Virginia Coastal Zone Management Program have developed climate change impact analyses and adaptation plans for shorelines and communities.
(<http://www.deq.virginia.gov/Programs/CoastalZoneManagement/CZMIssuesInitiatives/ClimateChange.aspx>)
- The Virginia Department of Conservation and Recreation, Division of Natural Heritage, completed Climate Change Vulnerability Indices rankings on 41 plant and animal species as a pilot effort in 2010. (<https://connect.natureserve.org/science/climate-change/ccvi>)
- In 2009, the Virginia Department of Game and Inland Fisheries and partners completed *Virginia's Strategy for Safeguarding Species of Greatest Conservation Need from the Effects of Climate Change*. This document identified 10 specific strategies needed to help conserve wildlife in the face of changing climatic conditions.
(<http://www.bewildvirginia.org/climate-change/>)
- Virginia Coastal Zone Management Program undertook a multi-year initiative to promote living shoreline development practices. Working with its partners and using grant funds the program supported a number of shoreline inventories, analyses, and

guidance development to help mitigate wetland loss from sea level rise.

(<http://www.deq.virginia.gov/Programs/CoastalZoneManagement/CZMIssuesInitiatives/LivingShore.aspx>)

- The Hampton Roads Transportation Planning Organization completed the Hampton Roads Military Transportation Needs Study: Roadways Serving the Military and Sea Level Rise/Storm Surge that estimates impacts from sea level rise and storm surge to the network of highways and roads serving area military installations; (<http://www.hrtpo.org/uploads/docs/Roadways%20Serving%20the%20Military%20&%20Sea%20Level%20Rise-Storm%20Surge%20Report.pdf>)
- Old Dominion University, in partnership with the US Navy and other military interests, along with the Hampton Roads PDC, the Virginia Coastal Policy Clinic, and others, is pursuing the development of a ‘whole government’ approach to planning and response. Called the “Intergovernmental Pilot Project,” the IPP is a two-year initiative that looks to create a permanent structure for federal, state and local collaboration and coordination. (<http://www.centerforsealevelrise.org/>)

Recommendation 15. Virginia will undertake a thorough review of state agency and local government authority to account for climate change in their actions.

- The Virginia Coastal Policy Clinic at the William and Mary Law School produced “Adaptive Planning for Flooding and Coastal Change in Virginia: Legal and Policy Issues for Local Government - Post Conference Report” in October 2013. (<https://law.wm.edu/academics/programs/jd/electives/clinics/vacoastal/docs/adaptive%20planning%20conference%20documents/finalreport.pdf>)
- The Virginia Coastal Policy Clinic has generated reports on a variety of issues including: the responsibilities of localities under sea level rise, the use of zoning tools for sea level rise adaptation and the impact of the Dillon Rule on sea level rise planning. (Appendix 8) (<http://law.wm.edu/academics/programs/jd/electives/clinics/vacoastal/reports/index.php>)
- Georgetown Law’s Georgetown Climate Center has studied Virginia’s local government authority to implement policy options identified in the Virginia’s Climate Action Plan. They issued a report titled “Stemming the Tide: How Local Governments Can Manage Rising Flood Risks.” (<http://www.georgetownclimate.org/resources/stemming-the-tide-how-local-governments-can-manage-rising-flood-risks>)

Conclusion

As reflected in this analysis, the 2008 Plan contained an ambitious set of recommendations and goals. The state has yet to develop a comprehensive response to the plan and its recommendations and goals, though actions have occurred consistent with or in response to them, both at the state and local level. (See [Appendix 4](#), “Who is doing what in Coastal Virginia”)

Prioritization of the incomplete recommendations and adoption of a state plan focused on key implementation actions, particularly ones targeted at adaptation, would be a practical next step for the Climate Change and Resiliency Update Commission. The Center for Coastal Resources Management and the Virginia Coastal Policy Clinic offer the attached Action Options for consideration by the Commission.

ACTION OPTIONS

Suggested by the Center for Coastal Resources Management and the Virginia Coastal Policy Clinic

As the current Governor's Climate Change and Resiliency Update Commission (CCR) considers actions Virginia should pursue, the Center for Coastal Resources Management (CCRM) at the Virginia Institute for Marine Science (VIMS) and the Virginia Coastal Policy Clinic (VCPC) at the William & Mary School of Law have identified, as a result of the analysis presented herein, six responsive actions that repeatedly arise as necessary and critical needs for Virginia to respond effectively to the challenges of climate change adaptation. All three of the studies reviewed (the 2008 Plan, the 2013 VIMS Recurrent Flooding report, and the 2014 Secure Commonwealth subpanel report) identified the need for these six actions. It is important to note that none of the studies suggested that any one action was a 'silver bullet' solution; rather, each is a part of the whole which Virginia must deliberately consider addressing.

ACTION OPTION 1: Identify an entity to lead the Commonwealth's activities on climate change adaptation.

This is a particularly important action. The need for a central point of organization and leadership has been recognized by every group that has looked at the role of the state in response to climate change.

- The 2008 Climate Action Plan called for the Governor to establish a Sub-Cabinet on Climate Change Response. The Secretaries of Agriculture and Forestry, Commerce and Trade, Finance, Health and Human Resources, Natural Resources, Public Safety and Transportation were suggested members.
- The Secure Commonwealth Panel report suggested appointment of a Resiliency Coordinator to provide command oversight in a state response modeled after an incident management system.
- Some states have created special commissions or authorities to serve as the coordination entity. These are typically not affiliated with a particular agency. Membership can include state, federal, and private sector representatives.
- Another alternative some states have utilized is the enhancement of an existing state program with additional resources and/or authorities to expand its responsibilities and capacity to coordinate these issues.
- Virginia has undertaken a number of initiatives that focus primarily on management and coordination of activities at the local level. For these programs the Commonwealth has repeatedly used a model of state-local collaboration that delegates implementation authority to local governments with guidance and oversight provided by a state agency.

The concerns reflected in the available literature regarding the various alternatives generally include the need for consistent performance through changes in elected leadership, adequate resources to allow meaningful effort, and sufficient authority to implement policy affecting multiple agencies. [Appendix 9a](#) provides a survey of strategies used by other states in

coordinating their responses to climate change. [Appendix 9b](#) is a review of Virginia's experience with the state-local collaboration model.

ACTION OPTION 2: Establish a state requirement for climate impact review in all state agency planning and permitting

This action would help ensure that decisions undertaken by state agencies are informed by consideration of current and potential climate impacts. Implementation of such a requirement would assist agencies in avoiding inappropriate use of public resources, particularly in circumstances where the consequences of agency decisions and actions will persist for decades. The value of requisite climate planning is particularly evident in infrastructure design and siting (e.g., roads).

The challenge for creation of such a requirement is the selection of the mechanism for establishing and implementing the requirement. Executive orders are straightforward, but do not extend beyond the term of the Governor who executes it. Legislative action is more permanent but faces the difficulty of crafting legislation that incorporates the multitude of state programs directed or authorized to incorporate climate impact reviews in their activities. These challenges are countered by the value and impact of consistent and comprehensive action among the diverse agencies of state government.

ACTION OPTION 3: Resolve the issues of local government authority and liability for adaptation to climate change

All three of the reports addressing the need for state responses to climate change have identified the issue of the limits to local government authority to act. Preliminary reviews by some of the Commonwealth's law schools have suggested the Dillon Rule is not an insurmountable impediment to effective action at the local level; however, there are court cases in Virginia that provide cause for concern. Moreover, many local officials remain hesitant to commit to actions that may result in lawsuits. The issue of liabilities for both actions and inactions in a changing system is another even more nebulous problem for local officials. The General Assembly is the only forum where these issues can be resolved in an attempt to provide as much certainty as possible for local governments confronted with unavoidable and substantive climate change impacts.

ACTION OPTION 4: Develop funding resources

The need for financial resources is widely recognized. In the past, the Commonwealth has created revolving funds, special purpose foundations, and a variety of tax policies to provide capital for program development and implementation. None of these, however, anticipated

the potential financial resources required for climate change adaptation. An inventory of existing funding opportunities, from state, federal, and private sector sources, followed by a General Assembly determination of the resource generation or reallocation necessary to support state agencies and local governments as they implement adaptation strategies would be appropriate action steps. As suggested by both the 2008 Climate Action Plan and the Secure Commonwealth Panel, coordinated state engagement with the Virginia congressional delegation and the federal government to identify and/or create financial resources for state and local programs should be a part of this effort.

ACTION OPTION 5: Develop needed planning data

Responding to climate change requires information on probable impacts and the costs and benefits of response options. Three types of information are critical:

1. the changes that will occur (for example: future sea level, temperature, precipitation, storm frequency);
2. the places that will be impacted by those changes; and
3. the costs and efficacy of adaptation measures.

There are multiple entities developing this type of information, but the consequence is a multitude of not necessarily consistent data. For effective planning at multiple scales (land parcels, local governments, regional districts, and statewide), basic information needs to be uniformly available and consistent across all scales. A statewide mechanism for collection or creation and dissemination of critical information could accomplish this. Many years ago, the state established the Virginia Geographic Information Network with a mission to do some of this. In addition, the General Assembly has charged the Virginia Institute of Marine Science to do some of this type of work for coastal localities. Insufficient funding has prevented both VGIN and VIMS from fully meeting the needs. Effective planning will also require information on the costs of different adaptation options, and no one is currently assembling this data.

The need is for both an overarching coordination and sufficient funding to generate and maintain the essential information for local and state planners.

ACTION OPTION 6: Develop and implement an outreach plan

All three of the reports reviewed for this analysis recommend an increased commitment to raising public awareness and understanding of both the impacts of climate change, and the options and efforts to respond. While there are many groups providing a constant stream of information about climate issues, there remains a gap in public information and knowledge about government policies and actions. Coordination of both message and delivery would assist in providing more effective and thorough outreach.

Appendices

- Appendix 1. 2008 Governor's Commission on Climate Change Findings and Recommendations
- Appendix 2. VIMS Recurrent Flooding Report Findings and Recommendations
- Appendix 3. Secure Commonwealth Panel Recurrent Flooding Sub-Panel Recommendations
- Appendix 4. Snapshot Comparison of 2008 Climate Action Plan Recommendations and the 2014 Virginia Energy Plan
- Appendix 5. Executive Orders
 - 5a - Executive Order 31 (2014)
 - 5b - Executive Order 19 (2010)
 - 5c - Executive Order 82 (2009)
- Appendix 6. Who is doing what in Coastal Virginia? A Guide to Current Adaptation Efforts to Sea-Level Rise and Flooding
- Appendix 7. 2014 Virginia GHG inventory update summary
- Appendix 8. Summary analysis on Dillon Rule and local government climate change actions
- Appendix 9a. Climate Adaptation Governance Case Studies
- Appendix 9b. Virginia local-state cooperative programs

2008 Governor's Commission on Climate Change Findings

Effects on the Built Environment and Insurance

1. Sea level rise is a major concern for coastal Virginia, particularly the highly populated Hampton Roads region.
2. the Virginia Beach-Norfolk Metropolitan Statistical Area ranks 10th in the world in value of assets exposed to increased flooding from sea level rise.
3. the fact that LiDAR (Light Detection and Ranging) elevation data does not exist for most of coastal Virginia is a major obstacle to the ability to plan effectively
4. Climate changes such as sea level rise pose serious and growing threats to Virginia's roads, railways, ports, utility systems, and other critical infrastructure.
5. Climate change is widely viewed as a threat to national security.
6. The continued affordability and availability of insurance for Virginia's landowners is a concern as our climate changes.

Effects on Natural Systems

1. Climate change will exacerbate threats already faced by Virginia ecosystems, such as loss of habitat, invasive species, pathogens, and pollution.
2. The effects of climate change on many of Virginia's ecosystems and species will be better understood as more research becomes available.
3. Some of the Chesapeake Bay's "foundation species," such as blue crabs, eelgrass, and oysters, could decline or disappear.
4. Oxygen levels in the Chesapeake Bay are expected to decrease and acidification of the Bay and Atlantic Ocean waters is expected to increase.
5. Coastal wetlands are being lost as sea levels rise, and freshwater coastal wetlands are threatened by saltwater intrusion.
6. Virginia's agriculture, forestry, commercial and sport fishing industries and park land will be impacted by climate change.
7. The trends of declining forestlands and agricultural lands in Virginia decrease the sequestration of CO₂.

Effects on Human Health

1. Climate change is likely to have wide-ranging and mostly adverse direct and indirect impacts on human health.
2. The Emergency Preparedness and Response Program for Virginia is available to address and mitigate the impacts of extreme weather events
3. Certain groups of people are recognized as being more vulnerable to the health impacts of climate change.

General Principles Regarding Strategies

1. It is not possible to effectively address the impacts of climate change without significant public and private investment.
2. Conserving and increasing the capacity of existing natural carbon represent an important and cost-competitive strategy to decrease net GHG emissions.

3. The three largest sources of GHG emissions in Virginia are electricity generation, transportation, and non-utility uses of fuel.
4. The nation's movement toward a GHG emission-constrained economy represents an opportunity for Virginia.
5. Fossil fuels are a significant part of Virginia's current fuel mix.
6. Energy efficiency and conservation provide the least costly and most readily deployable energy resource options available to Virginia.
7. Virginia ranks 27th highest of the states and the District of Columbia in annual per capita energy consumption.
8. Electricity demand is projected to grow.
9. Increased fuel costs and concomitant changes in driver behavior can significantly reduce emissions generated from driving.
10. Areas of compact development generally have lower per-capita energy consumption.
11. The response to climate change will be most effective if the mechanisms that are in place properly coordinate between state and local levels of government.
12. Virginia currently does not have an institutional infrastructure to monitor climate change impacts, efforts to reduce GHG emissions, or to forecast future climate and its impacts.
13. Climate change is a global problem that requires a global solution. That global solution is only achievable if the U.S. demonstrates a commitment to reducing emissions
14. The Commission anticipates that Congress will enact a cap-and-trade program within the next four years.

2008 Governor's Commission on Climate Change Recommendations

Recommendations that affect GHG emissions.

1. Virginia will reduce GHG emissions by increasing energy efficiency and conservation.
 - a. Enact legislation to encourage development of utility energy conservation programs
 - b. Support and encourage investment in advanced metering infrastructure
 - c. Establish capital fund for energy efficiency investments
 - d. Phase in requirements that all new commercial buildings meet LEED energy standards
 - e. Ensure stable funding for Weatherization Assistance Program
 - f. Implement business-specific educational and technical assistance efforts
 - g. Implement an energy efficiency consumer education program
 - h. Require utilities to pilot voluntary real-time rates and modify rates to encourage power conservation
 - i. Provide capital funds or tax credits to businesses to expand energy conservation
 - j. Incorporate energy efficiency requirements into uniform statewide building codes
2. Virginia will advocate for federal actions that will reduce net GHG emissions.

- a. Ask Congress to pass comprehensive climate change legislation
 - b. Ask Congress to fund research on carbon sequestration, energy efficiency and renewable energy
 - c. Ask Congress to support enhanced Corporate Average Fuel Economy standards
 - d. Ask Congress to encourage development of carbon-free renewable energy projects
 - e. Ask Congress to incorporate reduction of GHG emissions in transportation reauthorization legislation
3. Virginia will reduce GHG emissions related to vehicle miles traveled through expanded commuter choice, improved transportation system efficiency, and improved community designs.
- a. Require Statewide Transportation Plan to address GHG reduction
 - b. Promote telework and flextime standards
 - c. Increase state and local transit and rail funding
 - d. Promote compact, walkable, transit-oriented development
 - e. Evaluate High Occupancy Toll land networks impact on GHG emissions
 - f. Encourage insurance companies to offer pay-as-you-drive insurance
 - g. Require analysis of GHG emissions impact of major transportation projects
 - h. Use transportation pricing that reflects actual usage
 - i. Support statewide analyses of local transportation and land use planning
 - j. Evaluate costs/benefits of tax incentives to promote mass transit usage
 - k. Ensure funding to develop pedestrian and bicycle networks
 - l. Promote expansion of broadband access
 - m. Authorize split rate property tax to encourage redevelopment
 - n. Promote location efficient mortgages that encourage compact development
 - o. Implement access management plans to preserve new transportation corridors
 - p. Adopt a “complete streets” policy to accommodate all users
 - q. Local governments should enhance convenience of using mass transit
 - r. Harmonize state transportation plans and local land use plans on the same five-year schedule
 - s. Expand local governments’ ability to flex road funds
4. Virginia will reduce GHG emissions from automobiles and trucks by increasing efficiency of the transportation fleet and use of alternative fuels.
- a. Enact incentives for fuel efficient vehicles
 - b. Become a leader in promoting low-carbon fuel option
 - c. Establish retrofit/retirement program for older diesel engines
 - d. Fund increased enforcement of speed limits
 - e. Increase enforcement of state anti-idling statute
 - f. Educate drivers about energy efficient driving, participate in EcoDrivingUSA
 - g. Improve the timing and intelligence of traffic signalization to improve traffic flow
5. Virginia will reduce GHG emissions through accelerated research and development.
- a. Increase clean energy technology research
 - b. Promote research on alternative fuels
 - c. Research mechanisms to place a price on carbon emissions

6. Virginia will reduce GHG emissions by increasing the proportion of energy demands that are met by renewable sources.
 - a. Establish waste diversion goal of 50% to increase recycling
 - b. Increase utilities' voluntary Renewable Portfolio Standard to 15% by 2025
 - c. Encourage development and use of renewable forms of energy
 - d. Publicize options for retail electric customers to purchase renewable energy
 - e. Promote Virginia as a green industry center for excellence
 - f. Allow VDOT rights-of-way to be used for connection of renewable energy projects to the power grid
 - g. Expand the Energy Star sales tax credit
7. Virginia will reduce GHG emissions by increasing the proportion of electricity generation provided by emissions-free sources of energy.
 - a. Support nuclear energy
 - b. Encourage development of emissions-free renewable electricity generation
 - c. Include analysis of GHG emissions and climate change impacts in review of new generation projects
8. Virginia will reduce net GHG emissions by protecting/enhancing natural carbon sequestration capacity and researching/promoting carbon capture and storage technology.
 - a. Fund research on carbon capture and sequestration technology
 - b. Improve economic viability of farming
 - c. Vigorously promote adoption of agricultural best management practices that reduce fuel and fertilizer consumption
 - d. Fund acquisition of high resolution land cover data
 - e. Establish no net loss goal for natural carbon sequestration areas
 - f. Conduct research to quantify emission reduction benefits of land conservation
 - g. Develop a natural sequestration carbon crediting and debiting system
 - h. Encourage establishment of local tree canopy preservation goal
 - i. Reduce loss of critical natural habitats and native species
 - j. Amend VDOT landscaping standards to minimize mowing
9. The Commonwealth and local governments will lead by example by implementing practices that will reduce GHG emissions.
 - a. Require new public buildings to meet LEED energy efficiency standards
 - b. Set minimum miles-per-gallon standards for state vehicles
 - c. Establish one standard for diesel biofuel
 - d. Minimize vehicle miles traveled

Recommendations that Address Steps Virginia Should Take to Plan For and Adapt to Climate Change Impacts that are Likely Unavoidable, Including Direct Adaptive Responses, Required Research, and Increased Capacity and Coordination Within State and Local Government

10. Virginia should consider a more aggressive GHG reduction goal.
 - a. Consider adopting more aggressive GHG reduction goals that more closely reflect the IPCC recommendations

11. Virginia will focus and expand state capacity to ensure implementation of the Climate Change Action Plan.
 - a. Establish a Sub-Cabinet on Climate Change Response
 - b. Use existing state programs to implement recommendations in lieu of creating new state programs
 - c. Collaborate with neighboring states to implement regional GHG emissions reduction and adaptation strategies
 - d. Use Planning District Commissions as bridge between state and local governments
12. Virginia will educate the public about climate change and the actions necessary to address it.
 - a. Develop an outreach campaign to increase understanding and build public support for implementation of recommendations
 - b. Create a voluntary climate action plan for Virginia citizens
 - c. Eliminate distribution of free plastic and paper bags in stores
13. Virginia will continually monitor, track, and report on GHG emissions and the impacts of climate change.
 - a. Produce Virginia-specific predictions of climate change
 - b. Establish GHG reporting system
 - c. Annually update GHG emissions inventory
 - d. Monitor changes in harmful algal blooms
 - e. Develop system to track illness and disease associated with climate change
14. Virginia state agencies and local governments will prepare for and adapt to the impacts of climate change that cannot be prevented.
 - a. Emphasize use of living shorelines and avoid shoreline hardening
 - b. Develop adaptation plans to minimize impacts of climate change on Virginia's economy
 - c. Include projected climate change impacts in all local planning
 - d. Identify critical conservation areas
 - e. Insure climate change impacts are considered in all transportation planning
 - f. Develop climate change adaptation plans for critical infrastructures
 - g. Require that infrastructure projects receiving state funding are designed to be resistant to climate change impacts
 - h. Address climate change impacts in floodplain management
 - i. Develop analysis of areas most vulnerable to insurance losses due to climate change impacts
 - j. Make use of nature-based adaptation strategies
 - k. Develop a Sea Level Rise Adaptation Strategy
 - l. Expand Virginia's Resource Protection Areas buffer designation to accommodate the impact of sea level rise
 - m. Assess the impact of climate change of emergency preparedness
 - n. Fund acquisition of LiDAR for the entire state
 - o. Assess impacts of climate change on Virginia ecosystems
 - p. Develop regional adaptive resource management plans

- q. Ensure stormwater management measures will continue to function effectively in altered precipitation regime
 - r. Assess climate change consequences for urban and agricultural best management practices
 - s. Coordinate with Department of Defense to address climate change impacts to critical military installations
 - t. Discourage new development in vulnerable coastal areas
 - u. Require local integrated shoreline management plans
 - v. Track health impacts from climate change
 - w. Develop syndrome definitions for climate change related disease
 - x. Assess vulnerable human populations in Virginia
 - y. Promote the Virginia Medical Reserve Corps to strengthen local public health initiatives
 - z. Ensure every Health District has a heat emergency response plan
 - aa. Assess impact of climate change on persons of low socioeconomic status, minorities, and residents of coastal areas and flood plains
 - bb. Assess the impact of climate change on historic resources
15. Virginia will undertake a thorough review of state agency and local government authority to account for climate change in their actions.
- a. Amend the State Water Control Law to include as a policy consideration of changing climatic conditions in protection of state waters
 - b. Review state policies, regulations, and enabling authorities for amendments needed to account for climate change impacts
 - c. Review authorities of local governments and enact any needed enabling authority
 - d. Incorporate assessment of climate change impacts on instream flow into water resource management
 - e. Require climate change assessment in water supply planning

VIMS Recurrent Flooding Report findings

1. 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).
2. The risks associated with recurrent flooding are not the same throughout all areas of Tidewater Virginia.
3. Data are often lacking for comprehensive and/or fine resolution analysis of flood risks in the region.
4. 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 Report Recommendations

To begin the process of addressing recurrent flooding at the state and local levels, we offer the following recommendations:

1. 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.
2. The State should initiate identification, collection and analysis of data needed to support effective planning for response to recurrent flooding issues in Virginia.
3. 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.
4. 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.
5. 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

Secure Commonwealth Panel Recurrent Flooding Sub-Panel recommendations

1. 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:
 - a. Housing and Urban Development (HUD)
 - b. Federal Emergency Management Agency (FEMA)
 - c. Office of Management and Budget (OMB)
 - d. National Oceanic and Atmospheric Administration (NOAA)
 - e. The need for local resources (i.e. GIS and modeling) to be considered for in-kind credit for federal grants.
 - f. The ability of localities to rely on the stronger Virginia bonding capacity and its favorable interest rates.
2. 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.
 - a. Identify the appropriate executive leader to serve as the "Incident Commander" or "Resilience Coordinator"
 - b. 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.
3. 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
 - a. Communicate the Action Plan through the existing Floodplain Management Plan for the Commonwealth of Virginia
 - b. 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.
4. 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.
5. 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.
6. Establish a Single Point of Reference for reliable information (based on rigorous quality checks) on which to access consistent, timely and accurate information.
7. 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>)

8. 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)
9. Recommend FEMA Special Flood Hazards Area be reassessed
10. 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.
11. 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.
12. Develop project and resource prioritization criteria
13. Develop funding eligibility criteria
14. Have projects / designs / applications prepared in advance for potential, unannounced, short-fused funding opportunities.
15. Establish communication / information sharing plans and coordinate outreach materials - all using the same information and/or consolidating into one effort.
16. Consider modification to Real Estate disclosures to include flood-related damages
17. Invest in the education of Virginia's youth and college graduates – the Commonwealth's future scientists and planners.
18. Schedule cross-discipline training to ensure consistency and awareness among various departments, agencies, organizations and associations; tie them to continuing education credits.
19. 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.
20. Rely on the creativity of the entire Commonwealth through challenges, competitions and hackathons.

Snapshot Comparison of the 2008 Climate Action Plan Recommendations and the 2014 Virginia Energy Plan

COMPARISON

Similarities

- Renewable energy research and development
- Incentives for renewable energy (specifically wind, biofuels and solar)
- Consumer education about various uses of energy
- Government use of alternative fuels in its vehicle fleet
- Tax credits for renewable energy
- Nuclear energy development
- Energy efficiency (government and consumer energy savings and infrastructure improvements)
- Encouragement of private electricity generation and distributed generation
- Carbon sequestration research and development of clean coal

Notable differences

- The Kaine Commission Report includes a significant emphasis on greenhouse gas reductions
- The 2014 Virginia Energy plan is an “all of the above” plan, including traditional fossil fuel sources (offshore oil/gas and clean coal) as well as greater renewables (solar and wind)
- The Kaine Commission report has a greater focus on energy efficiency, including net metering schemes, feed-in tariffs or building code improvement
- The 2014 Virginia Energy Plan does not discuss renewable portfolio standards

VIRGINIA 2014 ENERGY PLAN

Accelerate development of renewables in Virginia

- Work to ensure a diversity of electricity generation fuel mixes
- Establish a Virginia Solar Energy Development Authority
- Create an environment that accommodates both utilities and distributed generation
- Encourage community solar programs by allowing subscription participation
- Encourage offshore wind
- Establish Virginia as the national manufacturing and supply hub for offshore wind

Increase Energy Efficiency

- Establish a board on energy efficiency to reduce energy consumption 10% by 2020.
- Reduce energy use in state run facilities by 15% by 2017

- Encourage “energy performance contracting” (educate, design plans and provide funding to assist energy efficiency) for local governments
- Create a state facility data registry to track energy use by state agencies.
- Encourage social entrepreneurs to assist government with energy planning

Market coal resources globally

- Create an outreach program to educate the coal industry about international markets
- Conduct an “export tour” to showcase coal and conduct trade missions
- Increase technical assistance to help coal develop international presence
- Support R&D of clean coal

Develop offshore oil and gas

- Ensure safe development
- Fully support developments contingent on federal revenue sharing agreements
- Advocate for the inclusion of Virginia in the DoI’s five-year OCS leasing plan
- Conduct a readiness study

Expand best-in-class energy infrastructure

- Expand interstate natural gas infrastructure
- Support nuclear energy generation
- Create flexible financing mechanisms
- Refine and focus the commonwealth’s Energy Assurance Plan and arrange a demonstration of affordable infrastructure hardening

Advanced Vehicle Technology and Alternative Fuels

- State agencies and localities should purchase alternative fuel consuming vehicles by expanding the Commonwealth Alternative Fuel Program
- Create public private partnerships to encourage vehicle and fuel station development
- Create an award for competition among governmental agencies for the greenest fleet
- Increase tax incentives and grants for alternative fuel vehicle purchase
- Fund consumer fuel education outreach
- Support use of the Gallon Gas Equivalent measure for compressed natural gas

Energy sector talent development

- Expand and accelerate the Troops to Energy program
- Encourage STEM training in community colleges and 4-year universities
- Identify goals and increase attainment rate of certifications

For reference purposes, the 2010 Plan inventory is provided here:

VIRGINIA 2010 ENERGY PLAN

Energy capital of the east coast

- Offshore gas and oil drilling
- Renewables: biomass, waste and wind
 - o Green jobs tax credits
 - o Grants for manufacturing
 - o Efficient permitting
 - o Offshore wind development and supply chains
 - o Biomass and algae fuels for government and military use
- New nuclear reactor and next generation reactors, and general expansion to satisfy growing demand during peak load time
- Facilitate private groups and utilities/private power projects/distributed generation
- Mining safety and reclamation
- Study uranium mining.
- Energy efficiency and infrastructure hardening
- Delivery of energy services during emergencies

Energy Education

- Consumer energy efficiency program
- More university programs in energy

Clean Energy research through universities

- Coordinate research and development
- Get more energy jobs
- Clean energy development and economic stimulus foundation
- Establish Virginia Energy Initiative
- Offshore oil and gas research and development
- Clean coal and sequestration



Commonwealth of Virginia
Office of the Governor

Executive Order

NUMBER THIRTY ONE (2014)

CONSERVING ENERGY AND REDUCING CONSUMPTION IN THE COMMONWEALTH OF VIRGINIA

Importance of the Issue

The cleanest and cheapest energy is energy that is not consumed. Strong energy efficiency measures in government, businesses, and residences can reduce energy consumption, costs, and bills, diminish the need to build new generation infrastructure, and increase Virginians' quality of life through lower carbon emissions polluting the atmosphere. Increased energy efficiency measures will serve as a stimulus to the growing energy efficiency industry in Virginia, helping create new jobs and diversifying our economy. The Commonwealth of Virginia will demonstrate the extraordinary potential and invaluable business advantages achieved with energy efficiency.

As a prudent steward of taxpayer dollars, Virginia is dedicated to finding creative solutions with increasingly limited resources. Pursuing sensible energy efficiency in state government will increase the productivity of the energy used, reduce consumption, save money, and lessen any negative environmental impact. The Commonwealth is seeking to reduce electricity consumption in state facilities by 15% by 2017, using 2009-2010 as a baseline.

While the Commonwealth embraces the challenge of reducing energy consumption, localities, businesses, and individual consumers are encouraged to use energy efficiently, and utilize available tools to conserve energy.

Energy Efficiency Initiatives

By the power vested in me by Article V of the Constitution of Virginia, and § 2.2-103 of the *Code of Virginia*, and subject always to my continuing and ultimate authority and responsibility to act in such matters, I hereby direct all executive branch agencies, authorities, departments, and all institutions of higher education, to every extent practicable, to operate in accordance with the following guidelines:

- All state agencies should proactively pursue energy efficiency measures, especially Energy Performance Contracting (EPC), to reduce energy consumption. EPC is a budget neutral, cost-effective tool that permits state agencies and publicly-owned facilities to reduce their deferred maintenance backlogs without adding any financial burden to the taxpayer. In addition, EPC is an effective mechanism to finance capital improvements using leveraged energy savings to reduce both energy costs and consumption. For agencies that have already employed EPC, overall energy consumption should be re-evaluated to identify areas for further efficiency improvements.
- Agencies should utilize the current process, at no cost to the agency, which provides for a general audit to assess whether EPC is appropriate for the agency. This portion of the process is managed by the Department of Mines, Minerals, and Energy (DMME), and all agencies should work with DMME to have a general audit conducted with the goal of implementing an EPC by 2016.

I have appointed the Advisor for Infrastructure and Development as the Commonwealth's Chief Energy Efficiency Officer (CEEEO) to oversee planning, implementation, and measurement of energy efficiency throughout state government, as follows:

- Organize a meeting with all agencies tasked with overseeing EPC in state government and state-certified Energy Service Companies (ESCOs) to establish a fully transparent, streamlined, and standardized process that agencies will use to implement EPC. This will include the development of an "EPC Roadmap" that will lay out each step of the EPC process, and ensure accountability among agencies and the ESCOs at each stage of project development and implementation.
- Coordinate with SCHEV to identify the deferred maintenance needs at each higher education institution and the opportunities to leverage energy savings to fund building infrastructure upgrades.
- Work with the Department of General Services (DGS) and DMME to identify and prioritize state facilities that offer opportunities for significant cost and consumption reduction.
- Work with DMME to establish a comprehensive system to measure, verify, and track energy consumption in state facilities.
- Re-commission electrical equipment and systems in publicly-owned facilities, when needed.
- Ensure that DMME reviews all annual project performance reports submitted by ESCOs to the agencies.
- Work with subject matter experts to identify best practices to incentivize individuals and agencies regarding energy efficiency measures. Those who show leadership in energy efficiency, regardless of agency and project size, will be recognized.

Effective Date of the Executive Order

This Executive Order shall be effective upon signing and shall remain in force and effect from its signing unless amended or rescinded by further executive order.

Given under my hand and under the Seal of the Commonwealth of Virginia, this 16th day of October, 2014.



Terence R. McAuliffe, Governor

Attest:

Levar M. Stoney, Secretary of the Commonwealth

COMMONWEALTH OF VIRGINIA



OFFICE OF THE GOVERNOR

NUMBER NINETEEN (2010)

Conservation and Efficiency in the Operation of State Government

Importance of the Issue

Virginia is blessed with a unique and spectacular natural environment. Our natural resources are so central to our quality of life, that their conservation, preservation and protection are required by the Constitution of Virginia. That responsibility imposes on each of us, in state government, a personal responsibility to do our work always and to every extent possible in ways that minimize the impact on Virginia's natural resources and preserve them for future generations of Virginians.

Virginia's government must set the example in its use of all resources. We must be conservative and frugal whether we are using dollars provided by taxpayers, materials purchased with those dollars, or the exceptional natural resources entrusted to our care. To this end, conservation and efficiency must be a central consideration in how we conduct all of our business and operations.

It is, therefore, expected that state agencies and institutions, offices and organizations, will take the lead in adopting practices and policies that maximize efficiency and conservation, and minimize waste and the impact of operations on the environment.

The Commonwealth, in performing a multitude of critical functions and operations, like other large organizations and business enterprises, has a significant impact on the environment. It is imperative that in every aspect of state government activity, we act as conscientious stewards of our resources and operate in a manner that to every extent possible minimizes the impact of our operations on Virginia's environment, while being prudent with taxpayer dollars.

By the power vested in me by Article V of the Constitution of Virginia, and § 2.2-103 of the Code of Virginia, and subject always to my continuing and ultimate authority and responsibility to act in such matters, I hereby direct the Governor's Secretaries and all executive branch agencies and institutions, to every extent practicable, to operate in accordance with the following guidelines.

Guidelines for Operation

Energy Use –

In general, all appropriate measures to reduce the consumption of energy should be utilized. All interior and exterior lights, computers, and other electrical devices and appliances should, as much as possible without compromising safety concerns, be turned off or powered down to stand by status when not in use, and when offices are closed.

Heating and cooling systems, whether in leased space or in state owned buildings, should at all times be actively managed in a manner that minimizes energy consumption.

Video or tele-conferences should be preferred to in-person meetings where meeting in person would require out of town, or even cross town, travel.

If travel is required, car pooling should be employed if possible. Agencies may adopt policies that do not provide for reimbursement for single-passenger use of personal vehicles for business travel if such use is avoidable. Agency policies should encourage the use of public transportation and other alternatives to personal vehicle use. All such policies must be reviewed and approved by the relevant Cabinet Secretary.

Citizens and businesses should be able and encouraged to engage in electronic transactions with the Commonwealth rather than having to travel to state offices.

Air and Water Use –

When practicable, landscaping at state facilities should employ drought resistant grass, plants, shrubs and trees in order to minimize the use of water necessary for irrigation by amount and frequency.

Plumbing leaks should be addressed immediately and when plumbing fixtures are replaced or installed new they should be the lowest possible flow available to meet the needs of the facility and comply with VUSBC.

To the extent that state government activity requires air or water permits from the Department of Environmental Quality, agencies must fully comply with all conditions and strive to operate at well below limits permitted.

Waste Reduction –

Follow the waste management hierarchy to reduce, reuse, or recycle whenever possible.

Every effort should be made for publications of the executive branch agencies and institutions to be published in electronic form only, unless there is a statutory or regulatory requirement to the contrary, or a substantial portion of the intended recipients of the publication cannot be reached electronically.

As much as practicable, materials and supplies purchased by the state, including paper, should be made from recycled and or renewable materials, where available and appropriate to the task for which they will be used, and be provided with a minimum of packaging.

Durable products should be used rather than disposable whenever practical, including whenever meals are served; if disposable materials must be used they should be biodegradable or recyclable.

Contact the Department of General Services office of surplus property to receive guidance on proper disposal instructions for serviceable state-owned material and equipment, and to inquire about surplus material and equipment that may be available in the state and federal surplus program rather than incurring the expense of buying new.

Use of remanufactured components should be maximized.

To the extent disposable plastics must be used, they should, when practicable, be recyclable plastics only.

Paper and other office supplies should be reused and only when beyond viable reuse, recycled. White paper, colored paper, plastic, aluminum, batteries and printer cartridges should all be recycled.

Collection containers should be provided for all recyclable materials, and employees are expected to make use of them.

Landscape maintenance waste should be composted as practicable.

Oil and antifreeze from state vehicles should be recycled.

Reduce use of toxic substances where suitable alternatives exist.

Buildings and Construction –

When leasing space, agencies and institutions should consider access to public transportation, if available. Where practical, new offices and facilities should be located within a quarter mile of public transportation access and in locations that are pedestrian and bicycle accessible.

When leasing space, agencies should also actively seek buildings that meet energy Star, LEED, or Green Globe standards.

Conferences and meetings not held in state owned offices, buildings or facilities should be held at “Virginia Green” certified facilities if such use will meet the needs for the meeting, will not increase travel distances, and is not cost-prohibitive.

Specific Directives

In addition to operating in accordance with the above guidelines, every agency, institution, office and organization of state government shall:

Continue to comply with § 2.2-2817.1 of the *Code of Virginia*, requiring each state agency to pursue a goal of not less than 20 percent of its eligible workforce telecommuting by January 1, 2010, and that all executive branch agencies and institutions shall provide a report to the Secretary of Administration no later than December 1, 2010, regarding compliance with § 2.2-2817.1, as directed by statute.

Purchase or lease only Energy Star rated appliances and equipment for all classifications for which an Energy Star designation is available

When entering the design phase for construction of a new building of more than 5,000 gross square feet, or renovating such a building where the cost of renovation exceeds 50 percent of the value of the building, shall meet Department of General Services (DGS), Division of Engineering and Buildings "Virginia Energy Conservation and Environmental Standards" for energy performance and water conservation.

All new or renovated buildings described above, should conform to LEED silver or Green Globes two-globe standards, unless special circumstances, including significant additional cost, support exemption from such standards and the Director of the DGS finds that construction to the standards would be impracticable.

The Department of General Services also shall include in its policies and procedures guidelines for the purchase of fuel-efficient, low-emission state-owned vehicles, when practicable. In addition, DGS shall include in its policies and procedures for leasing vehicles guidelines that encourage the use of compact, fuel-efficient, and low-emission vehicles.

Beginning on September 1, 2010, procure only diesel fuel, taking into consideration availability and variability in cost of biodiesel fuel with respect to unblended diesel fuel, containing, at a minimum, two percent, by volume, biodiesel fuel or green diesel fuel, as defined in § 45.1-394 of the *Code of Virginia*. This requirement shall only apply to procurements of diesel fuel for use in on-road internal combustion engines and #2 fuel burned in a boiler, furnace, or stove for heating, and shall not apply if supply is not readily available or the cost of such procurement exceeds the cost of unblended diesel fuel by 5 percent or more.

Develop and employ efficiency tools with the goal of reducing its annual energy use by at least 5 percent for fiscal year 2012 (compared to fiscal year 2010) and report their progress towards this energy-saving goal to the Deputy Secretary of Natural Resources and Senior Advisor on Energy. Such progress shall be reported to the public on the Secretary of Natural Resources' website. In order for large agencies to be better able to manage this process, it is

recommended that agencies that have energy costs exceeding one million dollars annually have a certified energy manager.

State Agency Cooperation and Support

Finally, the following agencies shall assist all agencies, offices, institutions and organizations of state government in their efforts to operate in conformance with these guidelines and requirements:

The Department of Mines, Minerals and Energy shall be responsible for providing technical assistance to state agencies and institutions for measuring, reporting and achieving energy savings, purchasing electricity, natural gas, and fuel oils, and in general provide information to assist agencies and institutions with implementation of this Executive Order;

The Department of General Services shall consider these guidelines in its review and approval of leases, purchases and plans for new construction and incorporate them into its rules and practices for the procurement of goods and services. In addition, DGS shall establish specifications for use by state agencies and institutions subject to the Virginia Public Procurement Act in the procurement of commodities and services that make environmental and energy efficiency practices of vendors, where appropriate, relevant considerations in any solicitation.

Each agency, institution, operation, organization and office is expected to implement these guidelines and meet these requirements as part of Virginia's government's constitutional obligation to be conscientious stewards of the environment, and with the understanding that, as public officers and employees, each of us sets the example for our citizens.

A copy of the Executive Order shall be published electronically to each state employee. Each agency head shall communicate these guidelines and requirements throughout his or her agency as an operational priority, and report, as required by the appropriate Secretary, on all conservation and efficiency efforts undertaken. All Cabinet members responsible for oversight of agencies and institutions of state government shall require such reporting at least twice each year.

Effective Date of the Executive Order

This Executive Order supersedes and rescinds Executive Order Number Eighty-two (2009), *Greening of State Government*, issued by Governor Timothy M. Kaine on June 10, 2009.

This Executive Order shall become effective upon its signing and shall remain in full force and effect until July 1, 2014, unless amended or rescinded by further executive order.

Given under my hand and under the Seal of the Commonwealth of Virginia this 1st day of July, 2010

Robert F. McDonnell, Governor

Attest: _____
Secretary of the Commonwealth



Commonwealth of Virginia
Office of the Governor

Executive Order

NUMBER EIGHTY-TWO (2009)

GREENING OF STATE GOVERNMENT

Importance of the Initiative

Virginians are fortunate to inhabit a state with tremendous natural beauty and abundant resources that support our economy. Virginia state government takes seriously the responsibility as set forth in Article XI of the Constitution of Virginia to act as a steward of these resources, in order to pass them along to future generations undiminished. The Commonwealth's citizens enjoy an unparalleled quality of life, and can continue to do so as our population increases and our economy expands if we are persistent in exploring ways to reduce our collective impact upon the environment.

Like all large enterprises, the business operations of the Commonwealth have a significant environmental impact in terms of pollution and natural resource consumption. The production, use, and disposal of materials, as well as the generation and use of energy can have a significant impact on environmental quality and public health. Fortunately, opportunities to reduce these impacts are numerous, as are opportunities to save money through reducing the energy and resources required to govern effectively. By showing leadership in reducing the environmental impact of government operations, the Commonwealth can inspire measures in the private sector and in the homes of citizens.

The Commonwealth already has taken a number of steps to reduce state government's energy and environmental impact. These actions include implementation of Executive Order 48 addressing energy use in state facilities, Executive Order 35 and §2.2-2817.1 of the *Code of Virginia* addressing telecommuting by state employees, and the adoption of Environmental Management System standards by a number of agencies. This new Executive Order expands these efforts so as to promote continual improvement in the Commonwealth's sustainability practices.

There are several ways to encourage sustainability in government operations. One way is to urge agencies to participate in a friendly competition to implement practices and generate ideas to

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reduce the environmental impact of everyday activities. Indeed, Virginia's local governments have shown tremendous leadership with this approach through the "Go Green Virginia" initiative that was created by the Virginia Municipal League and joined by the Virginia Association of Counties and the Virginia School Boards Association. In order to accelerate state government improvements in the short term, this Executive Order establishes a competition inspired by "Go Green Virginia." For longer-term goals, this Executive Order employs the approach of setting measurable goals in a way that affords flexibility in how the goals are met.

When Virginia has achieved the vision of a truly "green government," buildings will be constructed and operated in a way that minimizes the need for energy and water. State employees will eliminate unnecessary driving for business travel and commuting and will conduct business in a way that minimizes the use of disposable materials. Those disposable materials that are used in day-to-day operations will be recycled or reused to the maximum extent possible. Care will be taken to ensure that energy to power lights, computers, and heating and air conditioning systems is not unnecessarily being consumed during and outside of business hours. Recycled materials, nontoxic products and renewable forms of energy will be used as much as possible.

By the power vested in me by Article V of the Constitution of Virginia, and §2.2-103 of the *Code of Virginia*, and subject always to my continuing and ultimate authority and responsibility to act in such matters, I hereby direct the Governor's Secretaries and all executive branch agencies and institutions to increase the use of sustainability practices, many of which will result in long-term reduced costs in state government operations.

Environmental Management Systems and Policies

No later than July 1, 2010, every executive branch agency and institution shall either have (i) notified the Department of Environmental Quality's Office of Pollution Prevention of its intent to develop an Environmental Management System (EMS) or (ii) adopted and posted on its website a suite of policies regarding energy use, water use, waste reduction and travel that will reduce the environmental impacts and costs of those activities. Agencies and institutions electing to develop an EMS shall achieve E2 or higher certification under the Virginia Environmental Excellence program by July 1, 2011. Policies adopted in lieu of an EMS shall contain the following:

1. Energy use. At a minimum, the energy use policy shall address powering down computers when not in use, turning off interior and exterior lights when not needed, and reducing the energy consumption of heating and cooling systems outside of office hours.
2. Water use. At a minimum, the water use policy shall address eliminating plumbing leaks and (if applicable) minimizing use of water for irrigation through reduced frequency of watering, timing of watering, and the selection of low water-use landscaping such as drought resistant grass, plants, shrubs and trees.
3. Waste reduction. At a minimum, the waste reduction policy shall address ways of reducing

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consumption of paper and other office supplies, ways of reducing the use of disposable supplies, and recycling of white paper, mixed paper, plastic, batteries, printer cartridges and aluminum. For any agency that performs maintenance on vehicles, the policy shall address recycling of oil and antifreeze. Agencies are encouraged to include provisions regarding composting.

4. Travel. At a minimum, the travel policy shall address: carpooling to meetings, use of video conferencing and conference calls in lieu of in-person meetings, and purchasing of alternative fuels where available. Agencies are encouraged to include restrictions on whether the agency will pay mileage for single-passenger use of personal vehicles for business travel.

The Department of Environmental Quality shall, upon request, provide examples of such policies to any agency.

Building and Facility Construction and Location

All executive branch agencies and institutions entering the design phase for construction of a new building greater than 5,000 gross square feet in size, or renovating such a building where the cost of renovation exceeds 50 percent of the value of the building, shall meet Department of General Services (DGS), Division of Engineering and Buildings “Virginia Energy Conservation and Environmental Standards” for energy performance and water conservation. In addition, all such buildings shall conform to LEED silver or Green Globes two-globe standards, unless an exemption from such standards is granted by the Director of the DGS upon a written finding of special circumstances that make construction to the standards impracticable.

When a Commonwealth agency or institution is to lease space or build a new building in a metropolitan area where public transportation is available, it shall seek to lease or build within a quarter mile of a transit or commuter rail stop. The Commonwealth also shall, when leasing and building facilities, seek locations that are pedestrian and bicycle accessible. The Commonwealth shall encourage the private sector to adopt green building standards by striving to lease facilities that meet the same standards as those required for new state construction as outlined above. The Division of Real Estate Services of the Department of General Services shall consider these preferences in approving new leases or extensions of current leases.

Procurement Standards

The Department of General Services and Virginia Information Technology Agency shall establish specifications for use by state agencies and institutions subject to the Virginia Public Procurement Act in the procurement of commodities and services. The specifications shall encourage agencies to utilize commodities and services that will: (i) reduce or eliminate the health and environmental risks from the use or release of toxic substances; (ii) minimize risks of the discharge of pollutants into the environment; (iii) minimize the volume and toxicity of packaging; (iv) maximize the use of recycled content and materials composed of sustainably managed renewable resources; (v) maximize the use of equipment that is durable, and therefore, can be used for a long time without having to be replaced; and (vi) maximize the use of

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remanufactured components.

The Department of General Services also shall include in its policies and procedures requirements for the purchase of fuel-efficient, low-emission state-owned vehicles. In addition, DGS shall include in its policies and procedures for leasing vehicles requirements that encourage the use of compact, fuel-efficient, and low-emission vehicles.

All agencies and institutions except for public safety agencies shall maximize biofuel use in state fleet vehicles. The Department of General Services shall make available, at selected sites based upon the locations of state-owned flex-fuel and diesel vehicles, E85 and B2 fuels for agencies. Agencies and institutions that independently purchase fuel shall use E85 and B2 fuel sites to the maximum extent reasonably possible.

In addition, the following standards shall be observed by all executive branch agencies and institutions:

1. Agencies and institutions shall purchase or lease Energy Star-rated appliances and equipment for all classifications for which an Energy Star designation is available.
2. All new copiers, faxes, printers, and other such office equipment purchased or leased by agencies and institutions that use paper shall be recycled paper-compatible. Agencies and institutions shall purchase only recycled paper except where equipment limitations or the nature of the document preclude the use of recycled paper.
3. Beginning on July 1, 2010, agencies and institutions other than public safety agencies shall procure only diesel fuel containing, at a minimum, two percent, by volume, biodiesel fuel or green diesel fuel, as defined in §45.1-394 of the *Code of Virginia*. This requirement shall only apply to procurements of diesel fuel for use in on-road internal combustion engines and #2 fuel burned in a boiler, furnace, or stove for heating, and shall not apply if the cost of such procurement exceeds the cost of unblended diesel fuel by 5 percent or more.
4. In selecting sites for conferences and other meetings that are to be held at places other than state facilities, agencies and institutions shall, after complying with procurement statutes and regulations, observe the following guidelines. For meetings attended by fewer than 50 people, agencies and institutions shall strive to use "Virginia Green" certified facilities. For meetings attended by 50 or more people, only "Virginia Green" certified facilities shall be used unless permission to select a different site has been granted by the Chief of Staff. In conducting meetings, agencies and institutions shall minimize the use of paper. When meals are served, disposable materials should be avoided to the greatest extent possible. Disposable materials that are used should be biodegradable or recyclable.
5. No agency or institution shall procure water in individual serving-sized containers made of plastic except for use in emergencies or for safety and health reasons.

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Energy Efficiency

All agencies and institutions shall provide adequate management support to their energy-savings activities. In order to ensure agencies have sufficient expertise in energy management, every Agency Energy Manager for an agency or institution with energy costs exceeding \$1 million annually shall be certified as an energy manager by the Association of Energy Engineers.

The requirements of Executive Order 48 that (i) executive branch agencies and institutions must reduce the annual cost of non-renewable energy purchases by at least 20 percent of fiscal year 2006 expenditures by fiscal year 2010, and (ii) any agency or institution that can demonstrate to the Senior Advisor for Energy Policy that it met the 10 percent energy savings goal established for 2006 in Executive Order 54 (2003) must reduce costs of non-renewable energy purchase by an additional 15 percent of fiscal year 2006 expenditures by fiscal year 2010, are hereby continued. In addition, all executive branch agencies and institutions shall achieve an additional savings of 5 percent of fiscal year 2006 expenditures by fiscal year 2012.

Agencies shall report their progress towards the energy-savings goals to the Director of the Department of Mines, Minerals and Energy. Such progress shall be reported to the public on the Department of Mines, Minerals and Energy's website.

The Department of Mines, Minerals and Energy shall be responsible for providing technical assistance to state agencies and institutions in achieving energy savings. Specifically, the Department of Mines, Minerals and Energy shall:

1. Assist state agencies in their efforts to conserve energy to the maximum extent feasible;
2. Assist agencies and institutions with implementation of this Executive Order;
3. In cooperation with the Department of Environmental Quality, assist agencies with calculating the extent to which their energy savings result in a reduction in greenhouse gas emissions; and
4. Maintain a system to monitor and report on progress made by state agencies toward reducing from its 2006 baseline energy costs and consumption for state-owned facilities and provide a report at least annually on its website.

Providing Government Services

All reports published by executive branch agencies and institutions shall be published in electronic form only, unless permission to print the report has been granted by the Chief of Staff. If printing is necessary, agencies should maximize their use of post-consumer recycled paper and environmentally-friendly inks.

Executive branch agencies and institutions shall strive to increase opportunities for citizens and businesses to engage in electronic transactions with the Commonwealth rather than having to travel to state offices.

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Commuting to Work

As an employer, the Commonwealth should make it easy for employees to minimize the impacts of commuting on energy consumption, traffic congestion and emissions. All agencies and institutions shall implement transit and ridesharing incentive programs within the parameters of the Department of Human Resource Management's guidelines. Agencies shall consider encouraging the use of transit by providing transit passes for free while charging for parking, such as is currently the policy of the Virginia Department of Transportation and Virginia Department of Rail and Public Transportation.

§2.2-2817.1 of the *Code of Virginia* requires each state agency to pursue a goal of not less than 20 percent of its eligible workforce telecommuting by January 1, 2010. Wherever possible, agencies and institutions should use telecommuting to the fullest extent to mitigate traffic congestion and reduce emissions.

To encourage employers to fully explore the feasibility of telecommuting, I hereby declare Monday, August 3, 2009, a "Statewide Telework Day" and request that the directors of state agencies and institutions as well as private sector employers allow as many citizens as possible to telecommute on that day.

Green Commonwealth Challenge

Every day we each make choices that result in impacts to the environment; opportunities to lessen these impacts abound. For instance, we can reduce automobile emissions by holding videoconferences or conference calls rather than face-to-face meetings and by walking, bicycling, carpooling, or taking transit to work. We can reduce the need for landfills by reducing the disposable items we use and recycling the rest.

I challenge state agencies and employees to use the next few months to see how many such deliberate, voluntary actions can be achieved. Agencies that choose to participate in this challenge shall report to the Secretary of Natural Resources the following metrics for the period of June 15 through November 15, 2009:

- Number of in-person meetings avoided through the use of video conferences or conference calls, as well as an estimate of the resulting travel miles avoided.
- Number of trips avoided by agency employees carpooling with others.
- Number of meetings planned by the agency for which the agency facilitated carpooling of attendees (e.g., through the use of a survey or other tool to help connect meeting attendees).
- Number of different materials included in the agency's recycling program (e.g., white paper, mixed paper, plastic bottles, batteries).
- Number of days each employee telecommuted or commuted to work any way other than driving in a car alone.

In addition, participating agencies shall submit to the Secretary:

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- Electricity bills for the months of July, August, and September of 2008, as well as the months of July, August and September 2009.

The Secretary of Natural Resources shall devise a scoring system and provide guidelines to participating agencies. The Secretary shall compile all the reports received by December 1, 2009, and shall announce the three highest scoring agencies by December 15, 2009.

I invite all state employees to submit suggestions to the Employee Suggestion Program website regarding ways that state government can reduce environmental impacts of its operations. The employee who submits the idea that is determined by Secretaries of Administration and Natural Resources and the Chief of Staff to be the best idea will receive one day of annual leave. To be eligible for this extra incentive, the suggestions must reference this executive order.

Senior Advisor for Energy Policy and Energy Policy Advisory Council

The Governor's Energy Policy Advisory Council and the position of Senior Advisor to the Governor for Energy Policy established in Executive Order 48 are hereby continued. The Senior Advisor serves as the Governor's principal advisor on energy-related issues and is directed to coordinate energy policy across state agencies and institutions, including advising state institutions of higher education on coordinating energy research efforts.

The Senior Advisor shall update the Virginia Energy Plan in conjunction with the Division of Energy of the Department of Mines, Minerals, and Energy, as provided for in Chapter 2 of Title 67 of the *Code of Virginia*, drawing upon expertise of other agencies and institutions and Virginia businesses as appropriate.

The Governor's Energy Policy Advisory Council shall be chaired by the Senior Advisor for Energy Policy. The Council shall consist of 15 members appointed by the Governor, to serve at his pleasure. Appointees shall include representatives of Virginia's energy providers and producers, residential, commercial and industrial energy consumers, Virginia's conservation community, and the Secretaries of Natural Resources, Commerce and Trade, and Technology. The Advisory Council shall make a report of its activities by December 1 of each year. The Advisory Council's responsibilities shall include the following:

1. Review the recommendations set forth in the Virginia Energy Plan as well as other relevant reports and studies.
2. Evaluate strategies for implementing recommendations of the Virginia Energy Plan, including prioritization, approach, and timeline.
3. Monitor implementation of the Virginia Energy Plan.
4. Identify additional energy policy options for the Commonwealth to address energy issues.
5. Make other recommendations as may be appropriate.

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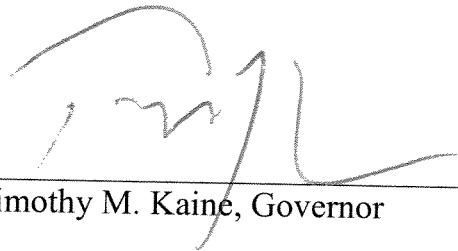
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Effective Date of the Order

This Executive Order rescinds Executive Order Number Forty-eight (2007), Energy Efficiency in State Government, issued on April 5, 2007.

This Executive Order shall become effective upon its signing and shall remain in full force and effect until July 1, 2013, unless amended or rescinded by further executive order.

Given under my hand and under the Seal of the Commonwealth of Virginia this 10th day of June, 2009.



Timothy M. Kaine, Governor

Attest:

Secretary of the Commonwealth

Who is doing what in Coastal Virginia?

A Guide to Current Adaptation Efforts to Sea-Level Rise and Flooding

ACADEMIA

Georgetown University Law’s Georgetown Climate Center seeks to advance effective climate policies in the United States. The Center completed a Virginia Case Study *Stemming the Tide: How Local Governments Can Manage Rising Flood Risks* which analyzes the authority of Virginia local governments to use existing land use regulations to adapt to sea level rise impacts. The Center is assisting Virginia localities connect with climate scientists to develop strategies for effectively communicating about climate change vulnerabilities and building more resilient communities. The Center will also be releasing, in September 2014, an online tool that will allow users to explore Virginia’s progress in implementing its Climate Change Action Plan and local and regional activities to prepare for climate change.

<<http://www.georgetownclimate.org/virginia-case-study-stemming-the-tide-how-local-governments-can-manage-rising-flood-risks>>

Contact: Jessica Grannis
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202-661-6954

Old Dominion University’s Mitigation and Adaptation Research Institute is developing several activities related to mitigation of climate change impacts and adaptation to climate change and sea level rise including new courses, certificates and, eventually, new degrees. ODU also has a Climate Change and Sea Level Rise Initiative that facilitates research, education and regional collaboration on a range of issues including the Hampton Roads Sea Level Rise/Flooding Adaptation Forum.

<<http://www.mari.odu.edu/>>

- In concert with the National Security Council (and others), ODU has launched the pilot “whole of government” project. The approach aims to better organize federal, state and local government, as well as partners in the private sector and academia to combat impacts of sea level rise and climate change.

Ray Toll, ODU Navy NOAA Liason
rtoll@odu.edu

- Focusing on work at ODU’s Virginia, Modeling, Analysis and Simulation Center, Weldon Cooper Center for Public Service released research report entitled “Hurricane Preparedness: Community Vulnerability and Medically Fragile Populations.”

<http://www.coopercenter.org/sites/default/files/publications/Virginia%20News%20Letter%202014%20Vol.%2090%20No%202_0.pdf>

Contact: Larry Atkinson
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757-683-4926

The Law School at the College of William and Mary started a Coastal Policy Clinic to work with localities and VIMS on the legal issues surrounding implementation of sea level rise adaptation.

<<http://law.wm.edu/academics/programs/jd/electives/clinics/vacoastal/index.php>>

Contact: Roy Hoagland

rahoagland@wm.edu

757-221-7404

The University of Virginia

- 1) Institute for Environmental Negotiation has been conducting community-based research and outreach for coastal communities (listening sessions, focus groups, workshops) to help them adapt to sea level rise and enhance their resilience.

<<http://www.virginia.edu/ien/sealevelrise/>>

- Community Engagement Workshops/Focus Groups
 - "Sea Level Rise in Hampton Roads: Findings from the Virginia Beach Listening Sessions
 - <http://www.virginia.edu/ien/sealevelrise/docs/Sea_Level_Rise%20final%20report%207-19.pdf> 2011.
 - Results from the City of Virginia Beach Focus Group Discussion of Sea Level Rise Policies. 2012.
<<http://www.virginia.edu/ien/sealevelrise/docs/VirginiaBeachFocusGroupReport.pdf>>
 - Final Report: Results from the Eastern Shore Coastal Flooding Workshop. 2012.
 - <<http://www.virginia.edu/ien/sealevelrise/docs/WorkshopReport-Final.pdf>>
 - Results from the Gloucester County Focus Group Discussion of Sea Level Rise. 2012.
<http://www.virginia.edu/ien/sealevelrise/docs/SeaLevelRiseFocusGrp_GloucesterFINAL.pdf>
 - Virginia Working Waterfronts workshop 2014
 - <<http://www.vims.edu/GreyLit/VIMS/mrr14-08.pdf>>
- Protecting Water Quality Through Actions on Urban-Suburban Properties. 2013.
 - Tackling issues regarding sea level rise impacts on storm water management
<<http://ien.arch.virginia.edu/clients/federal-government/a-collaborative-summit>>

Contact: Tanya Denckla Cobb

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Virginia Institute of Marine Science

- 1) *TideWatch* (and the Real-Time Storm Tide Observation and Forecast System) is an online, real-time water level monitoring tool developed by VIMS researchers. It provides information that can help predict the magnitude of coastal flooding in an area and allow comparison of storm tides at 9 locations within the Chesapeake Bay.
<<http://www.vims.edu/bayinfo/tidewatch/index.php>>
- 2) VIMS, in partnership with the Conservation Fund, the National Geographic Society, the Chesapeake Observing System, National Oceanic and Atmospheric Administration, the Maryland Department of Natural Resources, the Virginia Coastal Zone Management, and Burke Environmental Associates created *Chesapeake Sea-Level Rise and Storm Surge Public Awareness and Response* to raise awareness of the risk that the Chesapeake region faces in the face of climate change and rising sea levels. In addition to visualizations and maps, the website also includes examples of adaptation and mitigation efforts in Virginia.
<<http://www.chesapeakeadaptation.org/>>

Contact: John T. Wells
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804-684-7103

Virginia Institute of Marine Science- The Center for Coastal Resources Management (CCRM) develops and supports integrated and adaptive management of coastal zone resources. To fulfill this mission, the Center undertakes research, provides advisory service, and conducts outreach education. Coastal resiliency initiatives include:

- 2) The Recurrent Flooding Report for Tidewater and Eastern Shore localities
<http://www.ccrm.vims.edu/recurrent_flooding/Recurrent_Flooding_Study_web.pdf>
- 3) Developing adaptation plans for localities
- 4) The Comprehensive Coastal Resource Management Portal - Guidance for Tidal Shoreline Management Plans in Virginia <<http://www.ccrm.vims.edu/ccrmp/index.html>>
- 5) Variety of research projects looking at ecological impacts and tools for adaptation planning <http://ccrm.vims.edu/coastal_zone/climate_change/index.html>

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Virginia Tech hosts the Virginia Water Resources Research Center, one of 54 water resources research institutes located around the country as a result of the 1964 Federal Water Resources Research Act. The Virginia Water Resources Research Center features a stormwater best management practices website in collaboration with the Virginia Department of Environmental Quality (<http://vwrrc.vt.edu/projects.html>) and compiles climate-change articles and sources on a Water News blog at <http://vawatercentralnewsgrouper.wordpress.com/category/climate-change/>. Virginia Tech's Environmental and Water Resources Engineering Program has been examining impacts of sea level rise and climate change on coastal flooding and is introducing a

new focus on coastal engineering.

Contact: Stephen Schoenholtz
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540-231-0711

NON-GOVERNMENTAL ORGANIZATIONS

Back Bay Restoration Foundation (BBRF) is working on several sea level rise projects. BBRF was recently awarded a grant through the Virginia Migratory Waterfowl Stamp Grant Project to partner with U.S. Fish and Wildlife Service and Back Bay National Wildlife Refuge to restore 340 acres of high quality emergent and forested wetland habitat, as well as maintaining 260 acres of newly established submerged aquatic vegetation through refurbishment of two water control structures damaged by burrowing animals and flanking. In addition, BBRF will be funded through the Hurricane Sandy Resiliency Grant Program to partner with several organizations to restore 3783 acres forested wetlands and establish 1650 feet of living shoreline (estuarine) in the Back Bay estuary & watershed of Virginia. BBRF also hosts the Watersheds Forum each spring to provide up to date information regarding the health of Virginia Beach's watersheds, including sea level rise.

Chesapeake Climate Action Network has launched their Virginia Safe Coast campaign, which regards the greater Hampton Roads area as one of the country's regions most vulnerable to sea-level rise. The campaign has demanded immediate adoption of adaptation measures to protect coastal communities and reduction of carbon emissions to slow the level of rising seas. <http://www.chesapeakeclimate.org/index.php?option=com_k2&view=item&id=3736:virginia-safe-coast&Itemid=19>

Contact: Mike Tidwell
mtidwell@chesapeakeclimate.org
240-460-5838

Climate Central conducts scientific research on climate change and informs the public nationally by way of online tools, factsheets and peer-reviewed papers. Their Surging Seas tool focuses on impacts for much of the coastal US. They have recently released their tool for Virginia, including the ability to look at flood levels and related factors such as population, income, property as well as critical infrastructure locations. < <http://sealevel.climatecentral.org/ssrf/virginia>>

Contact: Ben Strauss
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Lynnhaven River Now is dedicated to reducing sources of contamination in the river including nutrients, sediments, and chemicals running off of our lawns, parking lots, roadways and out of our septic systems; educating the community about how they can help to protect the Lynnhaven River; and engaging partner organizations and the community to restore and protect the lost habitats of the river such as oyster reefs, salt marshes, and other buffers that help to filter polluted runoff and protect the ecological communities of the river.

The primary goal of the Marsh Island Resiliency Task Force is to develop tested methodologies to increase the resiliency of Lynnhaven marsh islands being threatened by sea level rise through experimentation with multiple restoration techniques. The task force will test the ability of each chosen resiliency strategy to improve resiliency of marsh islands at a high, medium, and low wave energy study sites. The living shoreline concept will be applied to island geography by restoring eroded sand and plant materials and protecting the perimeter of the islands with various substrates such as traditional rock sills, crushed concrete, oyster castles, and native mussels. All sills will be vented to allow for intertidal flow. High marsh elevations and associated plants will be emphasized as much as possible to increase resiliency to sea level rise over time. New resiliency methodologies may be applicable to other marsh island sites throughout the Chesapeake Bay Watershed.

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The Natural Resources Defense Council (NRDC) researches and advocates to protect water resources nationally. In a 2012 study entitled Ready or Not: An Evaluation of State Climate and Water Preparedness Planning, NRDC ranked Virginia as one of 29 states that were "largely unprepared and lagging behind" on planning for climate change. NRDC made several state level recommendations to build resilience to future climate impacts. NRDC referenced a study by researchers at Sandia National Laboratories that estimates between 2010 and 2050, Virginia could lose more than \$45 billion in GDP and more than 314,000 jobs due to climate change impacts on employment, personal income, and interstate migration. NRDC also discussed the climate risks and vulnerabilities of Norfolk in a 2011 study entitled Thirsty for Answers: Preparing for the Water-related Impacts of Climate Change in American Cities.

<<http://www.nrdc.org/water/readiness/water-readiness-report.asp>>

<<http://www.nrdc.org/water/thirstyforanswers.asp>>

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The Nature Conservancy has launched adaptation projects regarding the Eastern Shore of Virginia, conducting the Eastern Shore Climate Adaptation Strategies Workshop in 2010 and developing a 2011 report on *Strategies for Adapting to Climate Change for the Eastern Shore of*

Virginia. Their 2014 *Coasts at Risk: An Assessment of Coastal Risks and the Role of Environmental Solutions*, also examines coastal issues and environmental solutions, with more of a global scope to it. Their Coastal Resilience Tool also allows for exploration of risk, adaptation and conservation efforts.

<<http://www.virginia.edu/ien/sealevelrise/docs/VA%20Eastern%20Shore%20CC%20Adaptation%20Report%20Final.pdf>>

<<http://coastalresilience.org/>>

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Union of Concerned Scientists has launched a climate impacts initiative and has continued to increase its presence in Virginia. UCS has included Virginia in work focusing on sea level rise impacts on our cultural heritage in their *National Landmarks at Risk* report, as well as state specific facts related to flood insurance reform in their report on *Overwhelming Risk: Rethinking Flood Insurance in a World of Rising Seas*. Their 2014 *Encroaching Tides* report also discusses issues around increasing tidal flooding events, and includes a profile of Norfolk and discussion of Chesapeake community flooding.

<http://www.ucsusa.org/global_warming/science_and_impacts/impacts/preparing-for-sea-level-rise.html>

<www.ucsusa.org/global_warming/impacts/effects-of-tidal-flooding-and-sea-level-rise-east-coast-gulf-of-mexico>

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Virginia Coastal Coalition's mission is to facilitate a collaborative partnership between the business and environmental communities to provide non-partisan, scientifically sound information on environmental issues and guide development of policies that enhance the unique environmental assets of Coastal Virginia as integral to the region's identity, quality of life and thriving economy. VCC is launching a quarterly breakfast series beginning this fall aimed at providing useful and reliable information to the business community in Hampton Roads. Additionally, VCC is launching the Hampton Roads Businesses Acting on Rising Seas (HR BARS) following the work of the American Sustainable Business Council and similar programs in South Carolina and Boston this fall. This program will engage small businesses on the economic and physical consequences of sea level rise in Hampton Roads. Small businesses will be able to

learn about local impacts and hopefully want to engage more in resiliency measures as a result of this awareness. <www.vacoastal.org>

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Wetlands Watch began its sea level rise work after the group realized that a major portion of Virginia's wetlands are threatened by sea level rise, and the only way to protect those wetlands is to keep the land behind them open to allow them to migrate onto higher ground as sea levels rise. As such, the group's work has focused primarily on adaptation to sea level, participating in every major sea level rise conversation in the region, assisting local governments in addressing sea level rise, working to stop unwise development in areas likely to be affected by sea level rise, developing a toolkit for local governments to use in approaching adaptation efforts, partnering to host listening sessions in Virginia Beach and the Eastern Shore to facilitate an open public dialogue on sea level rise, assisting numerous researchers and members of the press to understand the flooding situation in Hampton Roads and increase visibility of the sea level rise problem, engaging the private sector on the problem and adaptation, and developing a study of private homeowners insurance and its potential influence on adaptation. They are also taking a look at changes to the National Flood Insurance Program (NFIP) and possible incentives for sea level rise adaptation, and a review of the NFIP's Community Rating System (CRS) and the potential for landscape and habitat approaches to flood plain management to incentivize adaptation and good floodplain management through flood insurance discounts. As well, Wetlands Watch is looking at how to generate co-benefits from green infrastructure approaches to flood plain management for stormwater pollution reduction efforts. Finally, Wetlands Watch is beginning to develop land-use education workshops for citizens to advocate for smart land use in the face of sea level rise, has recently released an app to track flooding problems at the street level and changes over time called Sea Level Rise (currently available on iPhone), and is hosting an adaptation design project to develop innovative ideas for adaptation in a Hampton Roads community.

- 1) Timeline of Wetland Watch's work on sea level rise adaptation:
 - a. <<http://www.wetlandswatch.org/WetlandScience/SeaLevelRise/Adaptation.aspx>>
- 2) Listening sessions: <<http://www.virginia.edu/ien/sealevelrise/>>
- 3) Toolkit <<http://www.wetlandswatch.org/Portals/3/WW%20documents/sea-level-rise/ASCE%20Meeting%20Paper.pdf>>
- 4) Insurance Study
<<http://www.wetlandswatch.org/WetlandScience/SeaLevelRise/PrivateInsurance.aspx>>
- 5) Homeowners Guide to Flood Insurance: <http://www.wetlandswatch.org/WetlandScience/SeaLevelRise/FloodInsurance.aspx>

<<http://wetlandswatch.org/>>

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World Resources Institute (WRI) focuses on the intersection of the environment and socio-economic development. Their research works to translate ideas into action, working globally with governments, business, and civil society to build transformative solutions that protect the earth and improve people's lives. WRI recently released a fact sheet on sea level rise and its impact on Virginia and has been involved with a number of recent discussions tackling flooding in the Commonwealth.

<http://www.wri.org/sites/default/files/WRI_FactSheet_Virginia_Final.pdf>

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COMMONWEALTH OF VIRGINIA

The Hampton Roads Regional Comprehensive Economic Development Strategy, required by the US Department of Commerce prior to receiving Community Development Block Grants, has listed sea level rise as an economic threat to the region.

<<http://hamptonroadsperforms.org/hampton-roads-vision/>>

Transportation:

The Hampton Roads Transportation Planning Organization issued a study in July 2013 entitled *Hampton Roads Military Transportation Needs Study: Roadways Serving the Military and Sea Level Rise/Storm Surge* that estimates impacts from sea level rise and storm surge to the network of highways and roads serving area military installations.

<<http://www.hrtpo.org/uploads/docs/Roadways%20Serving%20the%20Military%20&%20Sea%20Level%20Rise-Storm%20Surge%20DRAFT%20Report.pdf>>

More information on military transportation needs:

<<http://www.hrtpo.org/page/military-transportation-needs/>>

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Virginia’s long range transportation plan (VTRANS 2035) and Hampton Road’s long range transportation plan list climate change and sea level rise as a concern (see p 4 of VTRANS “Natural and Human Environment Report” and page 9-3 of Hampton Roads plan, Chapter 9).

<http://hrtpo.org/uploads/docs/Section_4_Transportation_Challenges.pdf>

<http://www.vtrans.org/resources/Natural_and_Human_Environment.pdf>

Agencies:

VA Department of Conservation and Recreation develops and implements education programs regarding the NFIP program and flood insurance as well as hosts the Virginia Flood Risk Information System aimed at making flood hazard data available to the public.

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VA Department of Emergency Management mitigation staff support local communities in creation of Hazard Mitigation proposals regarding repetitive loss and severe repetitive loss properties as well as the direct development of Hazard mitigation plans and their implementation. Currently there are approximately \$20 million in open FEMA HMA projects in the Commonwealth. The department released the Be Mobile Ready free emergency preparedness app at the beginning of this year. <<http://www.vaemergency.gov/news/news-releases/2013/mobile-app-ready>>

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VA Department of Environmental Quality’s Office of Water Supply has been conducting research on the land subsidence that can be accounted for from groundwater pumping and its significant contribution to sea-level rise. The report should be completed later this fall. They are also monitoring the potential for significant threats to the water supply from greater coastal flooding such as salt-water intrusion to private wells.

<<http://www.deq.virginia.gov/Programs/Water/WaterSupplyWaterQuantity.aspx>>

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Virginia Coastal Zone Management Program is Virginia’s coastal communities face a range of climate-related threats including rising water levels, more frequent and stronger hurricanes and storms, changes in precipitation patterns and warmer air and water temperatures. These changes will affect coastal habitats and the livelihoods and lifestyles of coastal residents. The most publicized change is the expected rise in sea level, which is predicted to be at least two

feet within the next 100 years, or double the rate from the past century. The region has added vulnerability because it is also gradually subsiding as a result of geologic changes related to the last ice age. As a result, Virginia faces the highest rate of relative sea level rise on the East Coast. Recognizing the potential severity of these changes, The Virginia Coastal Zone Management Program has undertaken a number of initiatives to help coastal communities adapt to the climate change impacts that now appear inevitable. Efforts have included a multi-year initiative to promote “living shorelines” to help mitigate wetland loss from sea level rise, public education projects, and funding for Virginia’s eight planning district commissions (PDCs).

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In addition to support for on-going technical assistance to coastal localities, several Planning District Commissions have undertaken the following climate adaptation projects.

- 1) **The Accomack-Northampton Planning District Commission** (Eastern Shore) coordinates a Climate Adaptation Working Group comprised of 31 local, state, and federal government agencies and NGOs. The group meets quarterly to develop public outreach projects and planning tools and offers networking opportunities amongst participating agencies. The group is utilizing new LiDAR coverage for the Eastern Shore to enhance its educational and planning efforts. In addition, the A-NPDC will be conducting a Transportation Infrastructure Inundation Vulnerability Assessment (funded by VCZM for FY14) to evaluate roadway vulnerability to sea level rise using recently acquired LiDAR data for region. Finally, the ESVA Coastal Change Archive, a compilation of local accounts of changes resulting from recurrent flooding/sea level rise, is currently underway.
 - a. 2011 - Coastal Resources Technical Assistance Program
<http://www.deq.virginia.gov/Programs/CoastalZoneManagement/Funds,Initiatives,Projects/2011Projects/2011VirginiaCZMGrantProjectTask4111.aspx>
Product: Climate Adaptation Working Group
 - b. 2012 - Coastal Resources Technical Assistance Program
<http://www.deq.virginia.gov/Programs/CoastalZoneManagement/Funds,Initiatives,Projects/2012Projects/2012VirginiaCZMGrantProjectTask4112.aspx>
Products: Climate Adaptation Working Group
Coastal Change Archive
 - c. 2013 - Coastal Resources Technical Assistance Program
<http://www.deq.virginia.gov/Programs/CoastalZoneManagement/Funds,Initiatives,Projects/2013Projects/2013VirginiaCZMGrantProjectTask4113.aspx>
Product: Climate Change Adaptation Working Group
 - d. 2013 - Eastern Shore Transportation Infrastructure Inundation Vulnerability
<http://www.deq.virginia.gov/Programs/CoastalZoneManagement/Funds,Initiatives,Projects/2013Projects/2013VirginiaCZMGrantProjectTask5313.aspx>

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- 2) The **Hampton Roads Planning District Commission's** (HRPDC) climate change and coastal resiliency efforts have included several projects to document the projected impacts of climate change and develop a strong partnership to respond to this issue. Efforts have focused on mapping various levels of sea level rise and storm surge and the public infrastructure, neighborhoods and coastal resources that would be affected. The projects have involved public outreach and education, ways to incorporate sea level rise adaptation into local plans, and adaptive management measures to address sea level rise.
 - a. HRPDC initiated a Regional Sea Level Rise Committee which meets regularly
 - b. 2008 - Hampton Roads Climate Change Adaptation
<http://www.deq.virginia.gov/Programs/CoastalZoneManagement/Funds,Initiatives,Projects/2008Projects/2008VirginiaCZMGrantProjectTask120308.aspx>
 - c. 2009 - Sustainable Communities Focal Area: Climate Change in Hampton Roads
<http://www.deq.virginia.gov/Programs/CoastalZoneManagement/Funds,Initiatives,Projects/2009Projects/2009VirginiaCZMGrantProjectTask120409.aspx>
 - d. 2010 - Sustainable Communities Focal Area: Climate Change in Hampton Roads
<http://www.deq.virginia.gov/Programs/CoastalZoneManagement/Funds,Initiatives,Projects/2010Projects/2010VirginiaCZMGrantProjectTask120410.aspx>
Climate Change in Hampton Roads Phase III: Sea Level Rise in Hampton Roads
http://www.hrpdcva.gov/Documents/Phys%20Planning/2012/HRPDC_ClimateChangeReport2012_Full_Reduced.pdf
 - e. 2011 - Coastal Resiliency: Adapting to Climate Change in Hampton Roads
<http://www.deq.virginia.gov/Programs/CoastalZoneManagement/Funds,Initiatives,Projects/2011Projects/2011VirginiaCZMGrantProjectTask5111.aspx>
Coastal Resiliency: Adapting to Climate Change in Hampton Roads
<http://www.hrpdcva.gov/uploads/docs/07182013-PDC-E9I.pdf>
 - f. 2011 - Developing a Local Sea Level Rise Adaptation Plan for Virginia Beach
<http://www.deq.virginia.gov/Programs/CoastalZoneManagement/Funds,Initiatives,Projects/2011Projects/2011VirginiaCZMGrantProjectTask5711.aspx>

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- 3) The **Middle Peninsula Planning District Commission** initially focused their three-year project on identifying potential impacts of climate change and sea level rise and assessed the associated economic and ecologic losses. Phase 2 aimed to understand the social perceptions on the topic within the region, while Phase 3 continued outreach efforts geared toward the general public and elected officials and also developed a

START (Start Adaptation and Response Today) kit which organized information that localities can consider when addressing potential climate change and sea level rise impacts. The START kit includes: (1) local scientific data (2) Kaiser– Permanente Natural Hazard Vulnerability Assessment Tool results from the Middle Peninsula, (3) local, state, national, and international case studies, as well as (4) sample adaptation ordinances from other communities.

- a. 2008 - Middle Peninsula Climate Change Adaptation- An Assessment of Potential Anthropogenic and Ecological Impacts of Climate Change on the Middle Peninsula
<http://www.deq.virginia.gov/Programs/CoastalZoneManagement/Funds,Initiatives,Projects/2008Projects/2008VirginiaCZMGrantProjectTask120408.aspx>
- b. 2009 - Middle Peninsula Climate Change Adaptation Phase 2- Facilitation of Presentations and Discussions of Climate Change Issues with Local Elected Officials and the General Public
<http://www.deq.virginia.gov/Programs/CoastalZoneManagement/Funds,Initiatives,Projects/2009Projects/2009VirginiaCZMGrantProjectTask120509.aspx>
- c. 2010 - Middle Peninsula Climate Change Adaptation: Ecological & Anthropogenic Impacts
<http://www.deq.virginia.gov/Programs/CoastalZoneManagement/Funds,Initiatives,Projects/2010Projects/2010VirginiaCZMGrantProjectTask120510.aspx>
- d. 2011 - Initiating Adaptation Public Policy Development study
http://www.mppdc.com/articles/service_centers/EnvironmentalCommunity%20Development/Phase_3_Climate_Change.pdf

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- 4) **Northern Virginia Regional Commission** Sustainable Shorelines and Community Management Project is a collaborative planning effort between the localities, major landholders, and universities in Northern Virginia that border the tidal Potomac River. The project regionalizes planning efforts for relative sea level rise and storm surge, along Northern Virginia's approximate 100 miles of tidal shoreline. This three-phase project, includes an inventory of existing data resources and policies for natural and man-made resources to identify data needs, and to understand current local shoreline management plans and regulations. The project also includes maps identifying shoreline vulnerability and strategies for adaptation and communication of project outcomes. A workgroup to guide and inform the project was formed consisting of representatives from local, state, and federal government agencies, colleges and universities, and other regional stakeholders.
 - a. 2008 - Northern Virginia Climate Change Adaptation- Sustainable Shoreline Community Management, Phase I

- <http://www.deq.virginia.gov/Programs/CoastalZoneManagement/Funds,Initiatives,Projects/2008Projects/2008VirginiaCZMGrantProjectTask120608.aspx>
- b. 2009 - Climate Change Adaptation: Sustainable Shoreline Community Management in Northern Virginia; Phase II
<http://www.deq.virginia.gov/Programs/CoastalZoneManagement/Funds,Initiatives,Projects/2009Projects/2009VirginiaCZMGrantProjectTask120709.aspx>
- c. 2010 - Climate Change Adaptation: Preparing Shorelines for Sea Level Rise
<http://www.deq.virginia.gov/Programs/CoastalZoneManagement/Funds,Initiatives,Projects/2010Projects/2010VirginiaCZMGrantProjectTask120710.aspx>

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The Virginia Sea Grant Program supports a wide range of activities addressing coastal community resilience and adaptation to sea level rise and climate change, including:

- 1) Provided research funding of innovative public engagement and deliberation strategies for contentious climate change and adaptation issues through the George Mason University's Center for Climate Change Communication and their research team including Dewberry, the Naval Academy, and the Anne Arundel County Community College. The team evaluated and developed open-source visualization software and public deliberative polling guidance (see: <http://www.futurecoast.info/>).
- 2) Currently funding and co-hosting the Hampton Roads Adaptation Forum with Old Dominion University and the Hampton Roads Planning District Commission. The Forum is a regular meeting among local government officials, federal facility managers, and university researchers to discuss the best available science and best management practices for adaptation. (see: <http://vaseagrant.vims.edu/coastal-flooding-072013/> and <http://vaseagrant.vims.edu/hampton-roads-adaptation-forum/>).
- 3) Currently funding VASG Law Fellows to work with the VCPC on legal and policy research on local government authorities, jurisdictions and options related to climate change. (see: <http://vaseagrant.vims.edu/summer-law-fellows-join-coastal-policy-clinic/>).
- 4) Funded community listening sessions throughout several Hampton Roads communities (particularly SE Virginia, Eastern Shore, and Middle Peninsula) and a planning evaluation in the City of Virginia Beach through the University of Virginia's Institute for Environmental Negotiation and the Department of Planning (see: <http://news.virginia.edu/content/uva-institute-assists-citizens-sea-level-rise-issues-virginias-coast?id=19402> and <http://www.virginia.edu/ien/sealevelrise/listeningsessions.html>).
- 5) Entered MOUs to support students and faculty in the Virginia Coastal Policy Clinic (VCPC) and to co-fund a Faculty of Practice member with Old Dominion University to conduct climate science synthesis and outreach to the Hampton Roads region. VCPC is now part of the National Sea Grant Law Network, consisting of a dozen legal programs providing advisory services and outreach to decision-makers nation-wide through the

state Sea Grant programs. The Faculty of Practice becomes a member of the National Sea Grant Climate Network, a professional network of climate outreach staff sharing best practices and lessons learned nation-wide.

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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. It works on flood observation and warning systems, planning, flood hazard mapping, flood hazard mitigation, dams, and flood response and recovery activities. The Virginia Team currently includes staff from the Army Corps of Engineers, 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.

<<http://www.nfrmp.us/state/factVirginia.cfm>>

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Current efforts include partnering on recurrent flooding and sea level rise efforts and the development of an interagency project proposal.

STATE LEGISLATURE

The Coastal Resource Management Law of 2011 passed by the state government requires localities to include coastal management strategies – including sea level rise projections and scientific advice provided by VIMS - in their long range land use plans starting in 2013. (Code of Virginia § 28.2-1100.9)

<<http://leg1.state.va.us/cgi-bin/legp504.exe?111+sum+SB964>>

The General Assembly Joint Subcommittee on Recurrent Flooding was established by HJR16/SJR3 to develop a coordinated and comprehensive plan for the state to address recurrent flooding. Headed by the chair Delegate Chris Stolle, and the Vice Chair Senator Mamie Locke, the subcommittee has begun to consider policies that protect Virginia's citizens, property, businesses, and natural resources. The review is tasked with issuing both short and

long-term plans to reduce recurrent flooding's effects on the Commonwealth.

<http://dls.virginia.gov/interim_studies_flooding.html>

Contact: Jeff Sharp, Division of Legislative Services,
804-786-3591, ext. 213

The Recurrent Flooding Report requested in February 2012 by the state legislature in a study resolution asked VIMS to produce research flooding and extreme events in Virginia and preventative strategies in Tidewater and Eastern Shore localities. The report was delivered at the end of 2012.

<[http://www.ccrm.vims.edu/recurrent_flooding/Recurrent Flooding Study web.pdf](http://www.ccrm.vims.edu/recurrent_flooding/Recurrent_Flooding_Study_web.pdf)>

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The Recurrent Flooding Sub-Panel of the Virginia General Assembly Secure Commonwealth Panel consisted of a collective effort by government officials, scientists, business leaders and NGOs to develop recommendations for tackling sea level rise and recurrent flooding in coastal Virginia. The sub-panel was instituted to build on the previous VIMS Recurrent Flood Study to contribute to the Secure Commonwealth Panel's ability to report on related emergency preparedness on the issue. The strategic Virginia-specific effort focused on local legal authority, state and federal support, framework and processes, data and mapping availability, project criterion and prioritization, and outreach on the issue. The September 2014 final report can be found at:<<http://www.norfolk.gov/DocumentCenter/View/17786>>

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The Honorable John Watkins (Senator, 10th District)

The Virginia Governor's Climate Change Commission (2008) laid out a detailed adaptation plan for the state in 2008. The only elements of which have been implemented with federal mapping efforts and two legislative initiatives. Governor McAuliffe's has restored the commission on Climate Change and Resiliency, who's efforts are currently underway.

- 1) <http://www.sealevelrisevirginia.net/main_CCC_files/>
- 2) <http://wetlandswatch.org/Portals/3/WW%20documents/Adap_Strat_adopted_VCCC_062109.pdf>

FEDERAL

Under Executive Order 13514, President Obama directed Federal agencies to release Climate Change Adaptation Plans, outlining strategies to reduce the vulnerability of Federal programs,

assets, and investments to the impacts of climate change, such as sea level rise or more frequent or severe extreme weather.

<<http://www.whitehouse.gov/administration/eop/ceq/initiatives/resilience>>

<<http://sustainability.performance.gov/>>

The US Environmental Protection Agency

- 1) *Climate Ready Estuaries* program addresses climate change in coastal areas
<<http://water.epa.gov/type/oceb/cre/toolkit.cfm>>
- 2) *Climate Resilience Evaluation & Awareness Tool (CREAT)* a software tool to assist drinking water and wastewater utility owners and operators in understanding potential climate change threats and in assessing the related risks at their individual utilities.
<<http://water.epa.gov/infrastructure/watersecurity/climate/creat.cfm>>

The Federal Emergency Management Agency (FEMA) has a number of resources regarding flood hazards including:

- 1) *Risk Assessment, Mapping and Planning Partners (RAMPP)* provides updated Digital Flood Insurance Rate Maps (DFIRM)--counties are at various levels of completion. RAMPP also provides hazard risk assessment and mitigation services (planning, outreach, etc.) and operate Regional Support Centers.
<<https://www.rampp-team.com/va.htm>>
- 2) *Risk MAP* provides mapping of flood potential, risk assessment and potential mitigation strategies. Virginia maps are currently in progress.
<<http://www.fema.gov/risk-mapping-assessment-planning>>
- 3) The Hazard Mitigation Grant Program provides state and local governments funding to implement long-term hazard mitigation measures following a major disaster. It requires a positive cost-benefit analysis and can be used for property specific (e.g. house elevation) as well as larger scale (e.g. levee) projects.
<<http://www.fema.gov/hazard-mitigation-grant-program>>
- 4) The Pre-Disaster Mitigation Grant Program provides states, territories, Indian tribal governments, communities and universities funding for hazard mitigation planning and implementation that reduces risk to people and structures.
<<http://www.fema.gov/pre-disaster-mitigation-grant-program>>
- 5) Funding to reduce flood losses includes Flood Mitigation Assistance to implement flood reduction measures, Severe Repetitive Loss Grants to reduce or eliminate long-term risk of flood damage to severe repetitive loss structures, and Repetitive Flood Claims Grants to reduce flood damages to NFIP properties with 1+ claims.
- 6) Virginia Disaster Declarations with Preliminary Disaster Reports can be found at:
<<http://www.fema.gov/states/virginia>>
- 7) The Biggert-Waters NFIP reform act of 2012 (Sections 100215 & 100216) allows FEMA to consider impacts of future sea level rise, development, storm surge, hurricanes on flood risk when updating maps.
<<http://www.philadelphiafed.org/bank-resources/publications/consumer-compliance-outlook/2012/third-quarter/Biggert-Waters%20Act.pdf>>

The Federal Highway Administration selected the Hampton Roads area as one of five regions to test a pilot model for conducting a climate change vulnerability and risk assessment of transportation infrastructure in coordination with the Virginia Department of Transportation, HRPDC, the Hampton Roads Transportation Planning Organization, and the University of Virginia.

The Government Accountability Office issued several studies related to SLR

- 1) “Future Federal Adaptation Efforts Could Better Support Local Infrastructure Decision Makers” that cites Hampton Roads military facilities as examples.
<<http://www.gao.gov/products/GAO-13-242>>
- 2) Over recent years the GAO has also highlighted the financial risks associated with the continued operation of the National Flood Insurance Program, adding it to its High Risk list since 2006. Recent reforms, such as inclusion of future sea level change in the Biggert-Waters Reform Act of 2012 and financial reforms may help reduce the public’s exposure if effectively implemented but will take time.
<<http://www.gao.gov/assets/660/652133.pdf>>
- 3) The “Improve Infrastructure Planning and Processes to Better Account for Potential Impacts” report recommends that DOD develop a plan and milestones for completing climate change vulnerability assessments of installations; provide further information to installation planners, clarifying actions that should be taken to account for climate change in planning documents; and clarify the processes used to compare military construction projects for funding, to include consideration of potential climate change impacts. <<http://www.gao.gov/products/GAO-14-446>>

The US Geological Survey (USGS)- A coalition of local governments and organizations in SE Virginia are working with USGS to get the last segment of Lidar mapping (high resolution digital maps with a 10cm vertical resolution) done for Hampton Roads. When complete, Virginia will have a continuous set of these Lidar maps for all tidal Virginia. The Nature Conservancy raised funds and paid \$100,000 to map the entire eastern shore in Lidar.

<<http://conserveonline.org/workspaces/e-shore-va-cc-adaptation/documents/eastern-shore-lidar-working-group>>

The U.S. Department of Housing (HUD)’s guidance associated with Executive Order 11988 requires that projects requesting federal assistance must be outside the base floodplains in order to avoid adverse impacts from floodplain development.

<http://portal.hud.gov/hudportal/HUD?src=/program_offices/comm_planning/environment/review/floodplain>

- 1) Hurricane Sandy Rebuilding Strategy- Shaun Donovan, Chair of the Hurricane Sandy Rebuilding Task Force, Secretary of HUD
<<http://portal.hud.gov/hudportal/documents/huddoc?id=HSRebuildingStrategy.pdf>>

NASA's two Virginia facilities (Langley Research Center and Wallops Island Launch complex) are conducting complete climate change evaluations to determine the challenges posed to continued operations.

1) *Wallops Flight Facility*

<http://www.c3p.org/Workshop%202010/Thursday%20Nov%204/13-Carolyn_Turner_-_Managing_Effects_of_Climate_Change-WFFTurner.pdf>

2) *Langley Research Center* hosted an "Adapting Now to a Changing Climate" workshop aimed at Langley planners, safety and security personnel and utility companies. Similar workshops are planned at every NASA center as part of an agency-wide climate risk management initiative.

<http://www.nasa.gov/centers/langley/news/researchernews/rn_climateworkshop.html>

NOAA Coastal Services Center provides many resources to guide climate adaptation and action plans. <<http://collaborate.csc.noaa.gov/climateadaptation/default.aspx>>

1) *Sea Level Rise and Coastal Flooding Impacts Viewer*

<<http://www.csc.noaa.gov/slr/viewer/>>

The U.S. Department of Transportation

1) U.S. Global Change Research Program issued a report on Regional Climate Impacts on the Southeast which estimates that more than 170 miles of major roads and railway and 35 percent of total port land area in Virginia would be at risk to inundation and storm surge after a nearly 2-foot rise in sea level.

<<http://globalchange.gov/images/cir/pdf/southeast.pdf>>

The Center for Climate Change and Environmental Forecasting analyzed the impacts of sea level rise on transportation infrastructure in Virginia.

<<http://www.worldcat.org/title/potential-impacts-of-global-sea-level-rise-on-transportation-infrastructure-phase-1-final-report-the-district-of-columbia-maryland-north-carolina-and-virginia/oclc/221685464>>

The U.S. Fish & Wildlife Service is supporting Sea Level Affecting Marshes Model (SLAMM), a web browser-based application that provides tools for improved understanding of sea level rise. <<http://www.slamview.org/>>

U.S. MILITARY

Langley Air Force Base has started a multi-year effort to look at the impacts of sea level rise on that facility (being conducted by Battelle Northwest Laboratory). This follows an earlier assessment of its climate impact vulnerability.

<<http://www.ornl.gov/sci/knownledgediscovery/Langley/>>

The U.S. Army Corps of Engineers has a number of flood risk management projects currently underway in Virginia, including the following.

Baltimore District

- a) Four Mile Run flood risk management and aquatic ecosystem restoration -- Currently in feasibility study
<<http://www.nab.usace.army.mil/Media/FactSheets/FactSheetArticleView/tabid/10470/Article/8310/four-mile-run-va.aspx>>
- b) Stafford County stormwater infrastructure, watershed management and stormwater modeling.
<<http://www.nab.usace.army.mil/Media/FactSheets/FactSheetArticleView/tabid/10470/Article/9377/planning-assistance-to-states-program.aspx>>

Norfolk District

- c) The Virginia Beach Erosion Control and Hurricane Protection Project were completed in March 2013, adding 1.25 million cubic yards of sand from 15th to 70th Streets. The beach, which was 150 to 280 feet wide, was extended to as much as 300 feet. Additionally, the beach berm was renourished, providing a minimum elevation of 8.5 feet and a minimum crest width of 100 feet.
- d) City of Virginia Beach - Renourishment along Sandbridge Beach Erosion Control and Hurricane Protection project was completed in April 2013, adding 2 million cubic yards of sand along the five-mile public beachfront, from Back Bay National Wildlife Refuge to the Dam Neck Naval Facility in south Virginia Beach, Va. The original contract sand quantities of 2 million cubic yards were funded by the city of Virginia Beach; using 100 percent non-federal contributed funds. An additional 134,850 cubic yards of sand was funded by Sandy FCCE, Flood Control and Coastal Emergency funds.
- e) The City of Norfolk - Willoughby Spit and Vicinity, Norfolk Hurricane Protection and Beach Erosion Control and Hague Watershed, Norfolk, Virginia, Section 205, Flood Risk Management Project.
- f) The City of Hampton - Newmarket Creek Watershed, Hampton, Virginia, CAP, Section 205, Flood Control. The Corps, under this authority, can investigate and construct local flood control projects through construction or improvement of flood control works. Typical flood control projects include levees, floodwalls, channel modifications, pumping stations, or some non-structural measures. The maximum federal limit is \$7 million per project. Additionally, through Flood Plain Management Services, a study is being completed on the vulnerability of Sanitary Sewer Pump Stations to flooding and sea level rise.
- g) The Fort Monroe Authority - Fort Monroe CAP, Section 103, Beach Erosion and Hurricane and Storm Damage Reduction Project. This authority allows the Corps to assist in protection of public infrastructure on small beaches against erosion caused by natural storm driven waves and currents. Typical projects include protecting utilities, roadways, and other public infrastructure systems. The maximum federal limit is \$3 million per project.
- h) The Commonwealth of Virginia - Tangier Island CAP, Section 107, Navigation Improvements. This authority allows the Corps to plan, design, and construct small

- projects for commercial navigation purposes such as channels, breakwaters, and jetties to ensure safe and efficient use of the Nation’s navigable waterways.
- i) The North Atlantic Coast Comprehensive Study, included a Virginia Appendix and the City of Norfolk as one of nine focus areas, will be published early 2015. The report is a collective effort of multiple disciplines and stakeholders and includes work from each of the districts within the North Atlantic Division, including Norfolk.
 - j) City of Franklin - The Norfolk District is developing a Project Management Plan and Feasibility Cost Sharing Agreement to initiate a feasibility study for the city of Franklin regarding flood risk management.
 - k) The City of Portsmouth - FPMS project to update the city’s Floodplain Management and Recurrent Flooding Plan including sea level rise analysis.
 - l) Norfolk District is partnering with IWR to engage and focus on the Commonwealth’s vulnerability and develop a USACE strategy.

Engineer Research and Development Center, Environmental Laboratory

- m) Strategic Environmental Research and Development Program (SERDP) RC-170 study is being developed as a tool to assess the vulnerabilities and mission impacts to military installations during severe weather events at given levels of sea level rise. SERDP’s Resource Conservation and Climate Change program supports the development of the science, technologies, and methods needed to manage the Department of Defense installation infrastructure in a sustainable way. One area of investment is aimed at developing the models and tools necessary to understand infrastructure vulnerabilities to the impacts from climate change but the awarded grants appear to be outside Virginia.
<<http://www.serdp.org/Program-Areas/Resource-Conservation-and-Climate-Change>>

South Atlantic Division

- n) The Army Corps oversees the Southeast Regional Partnership for Planning and Sustainability (SERPPAS) but the pilot projects fall outside of Virginia.
<<http://www.serdp.org/Featured-Initiatives/Climate-Change-and-Impacts-of-Sea-Level-Rise>>

Institute of Water Resources

- o) Comprehensive Evaluation of Projects with Respect to Sea-Level Change for the Army Corps Civil Works Programs. This online Sea Level Change Calculator produces the amount of predicted sea level change from 1992 forward.
<<http://corpsclimate.us/ccaceslcurves.cfm>>

The U.S. Navy's Task Force Climate Change *Climate Change Roadmap* lays out the Navy’s approach to adapting to climate change impacts, noting the security challenges and strategy implications of sea level rise and other impacts. The Navy has incorporated sea level rise into its Master Plan, Region Shore Infrastructure Plans, and Global Shore Infrastructure Plan. Measures being evaluated include building new unloading decks with utility lines and shutoff valves safely above potential water levels, adapting existing infrastructure with flood walls around dry docks and installing tide gates, raising pier elevations, and siting facilities outside of impact areas. The

Navy is engaging in shoreline protection projects, including adapting low impact development to reduce runoff. It has expanded its damage assessment teams and emergency operations center and is working with the local community on areas of mutual concern.

<<http://www.navy.mil/navydata/documents/CCR.pdf>>

- 1) The Department of Defense is conducting reviews of shoreline military facilities and climate change impacts. Naval Station Norfolk has a \$1.7 million/3-year study to look at sea level rise impacts on base operations – done by the US Army Corps of Engineers of the Vicksburg, MS, laboratory – has been completed and is due out in Feb 2013.

VIRGINIA GREENHOUSE GAS EMISSIONS

[1990 – 2030]

A: SUMMARY

Annual update to the greenhouse gases (GHG) emissions inventory for Virginia is carried out. The inventory provides an estimate of actual emissions during 1990 – 2012 and emissions likely to occur subsequently till 2030. The estimates conform to the basic structure of state inventory tool (SIT) provided by the Environmental Protection Agency (EPA) including updates made in 2014 with modifications where necessary on input data guided by the source authenticity & reliability. While updated SIT 2014 relies on the growth rates derived from Annual Energy Outlook for 2013 (AEO 2013) of Energy Information Agency (EIA) of the Department of Energy (DOE), growth rates derived from AEO 2014 are used.

Figure 1 summarizes the trend in estimated and projected GHG emissions anthropogenic and biogenic sources as reported in SIT (2014) and the current updates. Results indicate that anthropogenic emissions tend to lie around 150 MMT CO₂E by 2030.

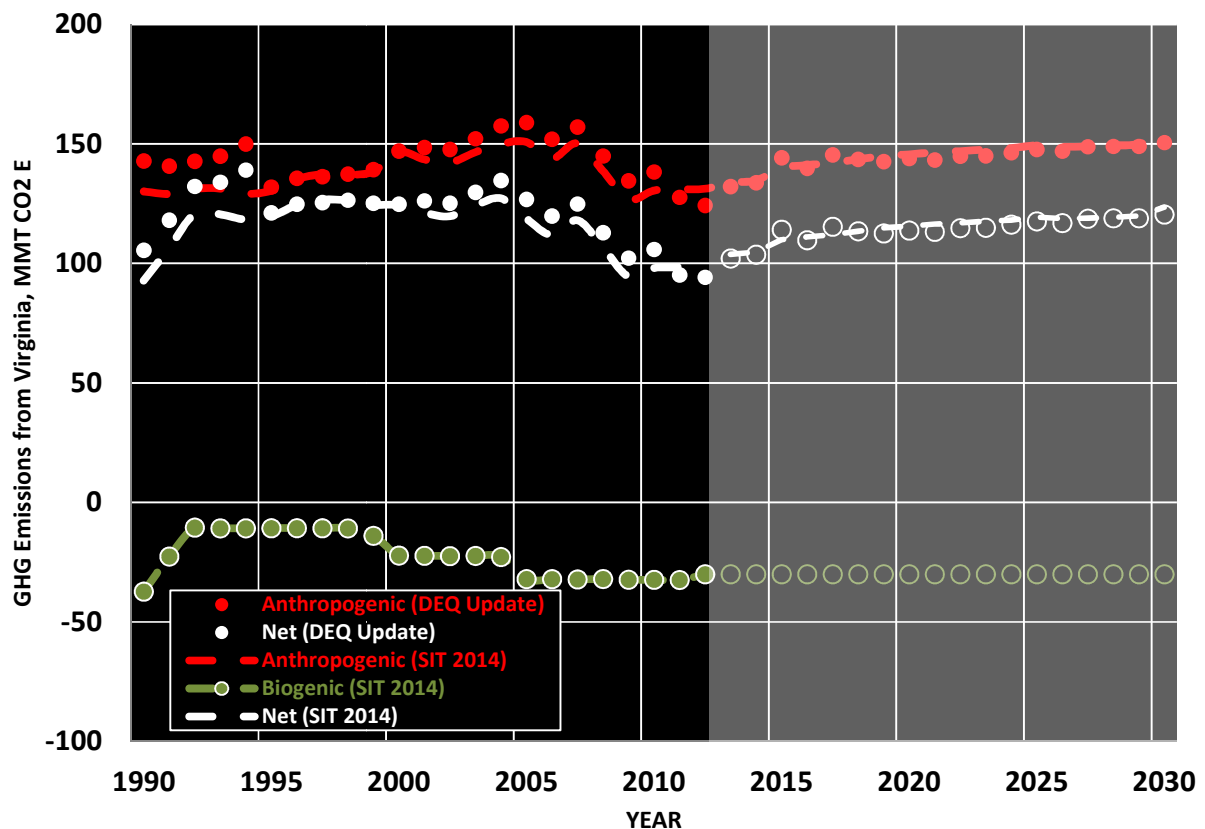


Figure 1: Greenhouse Gases (GHG) Emissions from Virginia

Emissions projected beyond 2012 assumes that the net carbon sequestration level continues to be at the current level.

Table 1 below gives a breakup of all anthropogenic emissions according to their source and Table 2 gives a breakup of individual gasses. Figure 2 shows the GHG makeup according to the sources.

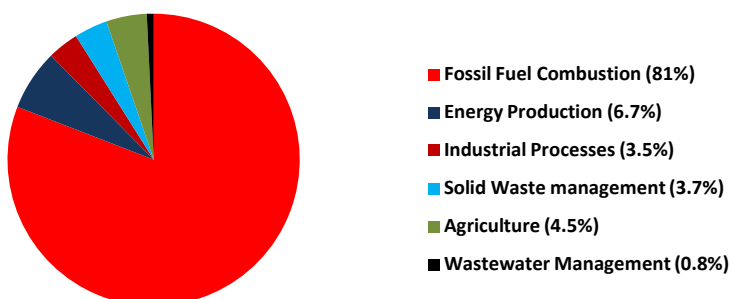
Table 1: Source Contribution of Anthropogenic Emissions

Emission Source	1990	1995	2000	2005	2010	2015	2020	2025	2030
	Million Metric Tons of CO2 Equivalent (MMTCO2E)								
A: Fossil Fuel Combustion	95.733	103.581	122.061	133.579	113.320	118.190	116.881	120.025	121.991
B: Energy Production	19.240	10.121	7.049	6.034	7.278	10.052	10.176	10.402	10.832
C: Industrial Processes	15.610	4.530	5.683	5.953	5.446	4.055	4.805	5.664	6.311
D: Solid Waste management	5.560	6.846	5.393	6.376	5.584	5.121	5.260	5.337	5.366
E: Agriculture	5.987	6.126	6.033	6.101	5.734	5.681	5.590	5.049	4.791
F: Wastewater Management	0.686	0.739	0.796	0.858	0.877	1.064	1.121	1.177	1.233
Total from all Sources	142.816	131.943	147.015	158.902	138.238	144.162	143.832	147.655	150.525

Table 2: Emission Makeup of Individual Gasses – Actual Tonnage

Sector	1990	1995	2000	2005	2010	2015	2020	2025	2030
	1,000 Short Tons								
Carbon Dioxide	102,848	110,891	131,299	144,608	123,317	128,698	127,261	130,744	132,938
Methane	1,462	1,039	772	781	788	791	812	814	836
Nitrous Oxide	65	27	22	20	16	14	13	13	12
F Chemicals	0.080	0.152	0.257	0.315	0.352	0.161	0.210	0.271	0.307
All Gases	104,375	111,957	132,094	145,409	124,122	129,503	128,087	131,571	133,786

Figure 2: Source Distribution of Emissions in 2012



Electricity: Consumption or demand for power in Virginia in recent years far exceeds the actual generation within the state and therefore to meet the additional needs, electricity is imported from neighboring states. Such imports being substantial in recent years, a situation likely to continue for many years in future, an estimate is made of GHG emissions attributable to such imports based on computed CO2 emission rates (lbs CO2/KWh) for the respective years. Figure 3 shows the emissions due to state generation and that attributable to imports along with the values of generation & emissions in Table 3.

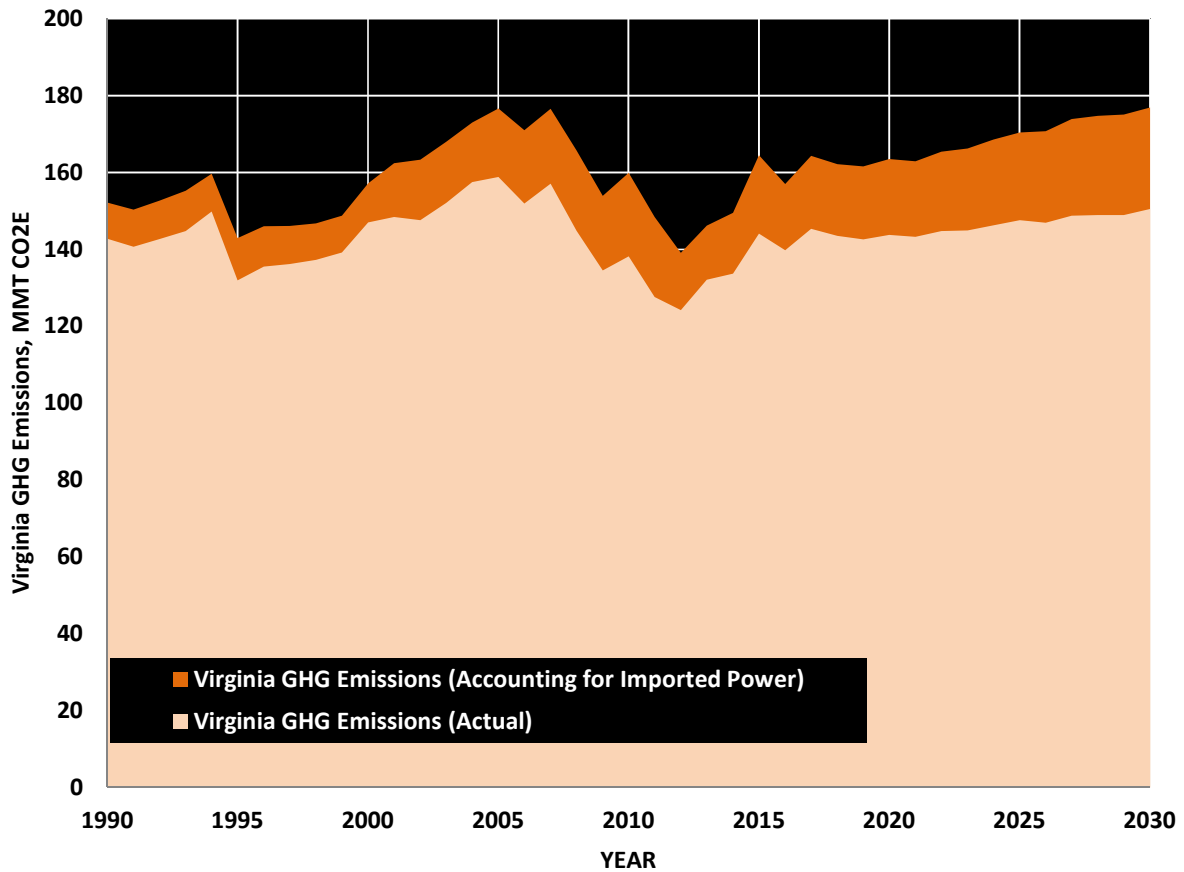


Figure 3: Implications of Imported Power on GHG Emissions

Table 3: Virginia GHG Emissions Accounting for Imported Power

	1990	1995	2000	2005	2010	2015	2020	2025	2030
Generation, Million KWh	51,731	62,573	77,992	78,943	72,966	76,130	80,889	84,325	86,737
GHG Emissions, MMT CO2E	142.816	131.943	147.015	158.902	138.238	144.162	143.832	147.655	150.525
Additional Power, Million KWh	20,965	22,589	18,723	29,907	40,840	34,972	36,125	38,553	42,187
Emissions due to imports, MMT CO2E	9.394	11.009	10.190	17.828	21.695	20.336	19.685	22.816	26.395

B: FOSSIL FUEL COMBUSTION

Combustion of fuels, mostly fossil (FFC) used in transportation (53%), power generation (26%), industrial (11%), residential (6%) and commercial (5%) sectors contributed around 80 percent of all GHG emissions in 2012. Table 4 below shows the emission distribution among consuming sectors and according to energy source. Petroleum fuels in 2012 contribute 57% of emissions with 90% accounted by transportation sector. 25% emissions result due to power generation, accounting for most of 18% of emissions resulting from coal with the balance resulting from natural gas.

Table 4: Emission Share of User Sectors and among Energy Source

Emission Source	1990	1995	2000	2005	2010	2015	2020	2025	2030
	Million Metric Tons of CO2 Equivalent (MMTCO2E)								
By Sector									
Commercial	4.509	5.394	5.983	5.726	5.077	5.005	5.080	5.022	4.973
Residential	6.576	7.285	8.333	8.556	7.263	5.964	5.770	5.519	5.261
Industrial	18.017	15.422	14.337	14.920	10.910	11.212	12.064	12.580	12.858
Power	23.179	30.496	42.450	47.060	38.761	44.270	44.077	49.904	54.269
Transportation	43.454	44.984	50.958	57.319	51.308	51.739	49.890	47.000	44.630
All	95.733	103.581	122.061	133.579	113.320	118.190	116.881	120.025	121.991
By Fuel									
Renewable	0.256	0.318	0.308	0.464	0.361	0.467	0.508	0.529	0.538
Coal	31.368	33.993	44.735	44.258	33.974	27.902	23.677	24.707	24.791
Natural gas	10.235	15.137	14.815	17.928	20.750	33.267	37.980	43.103	47.423
Petroleum	53.874	54.133	62.203	70.929	58.235	56.553	54.716	51.686	49.239
All	95.733	103.581	122.061	133.579	113.320	118.190	116.881	120.025	121.991

During 2012, 51% of FFC emissions came from transportation sector accounting 91% of all emissions due to use of petroleum fuels. Power generation accounted for 28% of all emissions with 17% from coal & 11% from natural gas. 73% of emissions attributable to coal were due to power generation with 20% for its industrial usage.

Future trends indicate emissions due to coal would reduce substantially and that due to petroleum usage decrease marginally while the share of natural gas would increase.

Net GHG emissions from all sectors have been the lowest in 2012 compared to previous years. Projected estimate indicate that the emissions would gradually increase in future and reach to a level that existed prior to 2002. Figure 4 in the next page indicates the emission trends from usage of petroleum, natural gas & coal by different sectors.

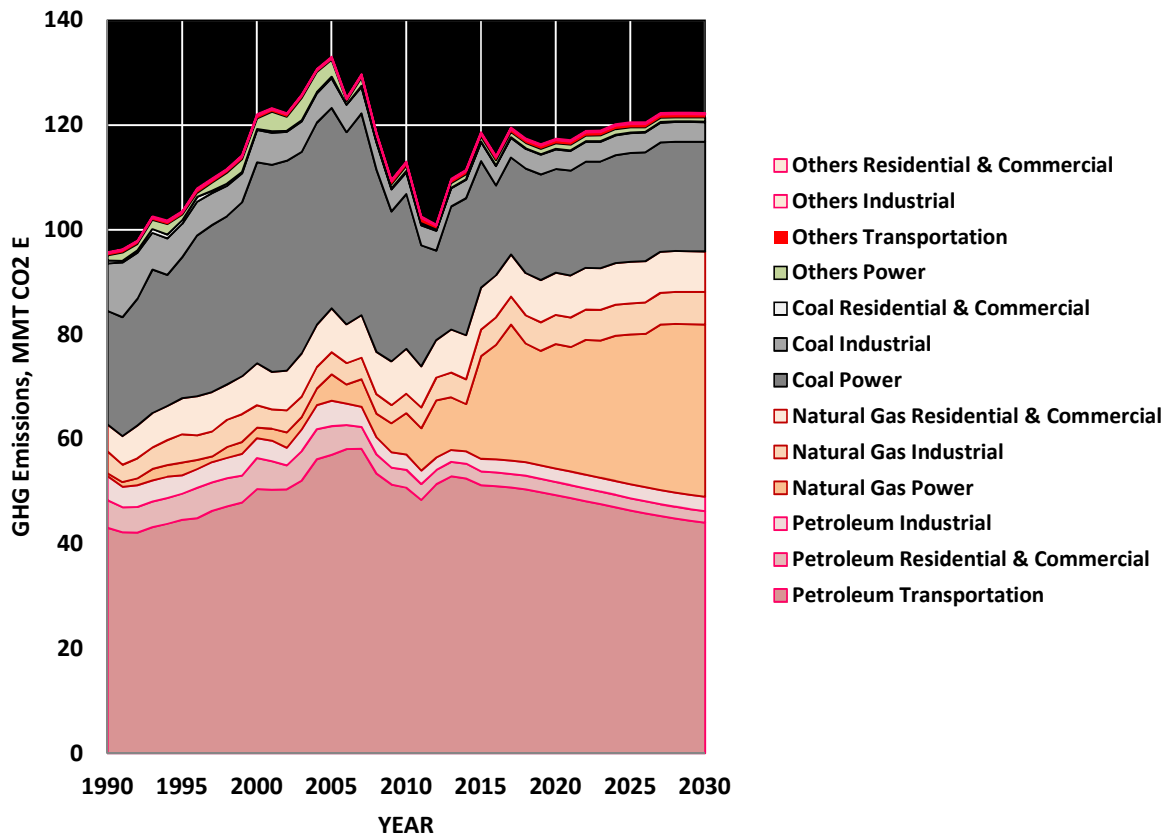


Figure 4: Greenhouse Gases (GHG) Emissions from Fossil Fuel Combustion

C: ENERGY PRODUCTION

Coal mining and natural gas recovery and to a small extent oil production contribute to GHG emissions. Taken together with emissions from FFC, they shared 88% of the total GHG emissions in 2012. Figure 5 shows the emission distribution due to production & petroleum products, natural gas and coal in the past and likely in the future.

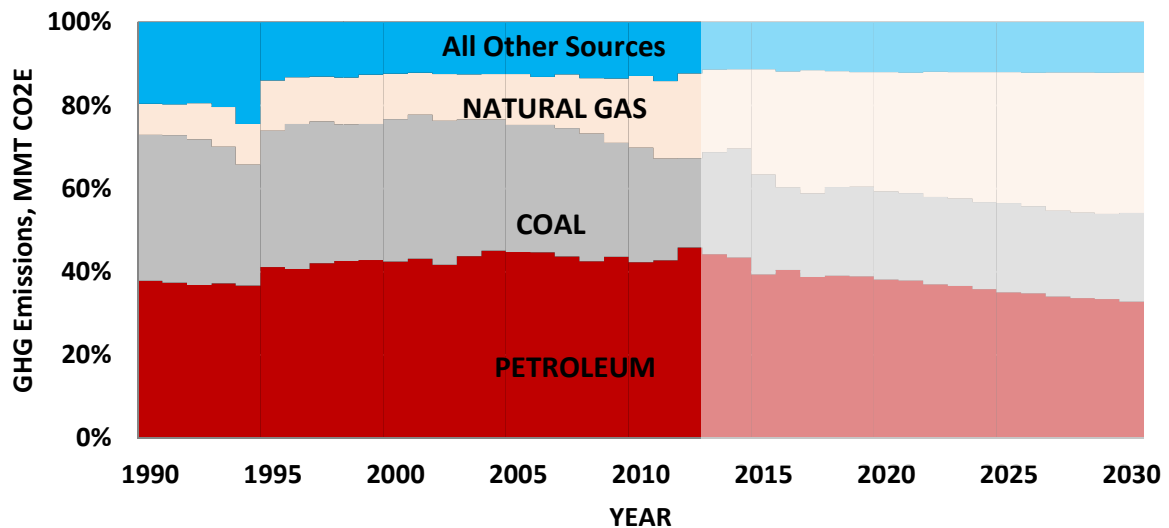


Figure 5: Changing Trend in the Fossil Fuel Share of GHG Emissions

Marginal reduction in emissions from petroleum fuels, significant reduction due to coal compensated by increased use of natural gas with time is seen. Table 5 gives the share of fossil fuels due both for their production & usage.

Table 5: GHG Contribution from Fossil Fuels

	1990	1995	2000	2005	2010	2015	2020	2025	2030
A: Production	GHG Emissions, MMT CO2E								
Coal	18.744	9.275	5.709	4.274	4.228	6.721	6.708	6.907	7.396
Natural Gas	0.408	0.780	1.282	1.704	2.973	3.244	3.387	3.430	3.384
Petroleum	0.088	0.066	0.058	0.056	0.077	0.086	0.081	0.066	0.053
B: Usage									
Coal	31.368	33.993	44.735	44.258	33.974	27.902	23.677	24.707	24.791
Petroleum	53.874	54.133	62.203	70.929	58.235	56.553	54.716	51.686	49.239
Natural gas	10.235	15.137	14.815	17.928	20.750	33.267	37.980	43.103	47.423
C: Total									
Petroleum	53.962	54.198	62.261	70.985	58.311	56.639	54.797	51.752	49.291
Coal	50.113	43.269	50.444	48.532	38.202	34.624	30.385	31.613	32.187
Natural Gas	10.642	15.917	16.098	19.631	23.723	36.511	41.367	46.534	50.807
Total	114.717	113.383	128.802	139.149	120.236	127.774	126.548	129.899	132.285

D: INDUSTRIAL PROCESSES

Emissions, mostly CO₂ from certain industrial processes, besides small quantities of fluorine chemicals constitute third group of GHG contributors in order of magnitude. CO₂ is emitted during the production of cement, lime, ammonia & urea, iron & steel, use of limestone as flux and to remove sulfur in power plants. Fluorine chemicals are produced during production of ozone depleting substances and semi-conductors as well as from transformers used in power transmission & distribution. GHG makeup due to the sources is shown in the Figure 6 with values given in Table 6.

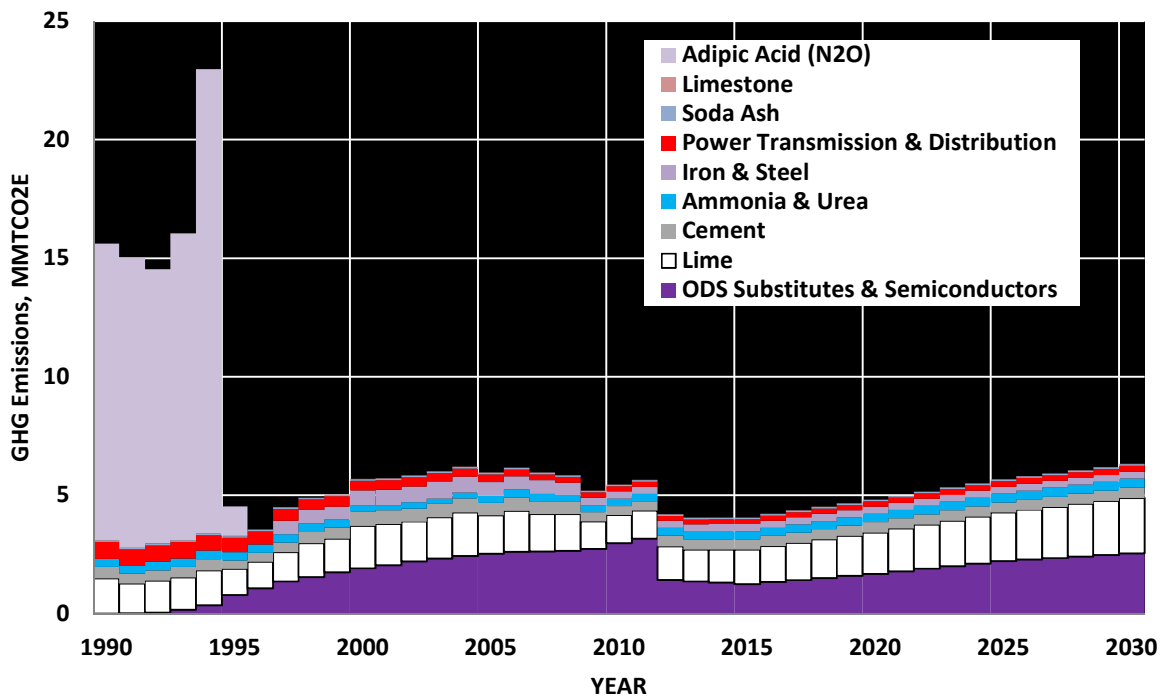


Figure 6: Greenhouse Gases Emission from Industrial Processes

Table 6: Industry Contribution of Greenhouse Gases

Sector	1990	1995	2000	2005	2010	2015	2020	2025	2030
	GHG Emissions, MMT CO ₂ E								
ODS Substitutes & Semiconductors	0.011	0.778	1.919	2.527	2.973	1.248	1.678	2.220	2.540
Lime	1.482	1.102	1.785	1.620	1.183	1.454	1.748	2.040	2.341
Cement	0.487	0.362	0.586	0.532	0.388	0.437	0.435	0.433	0.430
Ammonia & Urea	0.329	0.354	0.294	0.316	0.316	0.334	0.352	0.370	0.388
Iron & Steel	0.000	0.000	0.612	0.560	0.306	0.304	0.299	0.294	0.290
Power Transmission & Distribution	0.715	0.606	0.416	0.327	0.217	0.212	0.223	0.234	0.246
Soda Ash	0.067	0.068	0.067	0.066	0.057	0.060	0.063	0.066	0.070
Limestone	0.005	0.006	0.005	0.005	0.007	0.007	0.007	0.007	0.007
Adipic Acid (N ₂ O)	12.514	1.255							

E: SOLID WASTES MANAGEMENT

Land filled Solid wastes, mostly municipal and some industrial, generate CH₄ over a long period of time. Some of it is collected for use as an energy source, some flared at site and remainder escape to atmosphere. Also, some portion of solid wastes is incinerated. CO₂ generated from plastics and synthetic fiber portion of the incinerated wastes and all CH₄ and N₂O emissions are accounted In GHG computation.

Data used in SIT is substantially modified and normalized based on DEQ solid waste data in recent years being more authentic. CH₄ used as energy source or flared is considered as methane avoided in GHG computation. Figure 7 & Table 7 summarizes the effect of solid waste management on GHG emissions.

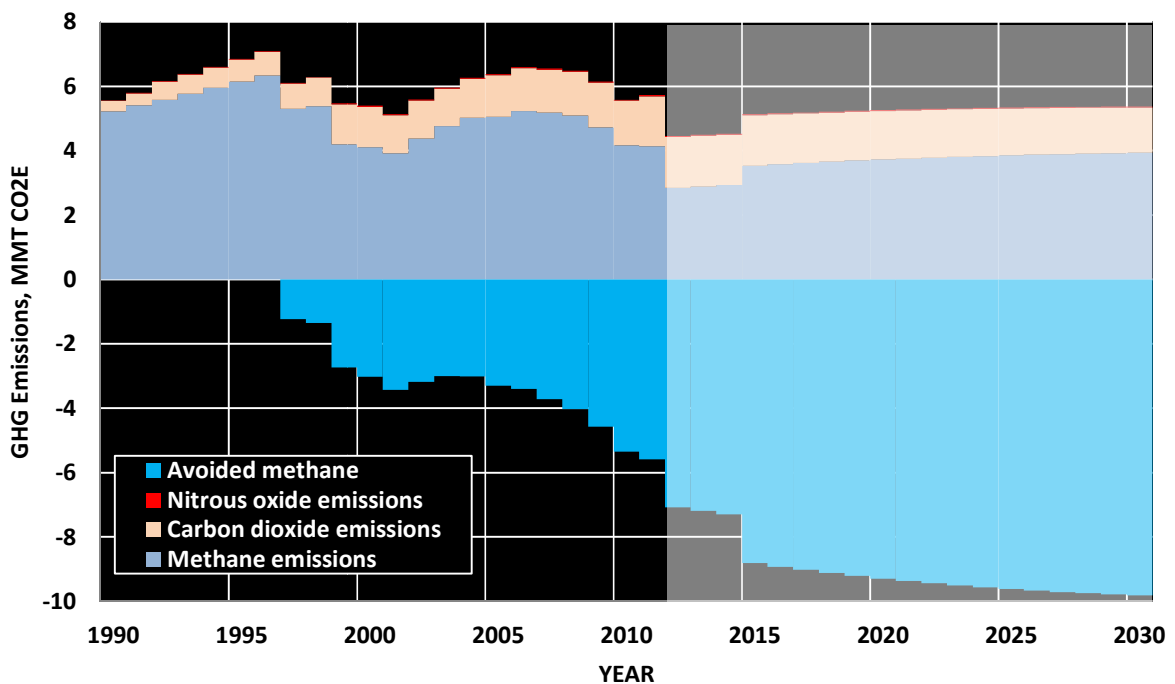


Figure 7: Greenhouse Gas Emissions from Solid Waste Management

Table 7: GHG Emissions from Solid Waste Management

GHG Gases	1990	1995	2000	2005	2010	2015	2020	2025	2030
	Emissions, MMT CO2E								
Methane	5.218	6.142	4.105	5.046	4.167	3.530	3.723	3.853	3.931
Carbon dioxide	0.330	0.682	1.253	1.300	1.389	1.562	1.509	1.458	1.408
Nitrous oxide	0.013	0.022	0.035	0.030	0.029	0.029	0.028	0.027	0.026
Methane Avoided	0.000	0.000	-3.019	-3.300	-5.341	-8.811	-9.292	-9.616	-9.813
Net Emissions	5.560	6.846	5.393	6.376	5.584	5.121	5.260	5.337	5.366

F: AGRICULTURE SECTOR

Livestock rearing and crop harvest activities in agriculture sector contribute some GHG emissions. Emissions from different elements of such activities are given in Table 8 and major contributors are highlighted in Figure 8.

Table 8: GHG Emissions from Agriculture Sector

	1990	1995	2000	2005	2010	2015	2020	2025	2030
	GHG Emissions, MMT CO2E								
Live Stock									
Enteric Fermentation	2.362	2.440	2.297	2.428	2.324	2.730	2.823	2.474	2.402
Manure Management	0.609	0.671	0.680	0.682	0.602	0.765	0.789	0.805	0.826
Crop Harvest									
Plant Residue	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fertilizers	3.010	3.010	3.049	2.986	2.804	2.181	1.973	1.766	1.558
Soils - Livestock	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Residue Burning	0.006	0.005	0.007	0.006	0.004	0.004	0.004	0.005	0.005
All Agriculture	5.987	6.126	6.033	6.101	5.734	5.681	5.590	5.049	4.791

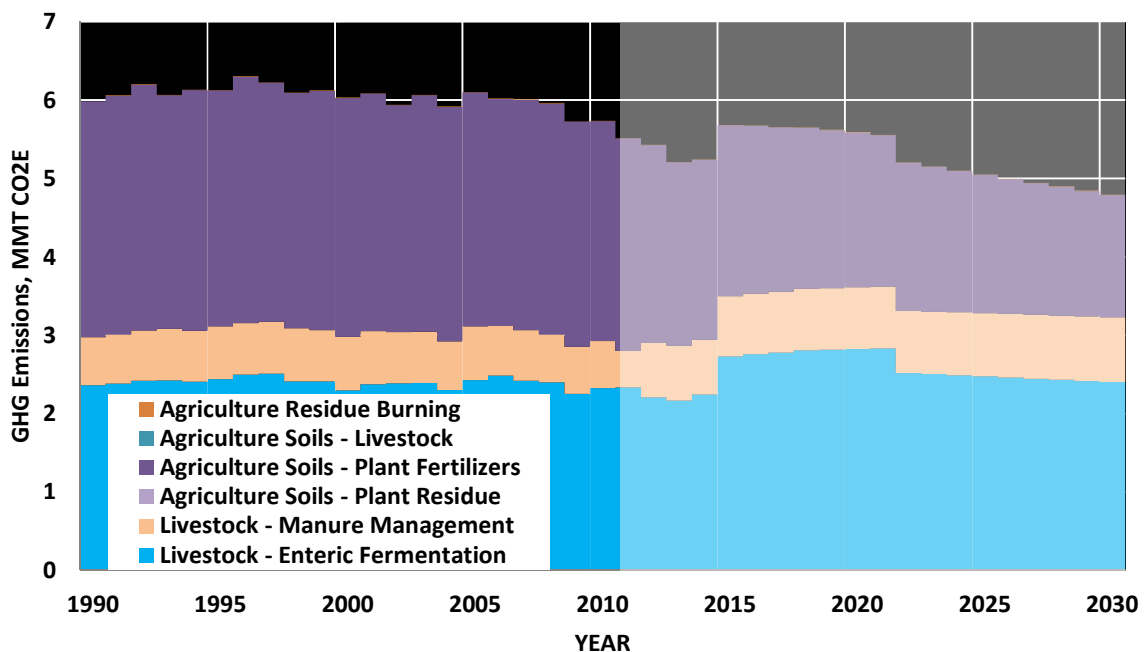


Figure 8: GHG Emissions from Different Agricultural Activities

Enteric fermentation & manure management from live stock rearing along with fertilizers used for crop harvest are major contributors of GHG. Table 9 gives the makeup of emissions by individual gasses.

Table 9: Makeup of Greenhouse Gasses from Agricultural Sources

	Nitrous Oxide, short tons								
Manure Management	1,131	1,377	1,309	1,174	1,061	1,287	1,332	1,372	1,415
Fertilizers	10,703	10,703	10,841	10,616	9,969	8,012	7,250	6,488	5,726
Residue Burning	9	7	10	8	6	4	4	5	5
Total Nitrous Oxide	11,842	12,087	12,160	11,798	11,035	9,304	8,586	7,864	7,146
	Methane, short tons								
Enteric Fermentation	123,969	128,084	120,586	127,448	122,008	120,385	124,474	109,076	105,905
Manure Management	15,300	14,885	16,361	18,452	15,924	18,289	18,827	19,025	19,462
Residue Burning	188	169	217	178	124	144	145	146	147
Total Methane	139,457	143,137	137,163	146,078	138,055	138,819	143,446	128,247	125,514

G: WASTEWATER TREATMENT

Processing of wastewater, mostly municipal and to some extent food processing & paper industries, before discharge or recycle, generate some methane & nitrous oxide. Estimated emissions from such sources are indicated below in Table 10 and Figure 9.

Table 10: GHG Emission Details from Wastewater Treatment

	1990	1995	2000	2005	2010	2015	2020	2025	2030
Emissions, Short tons									
Municipal CH4	21,937	23,306	25,082	26,643	28,332	29,829	31,447	33,064	34,682
Industrial CH4	5,140	5,757	5,825	6,767	5,038	6,141	6,258	6,375	6,493
Municipal N2O	605	660	735	789	857	913	976	1,038	1,100
Emissions, MMT CO2E									
All	0.686	0.739	0.796	0.858	0.877	0.942	0.993	1.043	1.094

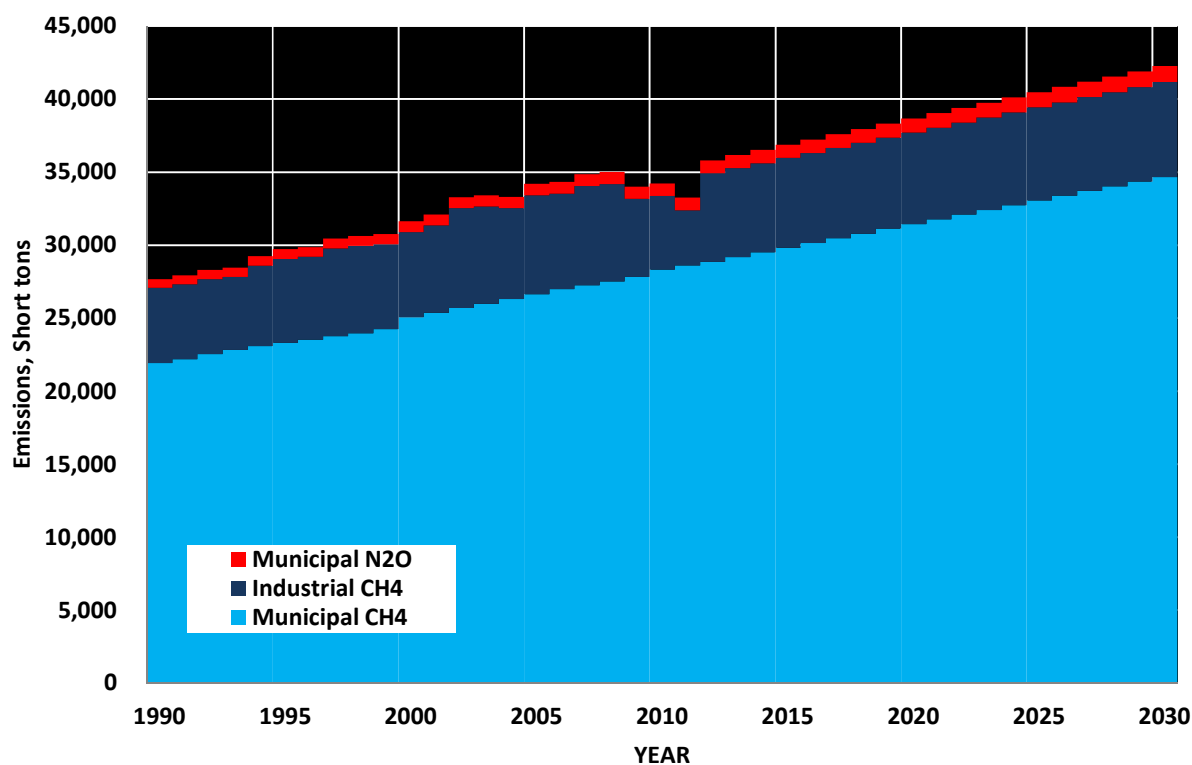


Figure 9: Methane & Nitrous Oxide Emissions from Wastewater Treatment

SUMMARY ANALYSIS ON DILLON RULE AND LOCAL GOVERNMENT CLIMATE CHANGE ACTIONS

Virginia is a Dillon Rule state. Because of this, local governments can only take action pursuant to grants of authority from the Virginia General Assembly. With local governments now considering how they will address sea level rise, recurrent flooding, and other impacts associated with climate change, the Dillon Rule poses an important question:

Do local governments currently have the authority to address climate change?

This question was the subject of several recent white papers focusing on Virginia¹ as a whole and Poquoson² and Norfolk,³ specifically. All of these papers concluded that localities in Virginia currently have authority sufficient to start addressing climate change without fear of challenges under the Dillon Rule. However, recent Dillon Rule rulings by the Virginia Supreme Court⁴ challenge this conclusion.

In finding that local climate change adaptation actions should withstand a Dillon Rule challenge, the white papers focus on several expressly granted powers. First, Section 15.2-970 of the Virginia Code grants local governments the power to build works such as dams, levees, and berms. Second, zoning and condemnation powers authorize a wide range of actions for local governments, including the creation of overlay districts. Third, local governments are given further powers to address flood control.

However, local governments are likely to need tools beyond those currently in place to successfully address climate change. The Georgetown paper acknowledges this potential need by exploring whether rolling easements, “easements that have a boundary line that ‘rolls’ with the tides,” would be allowed under the Dillon Rule.⁵ The paper concludes that the argument could be made rolling easements are just a variant of already authorized open space easements and so should be allowed.⁶ This conclusion may be overly optimistic.

¹ Andrew Sifton & Jessica Grannis, GEORGETOWN CLIMATE CENTER, VIRGINIA CASE STUDY – STEMMING THE TIDE: HOW LOCAL GOVERNMENTS CAN MANAGE RISING FLOOD RISKS (May 2010, rev. Jan 2013).

² Lauren Gill, VIRGINIA COASTAL POLICY CLINIC, THE DILLON RULE AND SEA LEVEL RISE: AN ANALYSIS OF THE IMPACT OF THE DILLON RULE ON POTENTIAL ADAPTATION MEASURES THE CITY OF POQUOSON MAY IMPLEMENT (2013).

³ Mary-Carson B. Saunders, VIRGINIA COASTAL POLICY CLINIC, THE DILLON RULE & NORFOLK SEA LEVEL RISE: AN ANALYSIS OF THE LIMITED IMPACTS OF THE DILLON RULE ON PLANNING FOR SEA LEVEL RISE IN NORFOLK (2013).

⁴ See *Marble Techs., Inc. v. City of Hampton*, 279 Va. 409 (2010).

⁵ Andrew Sifton, *supra* note 1 at 9-11.

⁶ *Id.* at 10-11.

At a 2013 conference, Professor Ronald Rosenberg of William & Mary School of Law cautioned that recent Dillon Rule cases, such as *Marble Technologies*, should be viewed as potential cautionary tales.⁷ In *Marble Technologies*, the Virginia Supreme Court held that the City of Hampton lacked the express or implied authority to consider expanding the Resource Protection Area beyond the express provisions of the Chesapeake Bay Preservation Act.⁸ In coming to this conclusion, the Court used very strong language, stating that “[i]f there is a reasonable doubt whether legislative power exists, the doubt must be resolved against the local governing body.”⁹

This recent holding by the Court leaves little room a ‘the argument could be made’ rationale. Individuals engaged in finding ways to address climate change may well need to refrain from reading authorizations of power into statutes where that authorization may be a bit tenuous. Further, rules governing statutory bodies such as boards of zoning appeals and architectural boards apply even more stringent standards; they can only exercise powers that are expressly conferred.¹⁰

While it appears that there are some specific authorizations upon which local governments can rely in confronting the impacts of climate change without Dillon Rule complications, the need by local governments for new tools are likely to raise more Dillon Rule questions. Further legal analysis under the exacting standard of *Marble Technologies* will be required and greater clarity from the Virginia General Assembly on the authority of local governments to confront climate change may well serve to enable local governments to better protect the general health, safety and welfare of their citizens. If the Assembly decides to provide greater clarity, localities may benefit from guidance and legislation that is both specific, listing suggested and approved tools, and broad, allowing for necessary tools that emerge with time.

⁷ Ron Rosenberg, “The Potential Impact of Dillon’s Rule Doctrine on Local Government Responses to Coastal Flooding and other Aspects of Sea Level Rise.” Talk at Conference on Adaptive Planning for Flooding and Coastal Change in Virginia: Legal and Policy Issues for Local Government. Williamsburg (Sept. 13, 2013).

⁸ *Marble Techs.*, 279 Va. at 420-21.

⁹ *Id.* at 47 (quoting *Board of Supervisors v. Reed's Landing Corp.*, 250 Va. 397, 400 (1995)).

¹⁰ ALBERMARLE COUNTY, *The Dillon Rule and Its Limitations on a Locality's Land Use Powers*, in LAND USE LAW HANDBOOK (2014), available at http://www.albemarle.org/upload/images/Forms_Center/Departments/County_Attorney/Forms/LUchapter05-dillonrule.pdf.

Governance Case Studies

Many states have climate adaptation advisory panels consisting of prominent business, labor, government, and private sector leaders but the following states models identify a coordinating body.

California

California Climate Adaptation Strategy (2009) is led by the Climate Action Team (CAT). The CAT members are state agency secretaries and the heads of agency, boards and departments, led by the Secretary of California EPA

<<http://www.climatechange.ca.gov/adaptation/strategy/index.html>>

Louisiana

Louisiana's 2012 Coastal Master Plan is led by the Coastal Protection and Restoration Authority, specifically the Chairman Jerome Zeringue.

<http://issuu.com/coastalmasterplan/docs/coastal_master_plan-v2?e=3722998/2447530>

Massachusetts

Massachusetts Climate Change Adaptation Report is led by the Massachusetts Climate Change Adaptation Advisory Committee and the Massachusetts Executive Office of Energy and Environmental Affairs < <http://www.mass.gov/eea/waste-mgmt-recycling/air-quality/green-house-gas-and-climate-change/climate-change-adaptation/climate-change-adaptation-report.html>>

Maryland

Maryland Climate Change Commission (MCCC) was charged with collectively developing an action plan to address the causes of climate change, prepare for the likely consequences and impacts of climate change to Maryland, and establish firm benchmarks and timetables for implementing the Commission's recommendations. The Commission included members representing academia, business, industry, environmental groups and many levels of government. It was staffed jointly by the Maryland Department of the Environment and Department of Natural Resources in coordination with other state agencies. Comprehensive Strategy for Reducing Maryland's Vulnerability to Climate Change Phase I and II can be accessed < <http://www.mde.state.md.us/assets/document/Air/ClimateChange/Chapter5.pdf>> and <http://www.dnr.state.md.us/climatechange/climatechange_phase2_adaptation_strategy.pdf>

North Carolina

N.C. Interagency Leadership Team includes a group of 11 state and federal agencies. They developed this coordinated climate adaptation strategy

<http://climateadaptationnc.nemac.org/Climate_Ready_North_Carolina_Building_a_Resilient_Future.pdf>

New Jersey

The New Jersey Climate Adaptation Alliance is a network of partner organizations dedicated to the mission of enhancing New Jersey's capacity to plan for and respond to a changing climate. The Alliance's efforts are guided by its Advisory Committee and facilitated by Rutgers University. <http://njadapt.rutgers.edu/component/docman/doc_download/73-njcaa-gap-analysis-final-pdf?Itemid=>

Governor Chris Christie's Executive Order 140 created the Office of Flood Hazard Risk Measures <<http://nj.gov/infobank/circular/eocc140.pdf>>

New York

The New York State 2100 Commission consists of appointed members. The NYS 2100 Commission recommending creating a Chief Risk Officer. The creation of a new Chief Risk Officer or government agent would provide a platform for coordination between different State agencies and neighboring municipalities and creates the basis for an "all hazards" approach to planning, investment, and decision-making to planning, investment, and decision-making. <<http://www.rockefellerfoundation.org/uploads/files/7c012997-176f-4e80-bf9c-b473ae9bbb3.pdf>>

Vermont

In the Vermont Agency of Transportation's VT Climate Action Plan, it suggests Federal and state agencies and universities at the federal and state levels - perhaps through the VT Climate Change Collaborative (partner of University of Vermont)- should work together to institute a process for better communication among transportation professionals, climate scientists, and those in other relevant scientific disciplines, and establish a clearinghouse for relevant climate change information.

Washington

Washington State's Integrated Climate Response Strategy, the Washington Department of Ecology in collaboration with the state departments of Agriculture, Commerce, Fish and Wildlife, Health, Natural Resources, and Transportation recommended developing an

institutional structure to improve coordination and support an integrated approach.

<<https://fortress.wa.gov/ecy/publications/publications/1201004.pdf>>

Other Governing Bodies

- Colorado Governor's Energy Office (GEO), Colorado Water Conservation Board (CWCB), Colorado Department of Agriculture (CDA), Colorado Department of Public Health and Environment (CDPHE), Governor's Office, Colorado Department of Natural Resources (DNR), and Colorado Division of Wildlife (DOW)
- Connecticut Department of Energy and Environmental Protection (CT DEEP), Federal Emergency Management Agency (FEMA) and Connecticut Department of Emergency Management and Homeland Security
- Florida Adaptation Technical Working Group
- Louisiana's Integrated Planning Team (IPT) consists of senior staff from the Dept. of Natural Resources and Dept. of Transportation and Development. The U.S. Army Corps of Engineers, New Orleans District, has also assigned a senior staff person to the team as a liaison.
- Maine Department of Environmental Protection
- Maine Department of Transportation
- Maryland Department of the Environment
- Massachusetts Climate Change Adaptation Advisory Committee and the Massachusetts Executive Office of Energy and Environmental Affairs
- Michigan Department of Community Health
- National Wildlife Federation, Virginia Conservation Network and Virginia Department of Game and Inland Fisheries
- New Hampshire Climate Change Policy Task Force
- New York State Climate Action Council, New York State Department of Environmental Conservation (DEC) and New York State Energy Research and Development Authority
- New York State Department of Transportation
- NOAA Office of Ocean and Coastal Resource Management (OCRM) and Virginia Department of Environmental Quality
- Oregon Department of Transportation and Oregon Climate Change Research Institute
- Oregon Governor's Climate Change Integration Group (CCIG), made up of industry leaders, non-profit organizations, and representatives from state, federal, and local governments
- Pennsylvania Department of Environmental Protection and the Climate Change Advisory Committee (consisting of public and private members)
- South Carolina Department of Health & Environmental Control

- South East Florida Climate Compact formed a Staff Steering Committee with representatives from each of the Compact Counties and the 109 cities of the region, as well as ex-officio advice from regional entities such as the South Florida Water Management District, South Florida Regional Planning Council, and others
- "State Hazard Mitigation Team includes over 80 agencies and organizations, and includes representatives of city and county associations as well as the private sector. Governor's
- Office of Emergency Services and the Office of Homeland Security also play a coordinating role"
- State of Oregon, Oregon Climate Change Research Institute and the Oregon Global Warming Commission
- The Climate Adaptation Advisory Panel consisting of prominent business, labor, government, and private sector leaders
- Vermont Agency of Natural Resources
- Vermont Agency of Transportation
- Washington Department of Ecology in collaboration with the state departments of Agriculture, Commerce, Fish and Wildlife, Health, Natural Resources, and Transportation - integrating the recommendations of the four advisory groups
- Wisconsin Initiative on Climate Change Impacts, Nelson Institute of Environmental Studies and Wisconsin Department of Natural Resources. Wisconsin Initiative on Climate Change Impacts coordinated sector-based working groups

Virginia State – Local Cooperative Programs

Virginia operates several different models for State – local cooperative programs. Common to most of the programs is a State legislative mandate to a State Agency or Authority which is combined with language to either grant authority to localities for the administration of the program or language to mandate locality implementation of the program.

Historic approaches took the form of a model ordinance, in State code, to be adopted by local authorities as is the case with the Tidal Wetlands Act and the Coastal Primary Sand Dunes Act. In this model, each Tidewater locality can, but is not required, to adopt the model ordinance. The State authority was vested in the Virginia Marine Resources Commission who retains oversight authority for the programs. There has been no significant change in this model since the passage of the original legislation, but questions have arisen as to the effectiveness of the program in achieving the intended goals.

http://ccrm.vims.edu/publications/pubs/Permit_Fidelity_2012.pdf

Virginia's cooperative water quality management programs are structured differently. The Chesapeake Bay Preservation Act (CBPA) placed State authority with a newly created agency and board, since evolved to the Department of Conversation and Recreation and most recently to the Department of Environmental Quality. The legislation and regulation are prescriptive, requiring the localities to develop and implement a program in accordance with statutory and regulatory standards, with the State authority establishing a liaison with each locality to assist with the local program implementation. CPBA regulation 9VAC25-830-50 reads, "Local governments shall develop measures (hereinafter called "local programs") necessary to comply with the Act and this chapter." The State retains oversight of the local programs, providing official approval of program consistency with the statutory and regulatory standards. Many of the CBPA provisions have been and are being integrated into the Stormwater Management Program.

The Erosion and Sediment Control Program has gone through many revisions to improve its performance since it was first established in the 1970s as a State-local cooperative program. Currently, the process requires approval by the Department of Environmental Quality of a Virginia Erosion and Sediment Control Program (VЕСP) authority. The authority then administers the Program. Authorities may include localities, state and federal entities, and utility companies. One of the duties of the authority is the review and approval of Erosion and Sediment Control Plans. As of July 2014, these plans must also satisfy requirements consistent with the Virginia Stormwater Management Program Regulations. VЕСPs operated by a county, city, or town have to include provisions for integration with stormwater management, flood plain management and other land-disturbing activities.

VЕСP authorities must report a listing of each land-disturbing activity approved to the DEQ. The DEQ also conducts periodic compliance reviews and evaluations of the VЕСP authorities. There are certification requirements for DEQ reviewers and inspectors, as well as the VЕСP.

Provisions include the option for fines and revocation of non-compliant VESCPs. (§ 62.1-44.15:52 et seq.)

A parallel process is in place for the administration of the cooperative Stormwater Management Act. A locality, state or federal entity or utility may be approved to become a Virginia Stormwater Management Program (VSMP) authority. After June 30, 2013, the State Water Control Board has the power to approve these authorities. The State Water Control Board is also granted authority to review, issue, revoke, modify, enforce state permits, adopt rules for reporting, and levee penalties for violations. (§ 62.1-44.15:24 et seq.)

Flood Protection Programs in Virginia are to be coordinated by the Department of Conservation and Recreation. DCR is tasked with developing a flood protection plan, coordinating state and federal programs, and establishing guidelines compliant with the National Flood Insurance Program. They are further tasked with providing flood and flood damage reduction data to localities for planning purposes, inspecting the effectiveness of local flood plain management programs, and providing financial and technical assistance as appropriations will allow. (Code of Virginia § 10.1-602).

Provisions to be coordinated through DCR include, but are not limited to, those of the Department of Transportation, the State Water Control Board, the Department of Forestry, the Department of Housing and Community Development, the Virginia Marine Resources Commission, the Department of Emergency Management, the Department of Game and Inland Fisheries, the Department of Mines, Minerals and Energy, the Virginia Waste Management Board, and local government assistance programs of the Virginia Soil and Water Conservation (§ 10.1-659. Flood protection programs; coordination.)