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Virginia Beach Comprehensive Sea Level Rise and Recurrent Flooding Planning Study

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Virginia Beach Comprehensive Sea Level Rise and Recurrent Flooding Planning Study




ODU Forum

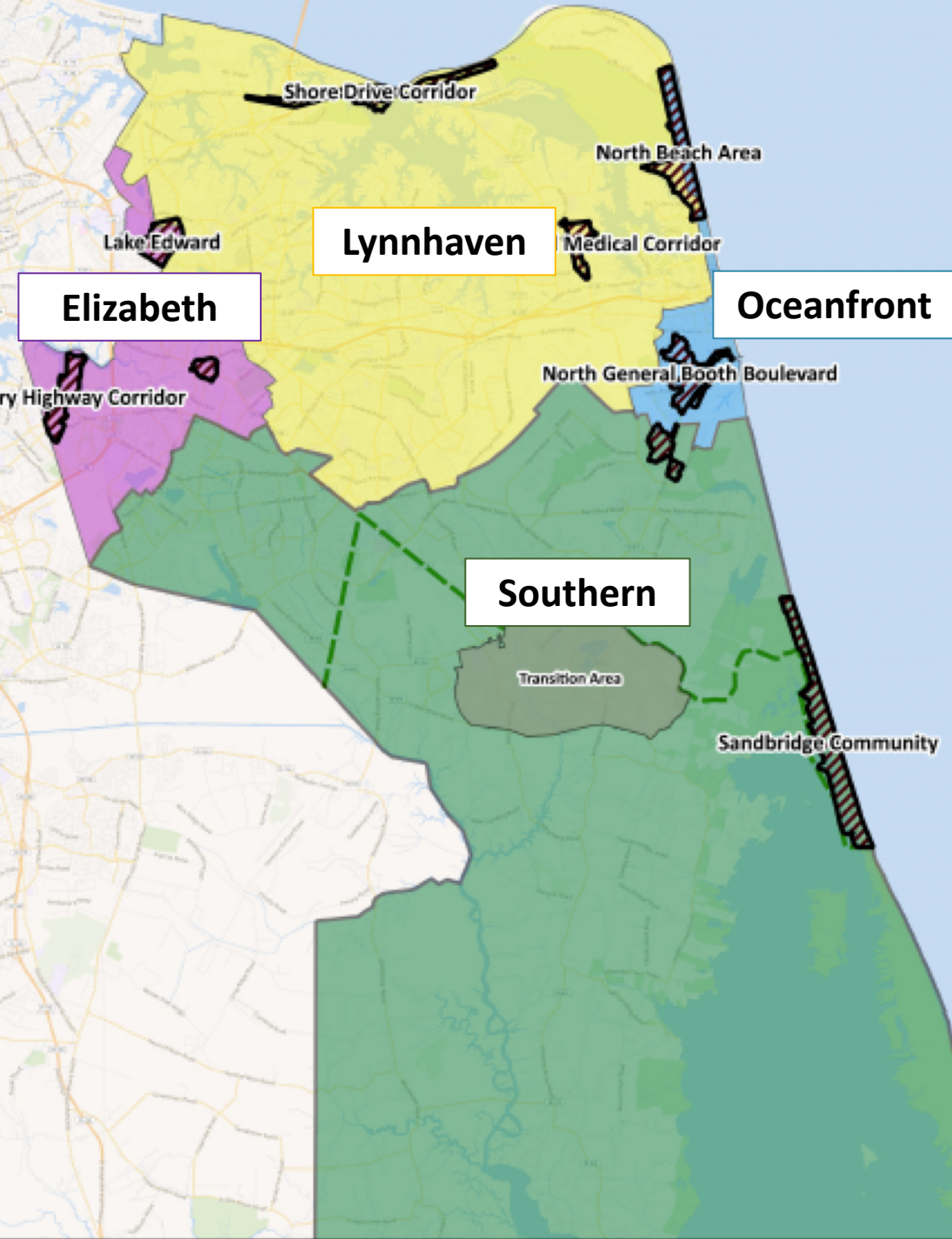
March 11, 2018

Future Conditions Floodplain

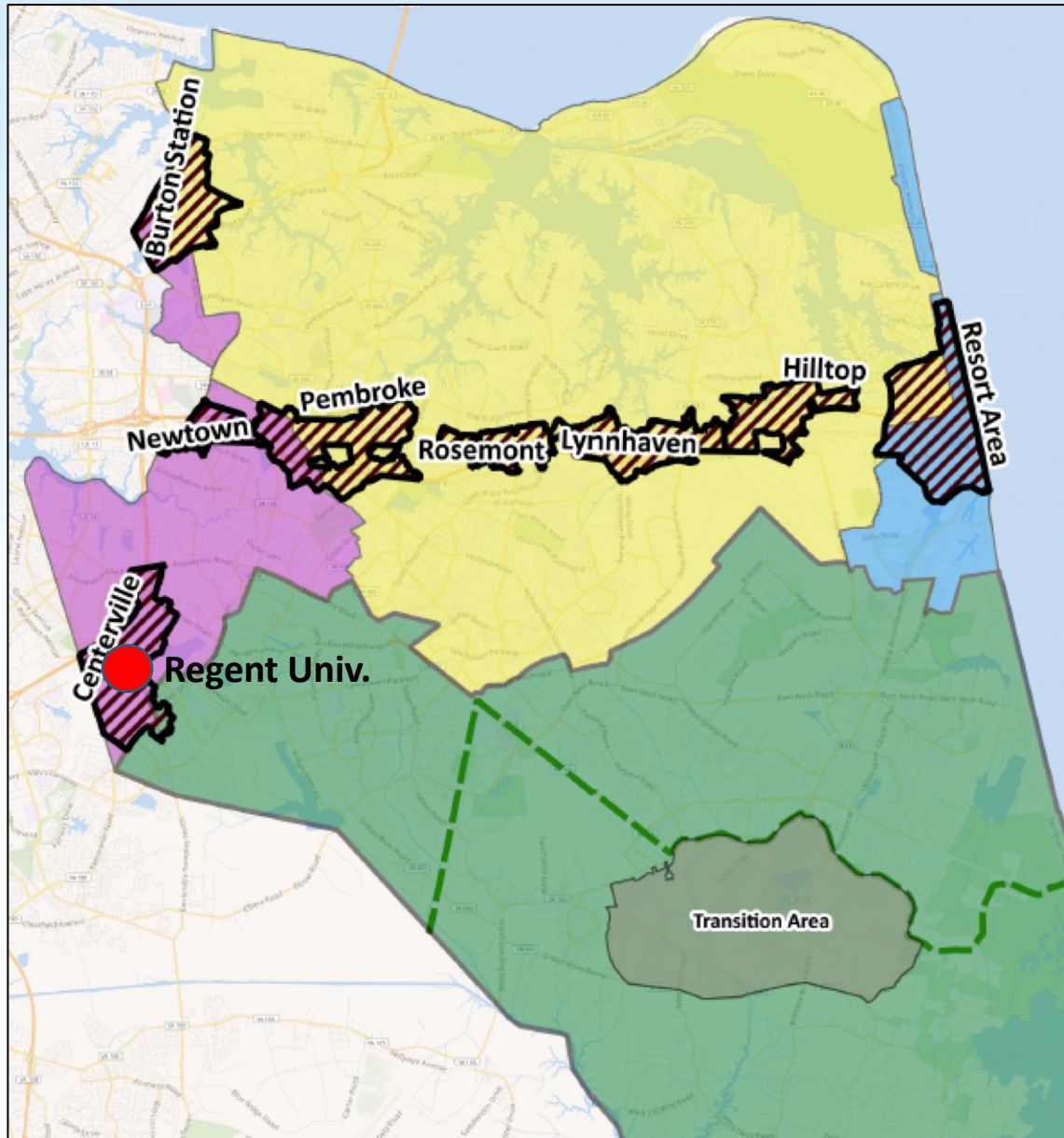
100-year with SLR

Legend

-  Today
-  1.5 ft SLR
-  3 ft SLR



Watershed Focus



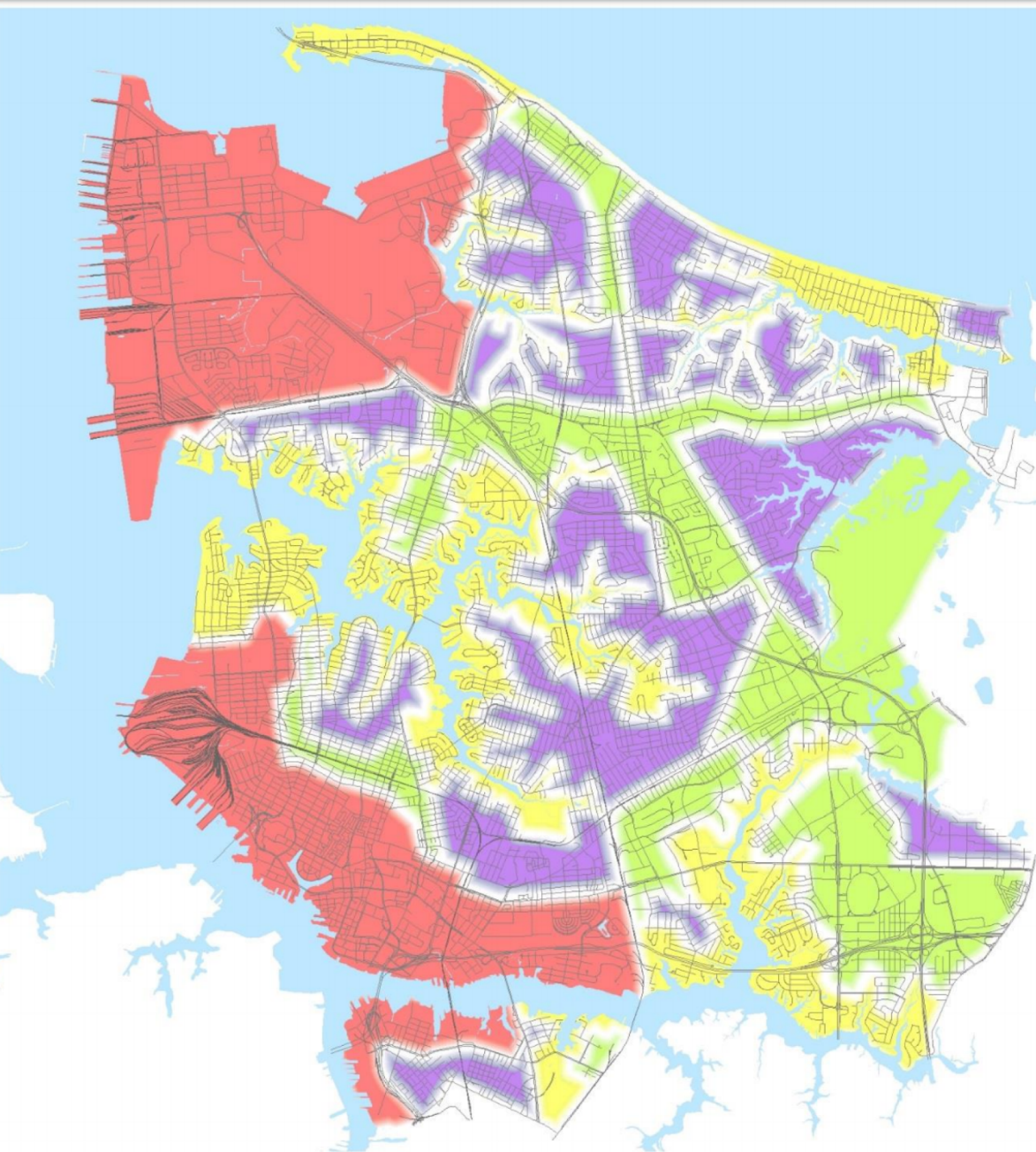
Strategic Growth Areas

Organization by Goals

- Goal 1: Plan for a future with more frequent and intense flooding
- Goal 2: Enhance the flood resilience of critical infrastructure and transportation systems and invest in capital improvements to reduce community flood risks
- Goal 3: Enhance the flood resilience of buildings and neighborhoods
- Goal 4: Protect local businesses and enhance the local economy
- Goal 5: Preserve and enhance natural flood buffers and open space
- Goal 6: Limit new development and redevelopment in harm's way
- Goal 7: Improve City coordination and responsiveness to community flood concerns
- Goal 8: Advocate for changes in federal and state law and policy to support local resilience initiatives

Goal 1: Plan for a future with more frequent and intense flooding

- Consider sea-level rise impacts and incorporate adaptation strategies in: Comprehensive, Hazard Mitigation Plan, and Transportation Plan
- Develop Floodplain Management Plan
- Develop a Planning Policy
- Develop GIS tool with flood risk information to inform planning
- Disaster and Evacuation Planning



- | | | | |
|---|-----------------------------|---|--|
|  | Red ("Economic Engines") |  | Green ("New Urban Centers") |
|  | Yellow ("Adaptation Areas") |  | Purple ("Neighborhoods of the Future") |

VISION 2100

*Norfolk,
Virginia*

PLANNING

Baltimore's Hazard Mitigation Plan



CITY OF BALTIMORE



Disaster Preparedness and Planning Project

A COMBINED ALL HAZARDS MITIGATION AND CLIMATE ADAPTATION PLAN

OCTOBER, 2013

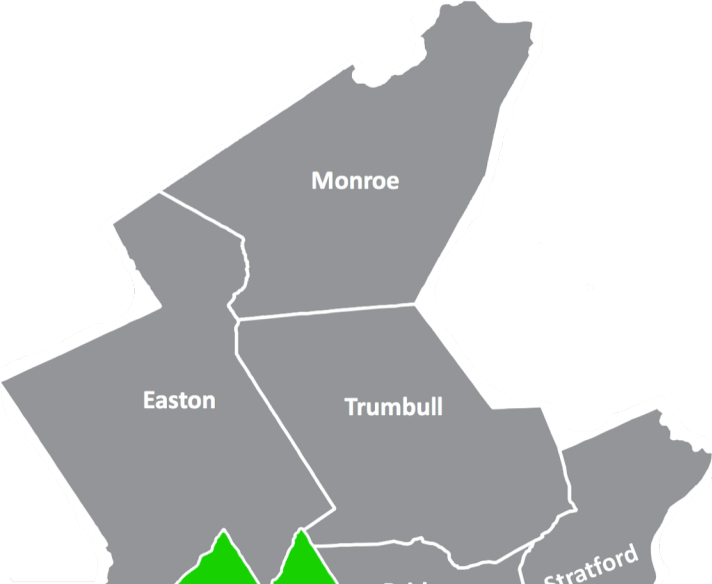


IMPLEMENTATION GUIDELINES

Lead Agency	MOEM
Stakeholders	BCRP (Forestry), BGE, Building Owners, DGS, DOT, DPW, Exelon, PSC, Utility customers, Veolia, Wheelabrator
Alignment with Goals	Goals 2 and 3
Connection with Existing Efforts	 Building Standards and Zoning Codes; CAP; ESF-12; MDNR
Timeframe	

GIS TOOLS

Bridgeport MetroCOG

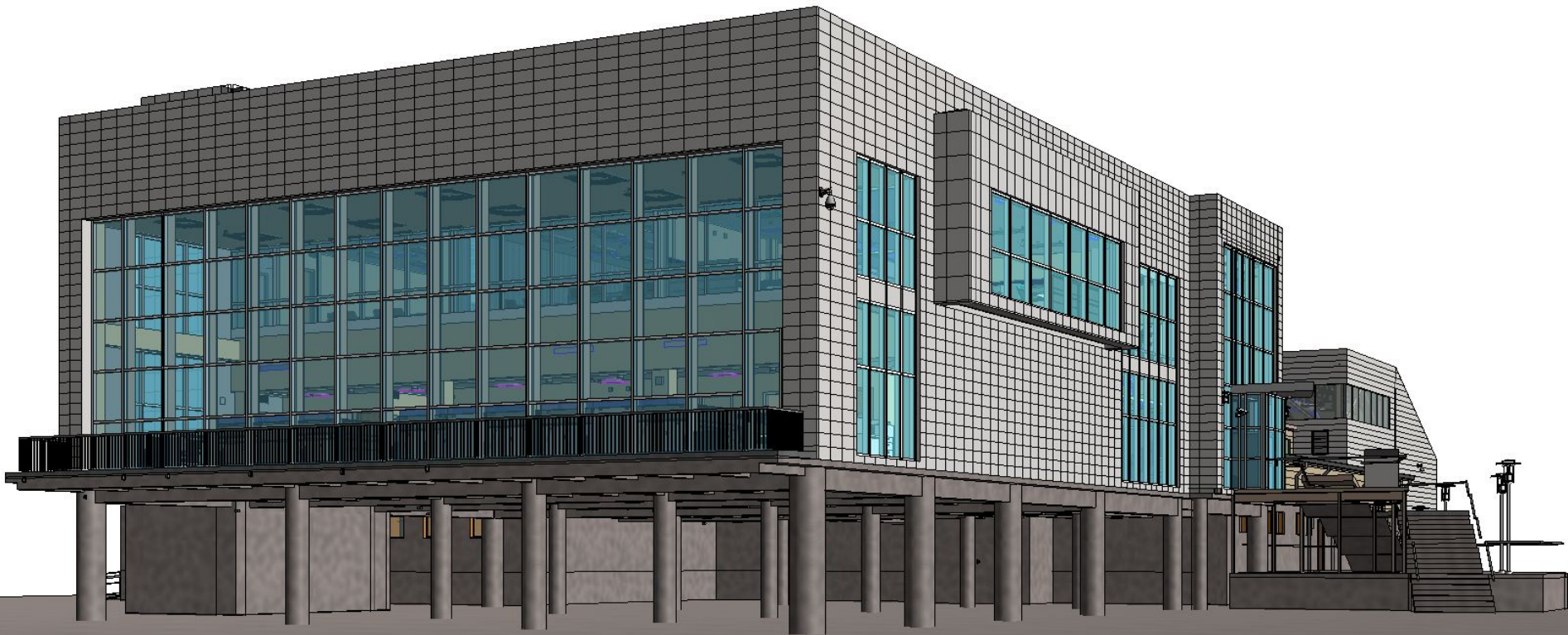


Goal 2: Enhance the flood resilience of critical infrastructure

- Consider sea-level rise impacts and incorporate adaptation strategies in Capital Improvement Plans and Budget
- Develop Asset Management Plans for Critical Assets
- Develop Design Guidelines for resilient infrastructure
- Develop a Green Infrastructure Plan and agreements between City agencies to coordinate GSI installation, operations and maintenance

MARYLAND:

Coast Smart Construction Rules



Goal 3: Enhance the flood resilience of buildings and neighborhoods

- **Update floodplain ordinance** (expand regulatory floodplain, require 3-foot freeboard, restrict critical facilities in 500-year floodplain, eliminate variances, use CAZ standards)
- Expand waterfront setbacks
- Develop adaptation checklist for large-scale development
- Use incentive zoning to encourage resilience measures
- Update Strategic Growth Area development standards
- Fund flood retrofits



ADAPTATION CHECKLIST

Boston, MA

RESILIENCE QUOTIENT SYSTEM

Norfolk, VA



RESILIENCE QUOTIENT SYSTEM

Norfolk, VA





VIRGINIA SHORELINE
RESILIENCY FUND

Goal 5: Preserve and enhance natural flood buffers and open space

- Enhance acquisition and conservation easement programs and identify funding sources
- Promote living shorelines
- Use tax incentives to encourage preservation of open space
- Investigate creation of a Transfer Development Rights program

LOCAL BUYOUTS:

Charlotte-Mecklenburg County





Goal 8: Advocate for changes in state law and policy to support local resilience initiatives

- Providing funding for critical infrastructure needs
- Require back-up power for assisted living facilities
- Impact fees
- Fund flood retrofit loans
- Flood risk disclosure
- Reconstruction of nonconforming structures

Other Georgetown Climate Center

RESOURCES

ONLINE RESOURCES

The screenshot shows the homepage of the Adaptation Clearinghouse. At the top left is the logo with the text "Adaptation Clearinghouse" and "POWERED BY THE GEORGETOWN CLIMATE CENTER AND USERS LIKE YOU". To the right is a "SITE SEARCH" box with the placeholder "Enter a keyword" and a search icon. Below the logo is a navigation bar with links for "RESOURCES", "SECTORS", "NETWORKS", "MY CLEARINGHOUSE", and "ABOUT". On the right side of the navigation bar is a button for "ADAPTATION PLANS & PROGRESS" with a dropdown arrow. The main content area features a large heading "Welcome to the Adaptation Clearinghouse" followed by a sub-heading "An online database and networking site that serves policymakers and others who are working to help communities adapt to climate change". Below this is a "Search the Clearinghouse" button and two tabs: "By Keyword" (selected) and "By State". To the right of the main heading is a section titled "Put the Power of the Adaptation Clearinghouse to Work for You" with a bulleted list of features: "Customize the Adaptation Clearinghouse to meet your needs", "Receive updates about new resources that match your interests", and "Connect with other professionals".

The screenshot shows the "Green Infrastructure Toolkit" page. The title "Green Infrastructure Toolkit" is at the top in a blue header. Below the title are four images: a rooftop garden, a rain garden, a green roof, and a permeable pavement system. At the bottom left is the logo for "GEORGETOWN CLIMATE CENTER" with the tagline "Adaptation Planning • Sustainable Urban Mobility". At the bottom right, the text "green infrastructure toolkit" is displayed on a green background.

The screenshot shows the "State and Local Adaptation Plans" page. The title "State and Local Adaptation Plans" is at the top. Below the title is a "Select a State" dropdown menu and a "Go" button. The main text reads: "States and communities around the country have begun to prepare for the climate changes that are already underway. This planning process typically results in a document called an adaptation plan. Below is a map that highlights the status of state adaptation efforts. Click on a state to view a summary of its progress to date and to access its full profile page. State profile pages include a detailed breakdown of each state's adaptation work and links to local adaptation plans and resources. Please move the map to view Alaska and Hawaii." Below the text is a map of the United States with state boundaries and major cities labeled. The map is interactive, with a "Map" and "Satellite" toggle at the top left.



Welcome to the Adaptation Clearinghouse

– an online database and networking site that serves policymakers and others who are working to help communities adapt to climate change.

Search the Clearinghouse

By Keyword

By State

SEARCH FOR: RESOURCES ORGANIZATIONS USERS ALL

Enter a keyword

SEARCH

Recently Added Resources

Resource

San Francisco Bay Clean Water, Pollution Prevention and Habitat Restoration Measure

June 7, 2016

The San Francisco Bay Clean Water, Pollution Prevention and Habitat Restoration Measure was approved by the nine county San Francisco Bay Area region of California and became law on June 7, 2016. The measure implements a regional tax - approved across the nine counties - to fund coastal habitat rehabilitation programs and adaptations to sea level rise and flooding. The purpose of the measure as stated is "to protect and restore San Francisco Bay to benefit future generations by reducing trash, pollution, and harmful toxins, improving water quality, restoring habitat for fish, birds, and wildlife, protecting communities from flood, and increasing shoreline public access and recreational areas."

Related Organizations: San Francisco Bay Restoration Authority

Resource Category: Law and Governance

Average Rating



SEE RESOURCE

LOGIN TO ADD TO MY RESOURCE LIST

Put the Power of the Adaptation Clearinghouse to Work for You

- Customize the Adaptation Clearinghouse to meet your needs
- Receive updates about new resources that match your interest areas
- Connect with other professionals

BECOME A MEMBER

LOGIN

Featured Sectors



COASTAL



ECOSYSTEMS



ENERGY



PUBLIC HEALTH



TRANSPORTATION



WATER

Select the sectors tab to find sector portals

Sectors

This page allows you to explore the resources in the Adaptation Clearinghouse by sector. Each sector page includes curated lists of resources on adaptation efforts in specific sectors.

Sectors covered include agriculture and food, business, coastal, ecosystems, emergency preparedness, energy, land use, public health, transportation, water, and more.

These pages provide easy-to-navigate lists of resources to help policymakers assess vulnerabilities, develop plans, and respond to climate change impacts in that sector. These pages also allow users to see resources that are most popular among adaptation experts.

Put the Power of the Adaptation Clearinghouse to Work for You

- Customize the Adaptation Clearinghouse to meet your needs
- Receive updates about new resources that match your interest areas
- Connect with other professionals

BECOME A MEMBER

LOGIN

All Sectors



Agriculture & Food

Climate change is changing our assumptions about agriculture and food production. This page includes resources to help policymakers adapt to climate change impacts to the agricultural sector and to food systems.

If you are interested in the agricultural and food sectors, please sign up for email updates to receive monthly notifications about all of the latest agricultural and adaptation resources.

VIEW SECTOR



Business

This page includes resources to help policymakers and businesses understand, plan, and prepare for the impacts of climate change to the business sector, including risks to operations, investments, and profits. Resources describe how climate change consideration in business decisions can promote long-term economic health.

If you are interested in adaptation efforts in the business sector, please sign up for email updates to receive monthly notifications about all the latest business resources.

VIEW SECTOR



Coastal

Climate change will have profound effects on resources, communities, and infrastructure in coastal regions. This page includes resources to help policymakers understand, plan, and prepare for the impacts of climate change to the coastal sector, including coastal communities and infrastructure, and coastal and marine ecosystems.

Tabs include climate science & tools, plans, planning guides, funding programs, and other resources tailored for policymakers working in the coastal sector.

If you are interested in coastal issues, please sign up for email updates to receive monthly notifications about all the latest coastal resources.

VIEW SECTOR



Ecosystems

This page includes resources to help policymakers understand, plan, and prepare for the impacts of climate change on biodiversity and ecosystems including fish and fisheries, forests, oceans, and wildlife. It also includes resources tailored for natural resource managers pursuing land management and conservation strategies to prepare for the impacts of climate change.

If you are interested in biodiversity and ecosystems issues, please sign up for email updates to receive monthly notifications about all the latest resources in this sector.

VIEW SECTOR

POPULAR RESOURCES

TRANSPORTATION
BASICS

ASSESSMENTS & TOOLS

PLANS

PLANNING GUIDES

LAW & POLICY

CASE STUDIES

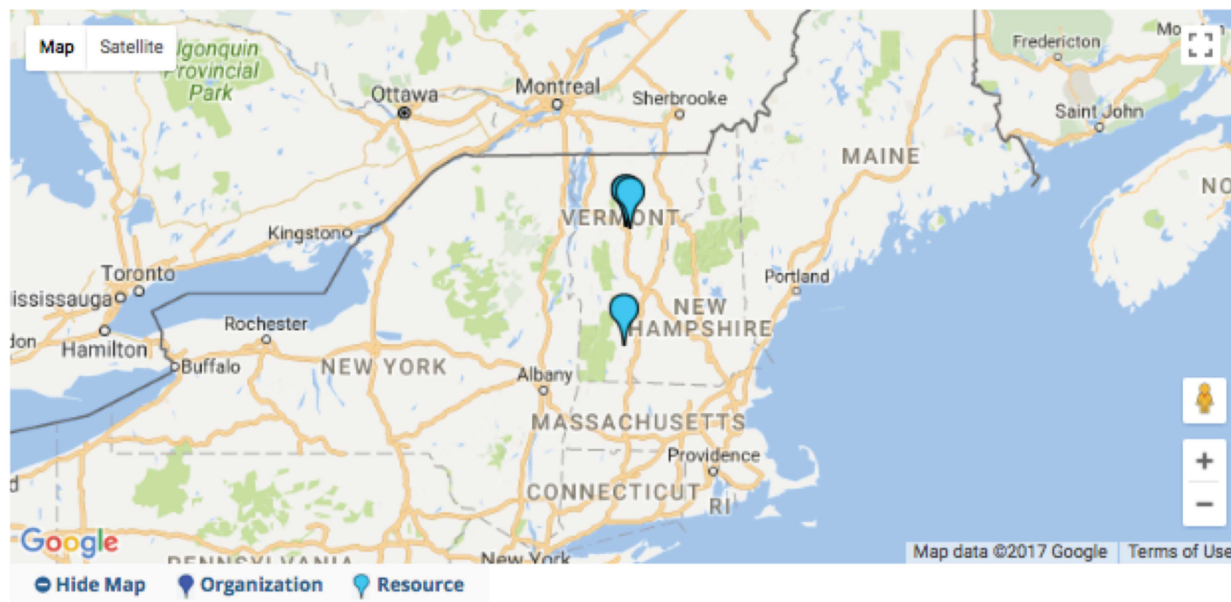
FUNDING

PROJECT DESIGN

OPERATIONS &
MAINTENANCE

ORGANIZATIONS

GEOGRAPHIC SEARCH



Resource

Vermont Culvert Rebuilding after Tropical Storm Irene

December 2013

Vermont experienced significant barriers to using disaster relief funding to install larger culverts after Tropical Storm Irene. The storm caused massive damage to the state's transportation infrastructure and warranted a presidential disaster declaration. In the aftermath of the event, the Vermont Transportation agency (VTrans) and localities followed state regulations that required the installation of larger culverts to address increased stream flow and to allow for fish passage. Localities, however, were denied reimbursement for these "improvements" by the Federal Emergency Management Agency (FEMA), the agency that administers disaster relief funding for rebuilding local roads and bridges. Vermont's experience shows one of the challenges of adapting transportation infrastructure during the critical window of opportunity after a disaster.

Related Organizations: Vermont Agency of Transportation (VTrans), [Georgetown Climate Center](#)

Resource Category: Law and Governance

SEE RESOURCE

ADD TO MY RESOURCE LIST


[LEAVE NETWORK](#)

Local Government Professionals

The Local Government Professionals Portal is designed to help local officials in their efforts to prepare for the impacts of climate change. Users can find, rate, and share the adaptation resources that are aimed at and most useful to local government officials. It was developed in collaboration with the Urban Sustainability Directors Network (USDN) and features resources developed by USDN and its members.

[READ MORE](#)


Welcome Jessica Grannis

Adaptation Program Manager at Georgetown Climate Center

[Edit Profile](#) | [Logout](#)
[MANAGE EMAIL SUBSCRIPTIONS](#)
[VISIT MY CLEARINGHOUSE](#)
[SUBMIT A RESOURCE](#)

Network Resources & Activity

[Resources](#)
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POPULAR RESOURCES

[LOCAL PLANS](#)
[TOOLS](#)
[PLANNING GUIDES](#)
[ADAPTATION STRATEGIES](#)
[LOCAL LAWS](#)
[FUNDING PROGRAMS](#)
[COMMUNICATION & ENGAGEMENT](#)
[CASE STUDIES](#)
[ALL LOCAL RESOURCES](#)

Highly Rated Resources

[\(edit\)](#)

This tab features resources that are rated highly by other members of the Local Government Professionals Network. Local Government Professionals members like you may influence this list by rating resources. Just click on a resource and assign it a 1 (low) to 5 (high) star rating. The highest ratings (4 and 5) should be granted to resources that you have found useful in your own work.

[APPLY ADDITIONAL FILTERS ▾](#)
[SORT BY ▾](#)

Resource

Preparing for Climate Change: A Guidebook for Local, Regional, and State Governments

September 2007

This guidebook was developed by the Climate Impacts Group (CIG) at the University of Washington and King County, Washington, in association with ICLEI - Local Governments for Sustainability. The purpose of the guide is to help decision-makers in a local, regional, or state government prepare for climate change by recommending a detailed process for climate change preparedness based on familiar resources and tools.

Related Organizations: [Center for Science in the Earth System \(CSES\)](#), King County, Washington, University of Washington, [Climate Impacts Group \(CIG\)](#), [ICLEI - Local Governments for Sustainability](#)

Network Rating



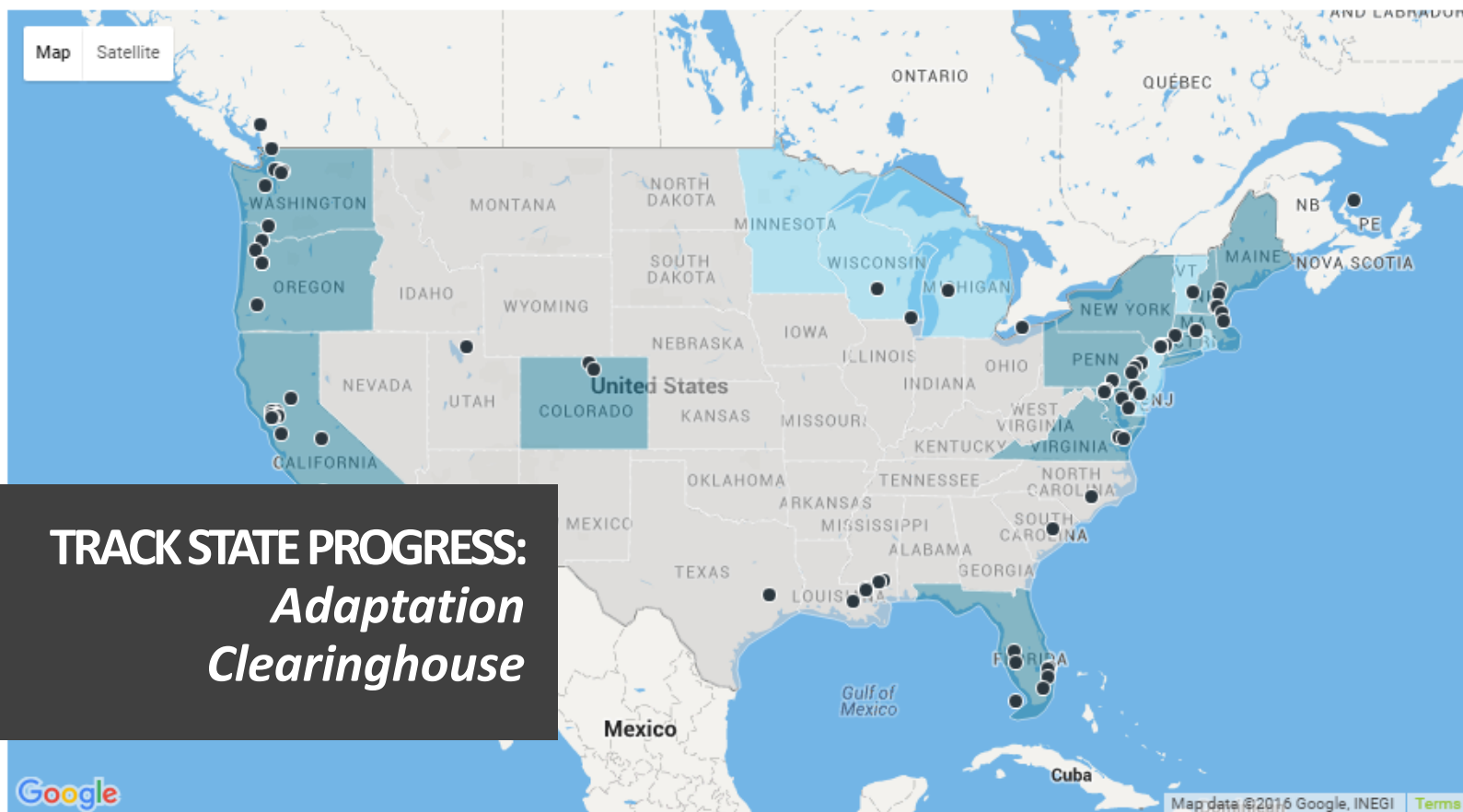
State and Local Adaptation Plans

Select a State

States and communities around the country have begun to prepare for the climate changes that are already underway. This planning process typically results in a document called an adaptation plan.

Below is a map that highlights the status of state adaptation efforts. Click on a state to view a summary of its progress to date and to access its full profile page. State profile pages include a detailed breakdown of each state's adaptation work and links to local adaptation plans and resources. Please move the map to view Alaska and Hawaii.

Select State ▼ Go



TRACK STATE PROGRESS:
*Adaptation
Clearinghouse*



Map data ©2016 Google, INEGI Terms of Service

■ State-Led Adaptation Plan Finalized ■ Other State Planning Efforts Underway ● Local and Regional Plans

Preparing for Climate Change in Virginia

[Change State](#)

[View Virginia Energy and Emissions Data](#)

This page provides an overview of the steps Virginia is taking to prepare for the impacts of climate change.

On December 21, 2007, Governor Tim Kaine established the Governor's Commission on Climate Change (Executive Order 59). The executive order also directed the Commission to create a Climate Action Plan that would evaluate expected impacts of climate change on Virginia's natural resources, public health, agriculture, forestry, tourism, and insurance sectors.

On December 15, 2008, the Governor's Commission released its [Final Report: A Climate Change Action Plan](#). The 2008 plan details the Commission's findings regarding climate impacts, particularly sea-level rise, on the state's infrastructure, coastline, and military installations. While the 2008 plan focuses primarily on measures to reduce greenhouse gas emissions, it includes a set of goals related to preparing for climate impacts. Specifically, it calls on state agencies to begin to consider climate change in planning and decision-making processes. The Governor's Commission was not continued under Governor Bob McDonnell, who served from 2010 to 2014.

On July 1, 2014, Governor Terry McAuliffe created a new Governor's Climate Change and Resiliency Update Commission (Update Commission) to review, update, and prioritize the goals of the 2008 Climate Change Action Plan ([Executive Order 19, Convening The Governor's Climate Change And Resiliency Update Commission](#)). The new commission is also charged with identifying sources of revenue to fund the implementation of these goals. The reconstituted commission met for the first time in September 2014. The Update Commission released its [Report and Final Recommendations to the Governor](#) in December 2015. Based upon recommendations from the Commission, the state has taken several actions such as appointing a state Chief Resilience Officer and developing a state-wide protocol for sea-level rise projections. Other recommendations in the 2015 report call on the state to establish a

Virginia



Virginia Governor's Commission on Climate Change Final Report: A Climate Change Action Plan

Finalized: December 15, 2008



● 1 out of 43 Goals Completed

● 8 out of 43 Goals in Progress



SUBMIT AN UPDATE ABOUT THIS STATE'S PROGRESS



RECEIVE EMAILS ABOUT THIS STATE'S PROGRESS

State Law and Policy

Resource Name	Resource Type	Date
Virginia SB 1443: comprehensive plan sea-level rise strategies	Law and Governance	March 16, 2015
Virginia EO 19: Convening the Governor's Climate Change and Resiliency Update Commission	Law and Governance	July 1, 2014
Virginia HJ 16: Recurrent flooding; joint subcommittee established to formulate recommendations to address	Law and Governance	March 8, 2014
Virginia HJ 50: Flooding; Virginia Institute of Marine Science to study strategies to prevent in Tidewater localities	Law and Governance	March 9, 2012
Virginia SB 964 (2011): Coastal resource management; Living Shorelines; VA Marine Resources Commission, et al. to develop integrated guidance.	Law and Governance	April 29, 2011
Executive Order 59 (2007- VA) the Governor's Commission on Climate Change	Law and Governance	December 21, 2007

State Agency Plans

Resource Name	Sector(s) Covered	Date
Virginia Climate Change and Resilience Report to the Governor	Coastal, Energy, Information technology, Land use and built environment, Transportation	December 21, 2015
VA Dept of Conservation and Recreation: Guidance for Local Floodplain Ordinances in Virginia	Coastal, Land management and conservation, Land use and built environment	October 2011
Virginia's Strategy for Safeguarding Species of Greatest Conservation Need from the Effects of Climate Change	Biodiversity and ecosystems, Coastal, Fish and fisheries, Wildlife	November 2009
Virginia Governor's Commission on Climate Change Final Report: A Climate Change Action Plan	Agriculture and food, Biodiversity and ecosystems, Coastal, Fish and fisheries, Forestry, Insurance, Land use and built environment, Public health	December 15, 2008



green infrastructure toolkit

For More Information and Additional Resources

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202-661-6594

<http://www.GeorgetownClimate.org>

<http://www.AdaptationClearinghouse.org>

GEORGETOWN CLIMATE CENTER

A Leading Resource for State and Federal Policy