Local Government Advisory Committee

to the Chesapeake Executive Council

Building Local Community Resilience Against Climate-Related Flooding Forum Report

APPENDICES

Appendix A

LIST OF FORUM PARTICIPANTS

2020 Local Government Forum Attendees	
Elizabeth Andrews, College of William and Mary* **	Tracy Garland, Resilient Virginia
Whitney Ashead, Chesapeake Bay Program	Jim George, MD Department of the Environment* **
Kristin Baja, Urban Sustainability Directors Network*	Norm Goulet, Northern VA Planning District Commission*
Jim Bass, Eastern Shore Land Conservancy*	Kyle Gray, University of Rhode Island
Richard Baugh, LGAC, VA Delegation	Penny Gross, LGAC, VA Delegation
Sharon Baxter, VA Department of Environmental Quality	Michael Helfrich, LGAC, PA Delegation
Carin Bisland, Chesapeake Bay Program	Donna Iannone, LGAC, PA Delegation
Patti Bohnsack, Alliance for the Chesapeake Bay*	Kevin Jenkins, Naval Academy
Patty Bubar, LGAC, MD Delegation	Zoe Johnson, Naval Facilities Engineering Command
Craig Carinci, Fairfax County, VA	Matthew Johnston, Anne Arundel County, MD
Nicole Carlozo, MD Department of Natural Resources* **	Bruce Jones, RK&K Engineering
Laura Cattell Noll, Alliance for the Chesapeake Bay	Whitney Katchmark, Hampton Roads Planning District Commission*
Joyce Coffee, Climate Resilience Consulting	Debra Knopman, RAND Climate Resilience Center*
Jen Cotting, University of Maryland: Environmental Finance Center	Martin Koch, DC Department of Energy and Environment
Kathleen Daley, Fairfax County, VA	Matthew Konfirst, EPA Region 3* **
Ola-Imani Davis, Alliance for the Chesapeake Bay	Heidi Kunka, PA Department of Environmental Protection* **
Mark Dobbins, LGAC, MD Delegation	Steve Lafferty, Baltimore County, MD*
Sadie Drescher, Chesapeake Bay Trust	Danny Lapin, Otsego County Conservation Association
Kevin Du Bois, US Department of the Navy* **	Bryan Lennon, City of Wilmington Public Works
Amy Dubois, LGAC, VA Delegation	Ed Link, University of Maryland
Rachel Felver, Chesapeake Bay Program	John Maleri, DC Department of Energy & Environment
Sheila Finlayson, LGAC, MD Delegation	Andria McClellan, LGAC, VA Delegation*
Kate Fritz, Alliance for the Chesapeake Bay	Kate McClure, University of Maryland*

Appendix A

Gerald Galloway, University of Maryland*	Ben McFarlane, Hampton Roads Planning District Commission* **
Erik Meyers, The Conservation Fund **	Skip Stiles, Wetlands Watch* **
Andy Miller, University of Maryland, Baltimore County	Taryn Sudol, University of Maryland: Center for Environmental Science*
Jason Papacosma, Arlington County Department of Environmental Services*	James Sullivan, DE Department of Natural Resources
Matthew Pennington, WV Eastern Panhandle Regional Planning and Development Council	Jaleesa Tate, MD Emergency Management Agency*
Tuana Phillips, Chesapeake Bay Program	John Thomas, LGAC, PA Delegation
Ann Phillips, VA Department of Natural Resources	Joanne Throwe, Throwe Environmental LLC*
Don Phillips Jr, LGAC, DE Delegation	Kevin Wagner, MD Department of the Environment*
Julie Reichert- Nguyen, NOAA Chesapeake Bay Office* **	Mark Watts, Chemung County Soil & Water Conservation District
Allison Reilly, University of Maryland	James Wheeler, LGAC, PA Delegation
Krista Romita Grocholski, RAND Climate Resilience Center*	Ashley White, County Commissioners Association of PA
Joel Scheraga, US EPA*	Bruce Williams, LGAC, MD Delegation
Ann Simonetti, LGAC, PA Delegation	Justin Williams, VA Department of Environmental Quality
Clif Stapes, NY Department of Environmental Conservation	David Wood, Chesapeake Stormwater Network
Jennifer Starr, Alliance for the Chesapeake Bay*	Cuiyin Wu, Chesapeake Bay Program* **
Kathy Stecker, MD Department of the Environment	

Additional Planning Team Representatives *(who were unable to attend the forum)*	
Pam Adams, PA Central Region Council of Governments	Sasha Land, MD Department of Natural Resources
Selaam Dollisso, C-StREAM Internship Program	Alan Sam, PA State College Borough
Joy Hatchette, MD Insurance Administration	

*Served on the Forum Planning Team

** Serves on the Climate Resiliency Work Group

Appendix B

BACKGROUNDER

NFWF/LGAC/CRWG Local Government Forum
Building Local Community Resilience Against Climate-Related Flooding
September 24, 2020

This document is intended to provide participants in the Local Government Forum with foundational information and an understanding of the preliminary recommendations for addressing the problem identified below. We ask that all participants review this information in advance and that you come to the meeting prepared to contribute to the development of specific actionable recommendations.

Introduction and Problem Statement

Local elected officials are tasked with protecting the lives, businesses and property of their constituents. For them, the impacts of climate are visible and frequent. Taking action to make communities more resilient is a powerful and pressing need.

What is Climate Resiliency?

In the context of this Forum, climate resilience is the ability to anticipate, prepare for, and respond to hazardous events, trends, or disturbances related to climate. Improving climate resilience involves assessing how climate change will create new, or alter current, climate-related risks, and taking steps to better cope with these risks.

Due to climate change, devastating storms and sea level rise will increasingly threaten vibrant communities, critical infrastructure, and vital natural systems. Cities, regions, and states are facing natural disasters that can have devastating effects on life, property, the economy, and ecosystems. Climate change is already having observable effects on the environment, and past conditions are no longer a reliable indication of the type or extent of disasters communities will face in the future.

Problem Statement: *As communities face the increasing challenge of climate-related flooding, there is a growing need for local decision makers to harness public support and resources necessary to effectively prepare for, manage, and ultimately reduce/mitigate local flooding impacts. Making the case to state and federal partners for funding actions tied to improving community resilience is paramount. Climate-related inequities need to be addressed as well as protection of social, economic, and natural infrastructure assets. Managing water quantity challenges caused by flooding must be prioritized along with meeting water quality requirements. There is a cost to no action compared to securing resources to prepare for and better respond to flooding impacts.*

Background

The Local Government Advisory Committee (LGAC) raised the issue of significant climate changes and increased local flooding with the Chesapeake Executive Council (EC) in 2019. At the September 5, 2019 meeting of the Chesapeake Executive Council, LGAC called for the EC to hold a watershed wide summit to consider dual benefits of flood mitigation with Watershed restoration when engaging on local flooding concerns. In response, the Chesapeake Executive Council expressed a willingness to hold this Summit in 2020 or 2021. Meanwhile, LGAC and the Chesapeake Bay Program Climate Resiliency Workgroup (CRW) are hosting this Forum in order to provide the Chesapeake Bay Program leadership with more specific recommendations for addressing climate impacts on local governments.

Appendix B

One of the Climate Resiliency Workgroup core values is to increase the resilience of the Chesapeake Bay Watershed, including its living resources, habitats, public infrastructure and communities, to withstand adverse impacts from changing environmental and climate condiions. Within the CRWG 2018-2020 Workplan is 3.4, 3.5, 3.6, "Target engagement with educators, business leaders, state, municipalities, and local managers to enable incorporation of climate information/impacts into their decision-making."

Forum Goal

By the end of the day, we expect to have specific recommendations for thoughtfully addressing flooding to impacted communities throughout the Chesapeake Bay Watershed.

Assumptions

The Forum Planning Committee helped LGAC identify the key barriers to building climate capacity across the region. We developed a set of assumptions to guide and focus the day, since this is a broad topic that involves many partners and varying local demand and supply.

The following are the guiding set of assumptions:

- The amount of research and modeling related to climate impacts is significant and recognized. Extensive research shows increasing concern over dramatic and more frequent flooding, high tides and sea level rise.
- There is a lack of regional analyses to examine and describe the bigger picture of physical environmental changes occuring and their impacts as well as future trends. Collaboration and partnering can address this.
- Local government planning for these climate impacts will result in a more efficient, actionable, cost-effective and comprehensive strategy.
- Partnerships are critical in helping many local governments to effectively address flooding by improving funding and capacity.
- Promoting effective communication, collaboration and cooperation for climate planning and financing across the watershed will aid in this strategy.
- There is no one size fits all approach when it comes to flooding resilience as communities are all unique.
- There is a high priority to focus on nearer term flood mitigation efforts but the longer term green infrastructure/nature based implementation also need time and funding.
- Local economies and budgets are being challenged now and in the foreseeable future.
- Pursuing projects that provide climate flooding adaptation and/or mitigation also provide water quality and natural resource benefits which is a wise use of limited resources. Tying these multiple benefits together are an important aspect that can lead to local support.
- Local capacity and adequate resources to address problems related to climate flooding resilience are extremely limited.
- There is a lack of incentivizing properties that can privately benefit or benefit the greater community from flooding events.
- State policies and assistance to address flooding vary across the watershed
- Promotion of regional partnerships and collaboration do occur and can be effective.

Appendix C

AGENDA

Forum Agenda: Building Local Community Resilience Against Climate-Related Flooding
10:00 am - 4:00 pm, September 24, 2020

Email Ola Davis at odavis@allianceforthebay.org for Zoom information
Meeting materials and handouts can be found on the meeting page below
https://www.chesapeakebay.net/what/event/local_government_advisory_committee_september_2020
This meeting will be recorded for internal use.

Draft Problem Statement: ***As communities face the increasing challenge of climate-related flooding, there is a growing need for local decision makers to harness additional support and resources necessary to effectively prepare for and manage local flooding impacts. Making the case to local, state and federal partners for funding actions tied to improving community resilience is paramount. Climate-related inequities need to be addressed as well as protection of social, economic, and infrastructure assets. Meeting water quantity challenges caused by flooding must be prioritized along with meeting water quality requirements. There is a cost to no action compared to securing resources to prepare for and better respond to flooding impacts.***

AgendaMeeting Goal: By the end of the day, we expect to have specific recommendations for thoughtfully addressing flooding to impacted communities throughout the Chesapeake Bay Watershed.

10:00 a.m.	**Welcome/Introductions**	**Ann Simonetti, Chair, Local Government Advisory Committee** **Eric Meyers, Co-Chair, CBP Climate Resiliency Workgroup**
10:20 a.m.	**Workshop Overview/Purpose**	**Jennifer Starr, Director of Local Government Initiatives** **Alliance for the Chesapeake Bay**
10:25 a.m.	**Problem Statement Amendments and Agreement**	**Joanne Throwe, President** **Throwe Environmental, LLC**
10:35 a.m.	**Review Assumptions**	**Joanne Throwe**

- The amount of research and modeling related to climate impacts is significant and recognized. Findings show increasing concern over dramatic and more frequent flooding, high tides and sea level rise.
- Local government planning for these climate impacts will result in a more efficient, actionable, cost-effective and comprehensive strategy.
- Partnerships are critical in helping many local governments to effectively address flooding by improving funding and capacity.
- Promoting collaboration and cooperation for climate planning and financing across the watershed will aid in this strategy.
- There is no one size fits all approach when it comes to flooding resilience as communities are all unique.
- Local economies and budgets are being challenged now and in the foreseeable future.

- Pursuing projects that provide climate flooding mitigation also provide water quality and natural resource benefits which is a wise use of limited resources. Tying these multiple benefits together are an important aspect that can lead to local support.
- Local capacity and adequate resources to address problems related to climate flooding resilience are extremely limited.
- State policies and assistance to address flooding vary across the watershed
- Promotion of regional partnerships and collaboration do occur and can be effective.

10:45 a.m. Innovative Case Studies: Discover what others have done

- ***Community Capacity Building*-Hudson River, NY** ***Clif Staples***
- ***Regional Collaboration*-Eastern Shore Land Conservancy, MD** ***Jim Bass***
- ***Financing/Planning*-Anne Arundel County, MD** ***Matt Johnston***
- ***Local Ordinances* - Norfolk, VA** ***Andria McClellan***
- ***Comprehensive Effort*- South Wilmington, DE** ***Bryan Lennon***

11:45 p.m. Lunch

12:15 p.m. Zoom Room Discussions

- **Group 1 - Funding and Financing Gaps, Opportunities, and Resources**
- **Group 2 - Building Stronger Local and Regional Collaboration and Cooperation**
- **Group 3 - Needs Assessment/Ordinances**
- **Group 4 - Building Capacity/Technical Assistance**
- **Group 5 - Innovative Approaches**
- **Group 6 - Climate / Environmental Justice**

1:30 p.m. Break

1:45 p.m. Report outs: Recommendations for Building Local Community Flooding Resilience

3:30 p.m. Summary of Recommendations and Next Steps ***Joanne Throwe***

4:00 p.m. Adjourn

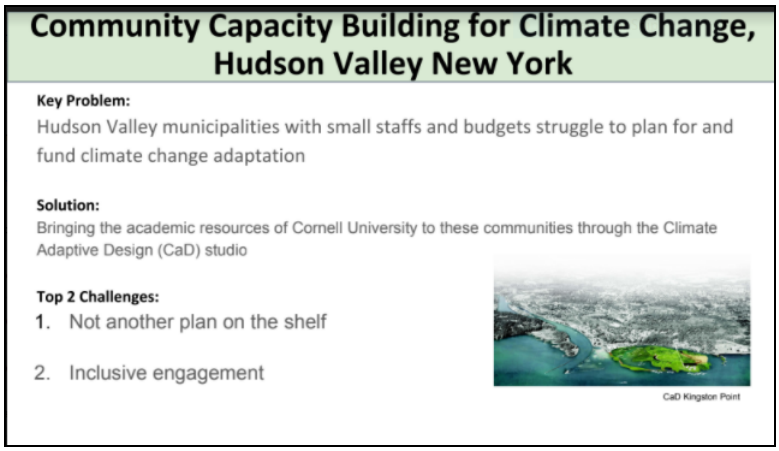
Appendix D

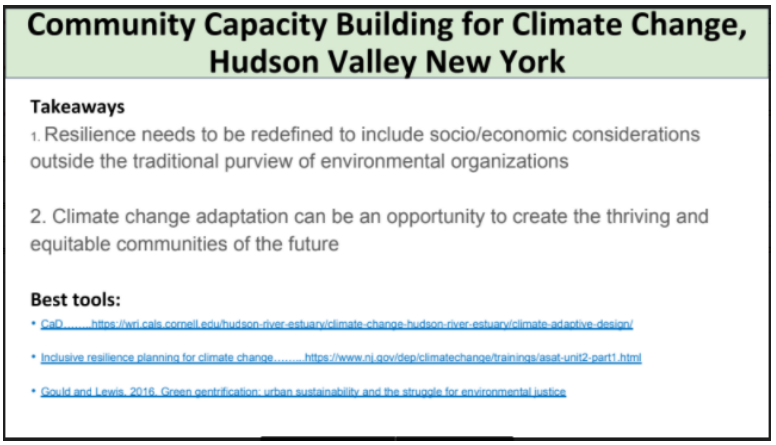
SIX CASE STUDIES SLIDES/SUMMARIES

2020 Building Local Community Resilience Against Climate - Related Flooding Forum

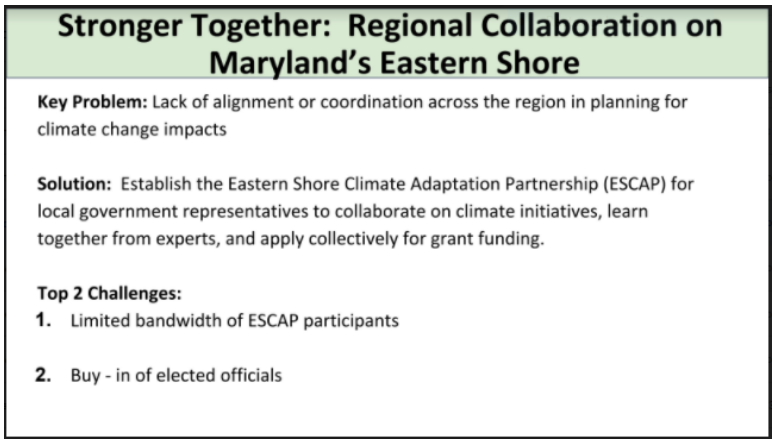
Individual Forum Case Study Slides can also be found on the Chesapeake Bay Program website

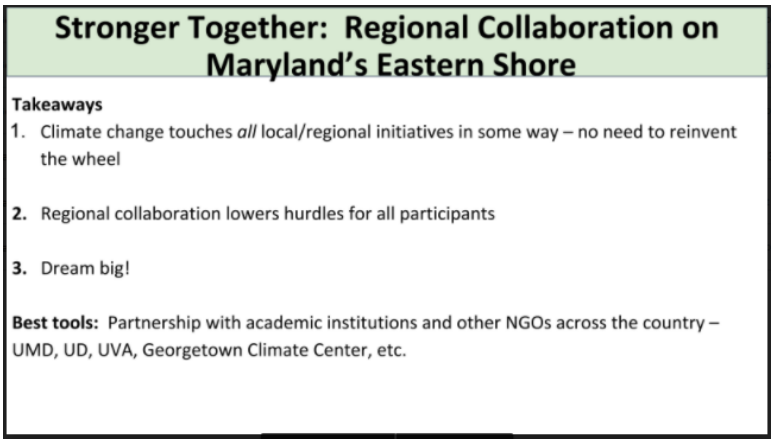
1. **Community Capacity Building for Climate Change, Hudson Valley NY**
   Clif Staples, Extension Support Specialist, Hudson River Estuary Program, New York State Department of Environmental Conservation





2. **Stronger Together: Regional Collaboration on Maryland's Eastern Shore**
   Jim Bass, Coastal Resilience Program Manager, Eastern Shore Land Conservancy





3. **Financing / Planning – Anne Arundel County, MD**
   Matt Johnston, Environmental Policy Director, Anne Arundel County, MD
   No Slides

4. **Local Ordinance: Resilient Quotient to Address Flooding & More**

Andria McClellan, Council Member, City of Norfolk, VA

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Local Ordinance: Resilient Quotient to address Flooding & More

Point-Based System for Managing Shocks & Stresses

2020 Local Government Forum: Building Local Community Resilience Against Climate-Related Flooding

September 24, 2020

Norfolk Councilwoman Andria McClellan
Andria.McClellan@Norfolk.gov

Our region has the nation's largest concentration of military and federal assets.

And our access roads flood regularly.

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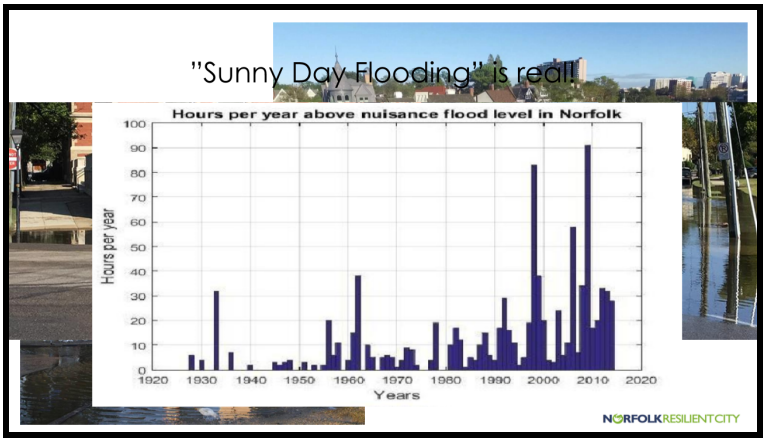
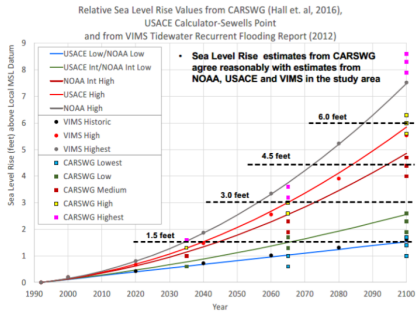
"Sunny Day Flooding" is real!



NORFOLK RESILIENT CITY

Adopted SLR estimates for planning *regionwide*

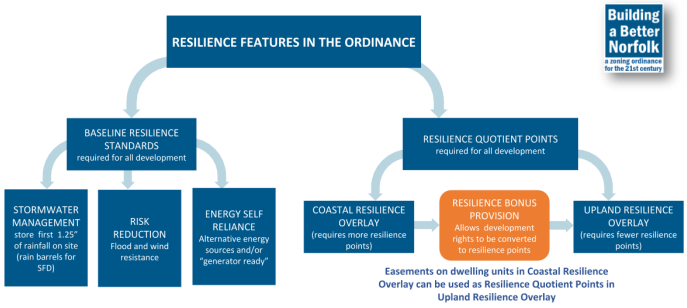


2050: 1.5'
2080: 3'
2100: 4.5'

NORFOLK RESILIENT CITY

How can Zoning Respond to Resilience Challenges?

- Norfolk has adopted "Rise Above the Risk" Approach
- Freeboard requirements:
  - 3' in SFHA
  - 18" in Shaded X
  - 16"-24" everywhere else in City
  - No new basements
- But, not enough…a new zoning ordinance was needed
  - 3 year process, finally adopted in 2018
  - Push back from building community



Appendix D

Premise of Resilience Quotient

Provide Flexibility to Developer and Property Owner to use the resilience tactics that work best for the specific project while still contributing positively to meeting the City's resilience strategies

Resilience Strategy in Zoning

Focus on flexibility and choice

- Must do—build into requirements
- Should do—create options
- Nice to do—provide a bonus

Add operational characteristics

Resilience Quotient is a blend of all

Resilience Quotient

Creating the most resilience-focused zoning ordinance in America

- Encouraging the use of resilient technologies
  - Stormwater management
  - Risk mitigation
  - Energy resilience
- Required of new development

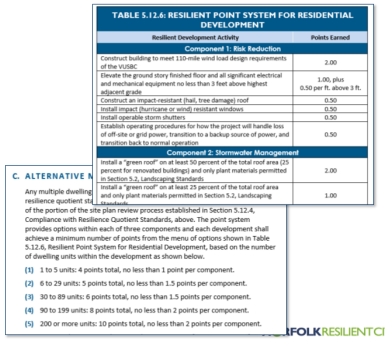


TABLE 5.12.6: RESILIENT POINT SYSTEM FOR RESIDENTIAL DEVELOPMENT

Resilient Development Activity	Points Earned
Component 1: Risk Reduction	
Construct building to meet 110-mile wind load design requirements of the VUSBC	2.00
Elevate the ground story finished floor and all significant electrical and mechanical equipment no less than 3 feet above highest adjacent grade	1.00, plus 0.50 per ft. above 3 ft.
Construct an impact-resistant (hail, tree damage) roof	0.50
Install impact (hurricane or wind) resistant windows	0.50
Install operable storm shutters	0.50
Establish operating procedures for how the project will handle loss of off-site or grid power, transition to a backup source of power, and transition back to normal operation	0.50
Component 2: Stormwater Management	
Install a "green roof" on at least 50 percent of the total roof area (25 percent for renovated buildings) and only plant materials permitted in Section 5.2, Landscaping Standards	2.00
Install a "green roof" on at least 25 percent of the total roof area and only plant materials permitted in Section 5.2, Landscaping	1.00

C. ALTERNATIVE

Any multiple dwelling
resilience quotient sta
of the portion of the site plan review process established in Section 5.12.4, Compliance with Resilience Quotient Standards, above. The point system provides options within each of three components and each development shall achieve a minimum number of points from the menu of options shown in Table 5.12.6, Resilient Point System for Residential Development, based on the number of dwelling units within the development as shown below.

(1) 1 to 5 units: 4 points total, no less than 1 point per component.
(2) 6 to 29 units: 5 points total, no less than 1.5 points per component.
(3) 30 to 89 units: 6 points total, no less than 1.5 points per component.
(4) 90 to 199 units: 8 points total, no less than 2 points per component.
(5) 200 or more units: 10 points total, no less than 2 points per component.

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Resilience Quotient Administration

- Point system is only one option of several:
  - Elevating the structure (8-16 inches) and capturing stormwater (200 gallons for SFD, first 1.25 inches of rainwater for others)
  - Structures achieving LEED Gold or equivalent are exempt
  - Historic rehabs are exempt
- Zoning Administrator authorized:
  - To approve minor deviations from point system, or
  - To review proposed alternatives that achieve the same resilience goals

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Resilience Quotient Example

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Points Breakdown

Total Project (96 townhomes, 30,000 sf retail)	8.0 points
Component 1	**3.0**
Construct to 110-mile wind	2.0
Elevate the ground story first floor elevation	1.0
Component 2	**3.0**
Treat 25% of site generated runoff	1.0
Treat an additional 25% of site generated runoff	1.0
Provide fenced community space	1.0
Component 3	**2.0**
Equip each unit with a generator hookup	1.0
Provide 2 operable windows on 2 exterior walls	0.5
Re-use existing non-historic retail building	0.25
Install tankless water heating system (in 1/2 units)	0.25 (1/2)

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Appendix D

Resilience Overlays

- Coastal Resilience Overlay
  - Applies to high flood risk areas
- Upland Resilience Overlay
  - Applies outside high flood risk areas
- Neighborhood Resilience Overlay
  - Applies to selected neighborhoods

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Resilience Overlays

- Coastal Resilience Overlay (CRO)
  - Applies to all properties within a high-risk flood zone (V, A, or X-shaded)
  - Requires:
    - Additional points from Resilience Quotient table
    - All landscaping to be salt tolerant/native species
    - All parking and open space to be pervious
  - Limits parking to 110% of the minimum required

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Resilience Overlays

- Upland Resilience Overlay (URO)
  - Applies to all properties outside a high-risk flood zone
  - Allows up to four points to be counted towards the point system requirements for extinguishing a development right in the CRO

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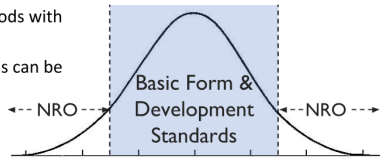
Resilience Overlays

- Neighborhood Resilience Overlay (NRO)
  - Designed to support neighborhoods with unique development character
  - Form and development standards can be tailored to fit needs of individual neighborhoods



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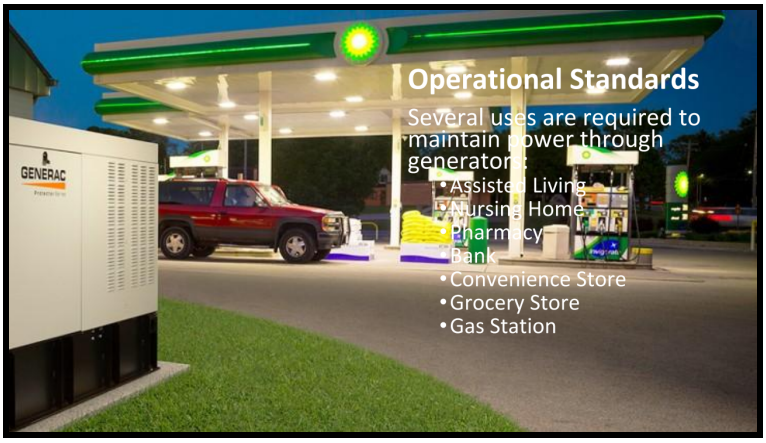

What else is Norfolk doing?

- 100 Resilient Cities
- Adopted the country's "most resilient zoning code"
- Climate Action Plan
- NDRC/HUD $$ creating "coastal community of the future"
- RISE Accelerator challenge grants
- Smart Sensors/WAZE connected city
- **Regional** efforts
  - HRPDC Coastal Resilience Subcommittee, inventory of all water projects, legislative agenda
  - GetFloodFluent.org
  - American Flood Coalition membership
- NFIP Community Rating System, reducing flood insurance rates

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Thank you!

Andria McClellan
Andria.mcclellan@Norfolk.gov
@andriamcclellan

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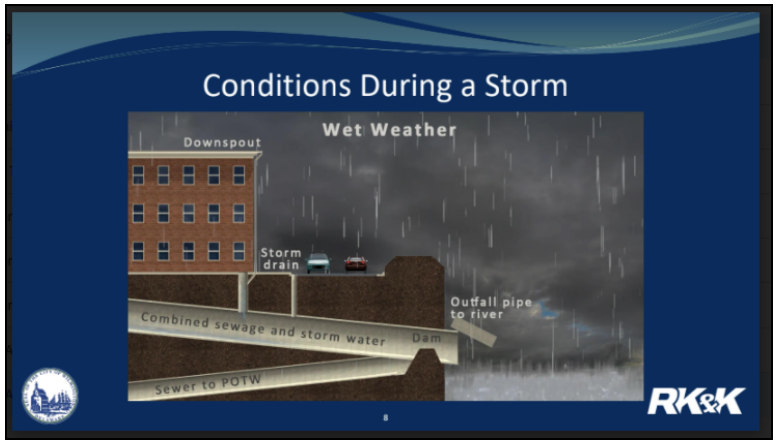
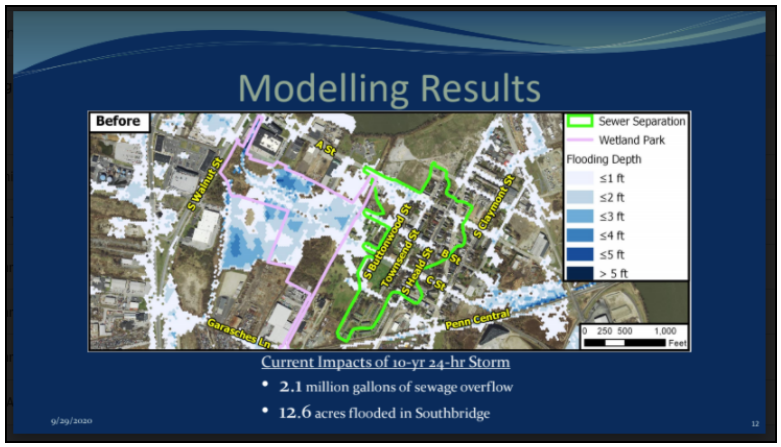
5. [South Wilmington Wetlands Project, City of Wilmington, DE]
Bryan Lennon, Assistant Director Water Division, City of Wilmington





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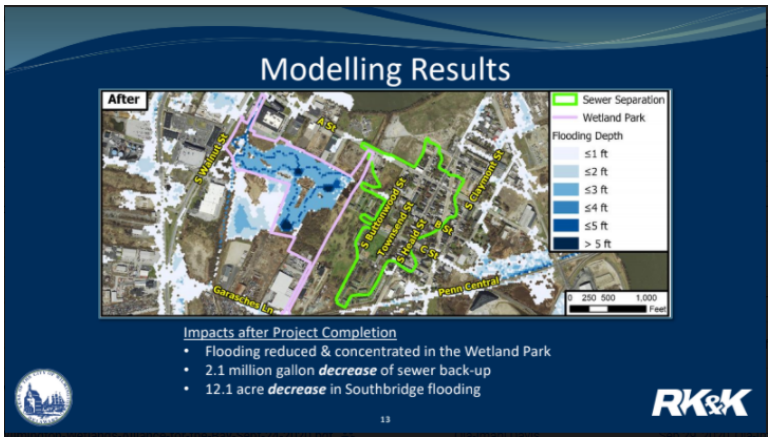

Modelling Results
After
Sewer Separation
Wetland Park
Flooding Depth
≤1 ft
≤2 ft
≤3 ft
≤4 ft
≤5 ft
> 5 ft
0 250 500 1,000
Feet
Impacts after Project Completion
• Flooding reduced & concentrated in the Wetland Park
• 2.1 million gallon decrease of sewer back-up
• 12.1 acre decrease in Southbridge flooding
13
RK&K


16
RK&K


Wetland Park Components:
Walking Path & Passive Recreation
17
RK&K

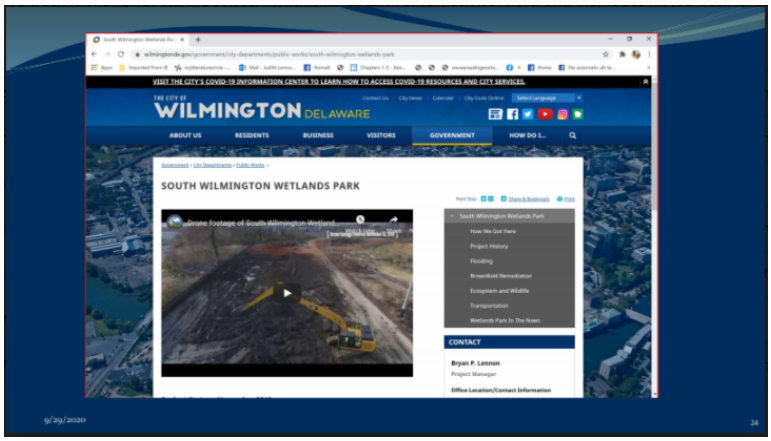

Wetland Park Components:
Walking Path & Passive Recreation
18
RK&K


Wetland Park Components:
Walking Path & Passive Recreation
19
RK&K


Wetland Park Components:
Walking Path & Passive Recreation
RK&K

Appendix D


Project Goals in Summary
Mitigate/reduce flooding
• 2.1 million gallon decrease of sewer back-up
• 12.1 acre decrease in Southbridge flooding
Improve water quality
• Treat 36.4 acres of stormwater run-off
Restore a functioning tidal wetland
• Restore a 15-acre tidal freshwater wetland
Clean up a brownfield
• Remove 100,000 cubic yards contaminated soils
Create a safe and attractive wetlands park
• Create walking paths, passive recreation, and planting of native species
Reduce mosquito breeding grounds
• Natural biological controlled of mosquito larvae
22
RK&K


WILMINGTON DELAWARE
SOUTH WILMINGTON WETLANDS PARK
CONTACT
9/29/2020

Appendix E

FOCUS GROUP DISCUSSIONS

Group 1 - Funding and Financing Gaps, Opportunities, and Resources

This Zoom Room breakout session discussed how to promote more sustainable funding and financing resources needed to address increased flooding caused by climate change. The group examined ways to overcome certain challenges that limit dedicated funding and financing towards protecting, restoring and improving infrastructure impacted by climate change. The breakout culminated with a set of recommendations geared toward incentivizing more community investments in critical Infrastructure.

Major points

- Unanimous agreement that there is a lack of funding and financing dedicated to the impacts of
- climate change as it relates to flooding.
- Many communities are not fully capable to address flooding issues. They are not sure of the cost involved, the timing and if they can can work regionally.
- Smaller communities have a lack of capacity. They can't write grant proposals without adequate staff. Additionally, it is hard to get a grant requiring matching funding when you don't have the funding to match.
- Covid has impacted budgets.
- Some communities are lacking incentive. If we are told we have to do things, we roll up our sleeves and put money into it but if we aren't told to do it *and* the money doesn't come from Washington, it doesn't get done.
- When discussing the differences between rural, suburban, urban communities in regard to funding and financing, the group felt that when flooding occurred, larger communities were expected to handle the issue and had the staff to do so while smaller communities didn't have the resources.
- When asked about examples of communities, within the Chesapeake Bay watershed, that seem to be more successful in financing for climate resilience the consensus was that the wealthier, larger communities with high budgets or tourism, seem to be doing better. Also, any community that is able to have a stormwater utility has a leg up on others. Those communities that participate in the Municipal Separate Storm Sewer System Permit Program (MS4) are doing well due to cooperative funding.
- The group discussed the empowerment of municipalities to have local authority to raise fees and taxes for flood related projects. It was shared that there are non federal admin grants to fund stormwater projects at 50% but people don't apply, perhaps because they can't come up with the matching funds.
- The idea of better ways to engage with the private sector was discussed: great idea in theory. Relationship building is hard with private groups and they don't get involved unless they see a profit. Potential lies with banks and insurance groups but there are drawbacks. Many insurance groups are pulling out of areas that are vulnerable.
- When asked if there were any national examples of financing for climate resilience as it relates to flooding, Denali, Alaska was noted.

Focus Group Recommendations

Communities need to push for greater investment and a more centralized effort to address flooding while working to influence legislative decision making. They need to be more intentional in creating a funding program that generates savings, has more emphasis on pre hazard prevention and focuses on flood resilience financing. A dedicated revenue stream i.e., stormwater fees is necessary. Communities spend lots of money on recovery but should shift that to mitigation so they can save money in the long run.

Appendix E

Group 2 - Building Stronger Local and Regional Collaboration and Cooperation

The purpose of this Zoom Room breakout session was to discuss in more detail how to enhance, promote, and develop better collaboration and cooperation, either on a local, regional, watershed, or state level. The group looked for ways to overcome certain local challenges that limit collaboration and developed recommendations that promote resilience through enhanced cooperation among various entities and localities.

Major Points

- Identified effective collaborations in the Chesapeake Bay area include the Eastern Shore Climate Adaptation Partnership (ESCAP) that is coordinated by the Eastern Shore Land Conservancy (ESLC) as well as the Lower Eastern Shore Climate Adaptation Network (LESCAN) that serves the three lower MD Eastern Shore counties (Worcester, Wicomico and Somerset) coordinated by The Nature Conservancy. DoD collaborates with surrounding communities on flooding issues through Joint Land Use Studies.
- Some attendees felt that collaborative programs are more effective in using funding to do restoration. While it was recognized that there is no perfect model for collaborative programs, collaborating is an effective way to share info, build partnership, and support stormwater infrastructure.
- The group discussed and identified two toolkits for developing regional resiliency against increased flooding due to climate change. The first one is the US Climate Toolkit (NOAA). The second from EPA outlines efforts in North Carolina, Wisconsin and Oregon . It was also shared that there is a regional system for treatment plants in Hampton Roads, VA.
- It was discussed that some hindrances or barriers to communities collaborating included the number of governments that would need to come onboard as well as who owned the infrastructure in question. Some older cities have an old system of combined sewer overflows (CSO). Another reason why communities don't collaborate is that some counties have other priorities such as land development.
- The Maryland Department of the Environment is updating the stormwater and resilience sections of the Clean Water State Revolving Fund (CWSRF) project ranking system to give extra points to Community Rating System (CRS) communities. The National Flood Insurance Program (NFIP) Community Rating System is another example of an incentive program that equates to lower flood insurance premiums, and of course, reduced flood risk.

Focus Group Recommendations

Regional/ multi jurisdictional collaborations come in all sizes. Communities need to determine how they are going to pay, be flexible and build consensus. If possible, big "players" from the community need to be involved. When a group has a common defined goal/ interest it is more successful. There should be documentation of the success stories or what didn't work and why.

Group 3 - Needs Assessment/Ordinances

The purpose of this zoom room was to come together to discuss in more detail how needs assessments and ordinances at the local level are needed to adequately address increased flooding caused by climate change. They looked for ways to overcome certain challenges and developed recommendations for creating more opportunities to help better manage critical infrastructure.

Major Points

- Predictive Intensity–Duration–Frequency (IDF) curves, are shaky at short time intervals, coming up with effective engineering calculations and then design is a challenge. It's time for a next generation set of design guidance/standards. IDF curves and future precipitation frequency and intensity are important pieces and need to be more comprehensive. Inspection and maintenance is challenging. We need creative design solutions to avoid losing performance.
- Cities are faced with challenges in building regulations. There's not enough room for the river and the road, it gets controversial when they decide to take historic buildings out of use. There's only so much mitigation that you can achieve. But it really doesn't help against the biggest storms. Many culverts and structures are currently undersized, so we need to build them bigger, but that costs money.
- Future ordinances will need to address both water quantity and water quality.
- It is going to take educating the population to adopt new ordinances. Cities need to communicate in the right terms: talk about high water issues, show examples. Cities need to work slowly, incrementally. Disaster events can spur action.
- The extent of floods needs to be documented. Good data does not exist. Local governments can't afford to do it, but maybe that is something that a larger entity (state or federal) could do.
- States need to go back to their regulations to see what can be done regarding water quantity. The emphasis has been on water quality and we haven't thought about water quantity in 30+ years. They need to examine regulations regarding increasing water quantity problems due to climate change. Existing stormwater utilities need to be evaluated to make sure they are addressing stormwater quantity instead of just water quality. Communities can do simplistic modeling to estimate lost tax revenue from property damage.
- Green infrastructure (GI) is not the silver bullet. GI might work for small or medium, but not for the big storms.
- Communities need to prepare for larger storms and communicate better with their residents. Explanations need to be at an understandable level.
- Circuit riders have proven to be valuable for smaller jurisdictions with limited staff, especially when it comes to ordinance development and educating a board of supervisors. They should have some background with floodplain management. Partnerships with nonprofits and/or universities, could be an example of a circuit rider program.

Focus Group Recommendations

There needs to be a shift in engineering: new IDF curves, new data, new designs, new concepts to handle excessive rain. Floods, and the extent of the floods, need to be documented. States (and stormwater utilities) need to conduct an evaluation of their regulations to focus on water quantity, not just water quality, data/modeling should be top down, policy decisions should be bottom up. Communities should use the services of a circuit rider for water quantity, not just water quality.

Appendix E

Group 4 - Building Capacity/Technical Assistance

The purpose of this Zoom Room breakout session was to come together and discuss how to build capacity at a local level to adequately address increased flooding caused by climate change. This group discussed ways to overcome certain challenges brought on by insufficient capacity spent on protecting, restoring and improving infrastructure impacted by climate change. Recommendations were created that will build capacity to help better manage critical infrastructure.

Major Points

- Many municipalities are under-staffed or are managing multiple jobs/priorities and are unable to focus much of their time specifically managing climate related flooding.
- Existing capacity is often spent on meeting municipal separate storm sewer system (MS-4) requirements as it relates to water quality and less on water quantity issues such as flooding.
- The group unanimously saw a need to build more capacity to address the impacts of climate change as it relates to flooding. Supporting rationale shows that in NY, some jurisdictions don't even have GIS capability, lack of capacity is limiting the region's ability to adapt. In West Virginia, there is a lack of capacity across the board, not just flood related. Rural coastal communities in VA often just have one planner, communities need to meet immediate needs first before they are able to work on adaptation.
- While there is a huge volume of tools and resources out there, it's overwhelming for local communities -- most are middle to smaller sized communities without technical expertise and resources.
- Climate and flooding are not the top priorities for most communities right now (broadband, support through the pandemic are).
- Local jurisdictions and their environmental justice communities should be engaged with one another in all facets of the community. To do so, they need to build solid trusting relationships. This can prove to be difficult with lack of staff, lack of structure, or a revolving door of staff and elected officials.
- Checklists are beneficial toward identifying capacity needs. A county in NY created a matrix as part of hazard mitigation planning: does the community have staff, do they have capacity to respond to disaster, etc?
- Regional collaboration is important. To make a stronger connection between successful funding opportunities and capacity, it is important to connect municipalities to funding sources. This can be done through the Circuit rider model for assistance on grants. However, that can prove difficult to get towns to apply. (often requires staff/volunteers with expertise)

Focus Group Recommendations

For communities to build capacity, it is recommended that communities collaborate with local research centers. Universities/ colleges can target student research for the local community to look at ecological data, demographic data, etc. Communities should look into a flexible funding mechanism through taxes. Additionally, there could be a fee for people living in floodplains to pay for mitigation. The EPA adaptation resource center (ARC-x) is an available resource. It is filterable by geographic area and issues of interest, produces tailored sets of information about climate change, adaptation strategies, and case studies. Code and content are available for universities to develop state-specific versions of ARC-x. It would be ideal for states to develop one place to go for assistance (one stop shopping), to help figure out appropriate programs -- a resiliency center similar to the USDA model.

Appendix E

Group 5 - Innovative Approaches

The purpose of this Zoom Room breakout session was to discuss how to promote innovative approaches at the local level to adequately address increased flooding caused by climate change. Recommendations were made that could create more opportunities to help better manage critical infrastructure.

Major Points

- One innovative solution discussed was the RISE organization. RISE is a U.S.-based non-profit with a mission to accelerate innovation and business growth by identifying and scaling solutions to coastal communities' resilience challenges. RISE provides technology grants, invites entrepreneurs to provide business ideas and technical solutions for Natural Disaster Resilience, and seeks innovative approaches that enhance resilience of coastal communities. RISE incentivizes projects and new businesses to address resilience to extreme weather events.
- Other examples within the Chesapeake Bay watershed with innovative approaches are the VA Beach Study, Sea Level Wise, where the municipality understands that they cannot go this alone because the watershed needs collaboration, the Retain Your Rain program in Norfolk, and the Annapolis City Resilience Workgroup (pg 74) at city dock. A few of the practices being used by the Annapolis workgroup include: Multi-functional flood protection methods to blend in adaptation approaches with the area, implementing scalable flood protection measures, innovative financing, and incorporating multi-functional safe space elements in the design. They will treat water quality as well as water quantity. The budget is $50M, they recognize funding is a barrier but also encourage innovation and collaboration.
- Nationally, there are innovative examples effectively addressing climate related flooding. One community well known for its flooding issues is New Orleans. New Orleans has been partnering with the Netherlands in an effort designated as "Living With Water". This approach focuses on polar opposite approaches than previously used in Louisiana, such as pumping and protecting the city from all sources of water. The Living with Water approach embraces the fact that you are below sea-level and encourages how to use the water productively and store it in multi-use ways. They have built a layered strategy to help southern Louisiana deal with sea-level rise and higher tides which will have risk reduction and protections to New Orleans by providing a buffer that will actually deal with the water. Other innovative programs include the Saint Paul's redevelopment project in the Ohio Creek in Norfolk, the New York - Dry Line, a parking garage in Rotterdam that holds stormwater, as well as in Wilmington DE, where they have moved the responsibility for ROW trees into their Water Stormwater Utility and consider their street trees as Stormwater assets, decreasing impervious surfaces, and increasing tree canopy.
- In our region, some of the key barriers that hinder adopting some innovative approaches include lack of stakeholder buy-in and lack of knowledge of how well the strategies will work. Our regional partnerships are critical and it can be difficult to expand across fence lines. We are uncertain if we have adequate regional information to facilitate definition of common ground for developing partnerships and cooperation. Some thoughts on how to overcome those barriers, include a good mechanism for prioritizing projects and training engineers on some of the innovative approaches. Hampton Roads Planning District Commission (HRPDC) is putting together an inventory of all water related projects to encourage partnerships. One other hindrance is the way the US Army Corps works through their benefit cost-analysis does not include the value of a federal installation in the benefit-cost analysis for a foreign area, i.e. the transportation networks that serve the naval bases cannot be considered a key part to justify the investment. Unsure how to address this.
- If we are going to survive we have to adapt and overcome with innovative technical strategies which will be expensive, but we are looking at a 70-year planning horizon because that is the extent of what you can do with technology innovations. Some of the thoughts the group had are:

- Pump stations and not storing water because sometimes storing water creates expensive challenges
- Use of a sea-gate or floodgate to periodically flood areas with heavy rainfall that were not in heavy use
- Use of Right of Way (ROW) for underground stormwater storage - no place to build stormwater retention facilities. WE could store water and release it over a shorter time frame.
- Perform Joint Land Use (JLUS)/ Compatible Use Studies/Military Installation Resilience Plan (MIR Grants) studies to identify future partner projects. The JLUS program name changed to Specifically targeted to look at weather events outside of the fence line and look at projects or planning needs that can build that community resilience. Annapolis was just awarded a pilot project
- Use the clean water revolving fund as a tool that may provide a funding source at a low interest rate for major stormwater improvement projects.
- Incentivize greater levels of retention and reuse of stormwater in the development community.

Focus Group Recommendations

A database for innovative flooding approaches, potentially with a map of projects that have been undertaken, needs to be created to help with building regional collaborations. Communities should be aware of the new Atlas called "Engineering with Nature". It is available online and in hard copy. While it may not be actively maintained, it is a good model for communicating information and includes a wide variety of approaches of using natural processes as mechanisms to control water. Communities need to develop planning processes, similar to what the Dutch have done, that incorporates phases and planned steps to address extreme storm events and flooding using scenario analysis. It will help communities understand how changes will dramatically influence the way that water is managed with respect to agriculture, municipal water supplies, population, etc. Implement cheaper regulations and simple methods for the average resident to start implementing improvements on their own or part of their redevelopment process to help out with some of the flooding problems. LGAC should continue with their tours during meetings because they are found to be very helpful to bring back to local municipalities and share information.

Appendix E

Group 6 - Climate / Environmental Justice

The purpose of this Zoom Room breakout session was to discuss how to promote climate / environmental justice at the local level to adequately address increased flooding caused by climate change. We recognized that flooding can occur anywhere but often impacts some populations more than others. To be successful, actions must improve the lives of all members of our community and not just a select few. Solutions should be created to overcome certain social challenges and develop more opportunities to help better manage critical infrastructure.

Major Points

- We need to ensure that social aspects of climate related flooding are addressed. Climate/environmental justice is more than just low income but also racism. We need to examine how race has an affect on the grant programs.
- Decision-making at the local level is still done with a typical cost-benefit. What's easiest and what's fastest. That works against big problems in the poor areas. It creates bigger gaps. We need to re-prioritize. Those who have the least get served first.
- Need partnerships with academic and state partnerships, etc for a strong grant application.
- Affluent areas find the resources.
- When low income communities have to deal with EPA, FEMA, etc there is so much red tape. It is discouraging because the processes take so long. There is a short term memory between droughts and rainy seasons. It takes 2-3 years to get a project done, which may mean another flood has happened and conditions have changed. We need to push the legislators to take action NOW and get projects sped up. Low income communities do not have flexibility and funds to hang around.
- Wellness of life is not just staying alive but how you live. Throughout this pandemic, emphasis has been to go outside and value open space, showing how it increases quality of life. Still this value isn't incorporated into benefits of cost-benefits. We all have to be good stewards of public funds, but recognize who the funds are meant to benefit.
- A positive model is the regional planning districts are all tied into Coastal Zone Management (CZM) and have helped push through a lot of nature based resiliency projects. They have increased capacity and can navigate the state system.
- There should be a sliding scale. Recognize the ability to pay. Change the rules so low-income can compete.
- One national example that is effectively addressing climate related flooding is LA Safe. They have been doing a lot of amazing work. Equity centered and shifting the conversation. It has taken a lot of time. Also, Portland OR has been doing community-led processes, shifting the money to those programs.

Focus Group Recommendations

Equity and justice for vulnerable communities need to be elevated in priority. Efforts to make grants more accessible and easier to apply for is also a priority. Decision makers need to equitably support underserved communities. When communicating with policy makers and underserved communities there needs to be defined goals for EJ communities. The EPA is creating a EJScreen mapping tool for the Chesapeake Bay area.

Appendix F

ADDITIONAL RESOURCES

State, Local, National and International Climate-Related Flood Mitigation Examples and Efforts
Chesapeake Bay Watershed
(this is not intended to be exhaustive and is up to date as of 11/2020)

Delaware

- Climate Action Plan - 2020 New plan development https://declimateplan.org
- Taking Action (2016) http://www.dnrec.delaware.gov/energy/Pages/Taking-Action.aspx
- The Plan https://dnrec.alpha.delaware.gov/climate-coastal-energy/climate-change/taking-action/
- Understanding Climate Change (2014) https://dnrec.alpha.delaware.gov/climate-coastal-energy/climate-change/
- Climate Framework (2014) http://www.dnrec.delaware.gov/energy/Documents/The%20Climate%20Framework%20for%20Delaware%20PDF.pdf
- Climate Action in DE Progress Report (2016) http://www.dnrec.delaware.gov/energy/Documents/2016%20Climate%20Action%20Progress%20Report/Climate%20Action%20in%20Delaware%202016%20Progress%20Report.pdf
- Delaware's Climate Action Plan: March 2020 Workshops Summary: https://declimateplan.org/wp-content/uploads/2020/06/Public-Workshop-Summary_Round-1_2020.06.22.pdf
- Delaware DNREC Climate Change: Precipitation Change Video https://youtu.be/ifHkGl8YgEk

District of Columbia

- DOEE Climate Ready webpage https://doee.dc.gov/service/climate-change
- Plan Report https://doee.dc.gov/sites/default/files/dc/sites/ddoe/service_content/attachments/CRDC-Report-FINAL-Web.pdf
- Flood Risk Management in the District https://doee.dc.gov/service/flooding

Maryland

State Resources

- Maryland's Climate Change Program https://mde.maryland.gov/programs/Air/ClimateChange/Pages/index.aspx
- Maryland Commission on Climate Change https://mde.maryland.gov/programs/Air/ClimateChange/MCCC/Pages/index.aspx
- The Greenhouse Gas Emissions Reduction Act Plan (2015) https://climatechange.maryland.gov/plan/
- Maryland Commission on Climate Change Annual Report (2019) https://mde.maryland.gov/programs/Air/ClimateChange/MCCC/Documents/2019MCCCAnnualReport.pdf
- MD Chapter of Assoc of Climate Change Officers https://climateofficers.org
- Sea-Level Rise Projections for Maryland 2018 (UMCES) Includes Baltimore nuisance flooding example. https://mde.maryland.gov/programs/Air/ClimateChange/MCCC/Documents/Sea-LevelRiseProjectionsMaryland2018.pdf

Appendix F

Regional Resources

- Identifying Priorities for Adaptation Planning: An Integrated Vulnerability Assessment for the Town of Oxford and Talbot County, Maryland (NOAA)
  https://coastalscience.noaa.gov/data_reports/identifying-priorities-for-adaptation-planning-an-integrated-vulnerability-assessment-for-the-town-of-oxford-and-talbot-county-maryland/
- Climate Change and Sea Level Rise Adaptation Report: Kent County, Maryland
  https://www.adaptationclearinghouse.org/resources/kent-county-maryland-climate-change-and-sea-level-rise-adaptation-report.html
- Preparing for Increases in Extreme Precipitation Events in Local Planning and Policy on Maryland's Eastern Shore
  https://www.eslc.org/wp-content/uploads/2020/01/ExtremePrecipitationReport.pdf
- Prioritizing Local Climate Adaptation through Regional Collaboration on Maryland's Eastern Shore
  https://www.eslc.org/wp-content/uploads/docs/coastal-resilience/escap-white-paper-2017.pdf

New York

- The Plan https://www.dec.ny.gov/energy/44992.html
- Climate Action Plan Interim Report (2010) https://www.dec.ny.gov/energy/80930.html
- A Change in Climate report (2010)
  https://www.dec.ny.gov/docs/administration_pdf/0210changeinclimate.pdf
- Climate Smart Communities https://climatesmart.ny.gov/
- Legislation: Climate Leadership And Community Protection Act (2019)
  https://www.nysenate.gov/newsroom/press-releases/senate-passes-historic-climate-leadership-and-community-protection-act-ccpa

Pennsylvania

- Climate Change https://www.dep.pa.gov/Citizens/climate/Pages/default.aspx
- Press release-PA releases climate plan
  https://www.governor.pa.gov/newsroom/pennsylvania-releases-state-climate-action-plan-join-u-s-climate-alliance/
- Climate Action Plan (2018) https://www.dep.pa.gov/Citizens/climate/Pages/PA-Climate-Action-Plan.aspx
- PDF of Plan (2018)
  http://files.dep.state.pa.us/Energy/Office%20of%20Energy%20and%20Technology/OETDPortalFiles/Climate%20Change%20Advisory%20Committee/2019/PAClimateActionBookletforWeb.pdf
- Developing Plans in 20 communities
  https://www.ahs.dep.pa.gov/NewsRoomPublic/articleviewer.aspx?id=21818&typeid=1
- Pennsylvania Climate Change Impacts Assessment Update (2020)
  http://files.dep.state.pa.us/Energy/Office%20of%20Energy%20and%20Technology/OETDPortalFiles/ClimateChange/2020ClimateChangeImpactsAssessmentUpdate.pdf

Virginia

State Resources

- Governor's Executive Order (2018)
  https://www.governor.virginia.gov/media/governorvirginiagov/executive-actions/ED-24-Increasing-Virginias-Resilience-To-Sea-Level-Rise-And-Natural-Hazards.pdf
- Coastal Adaption and Resilence Master Plan
  https://www.naturalresources.virginia.gov/initiatives/resilience/

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- Master Framework Announcement (2020) https://www.governor.virginia.gov/newsroom/all-releases/2020/october/headline-860976-en.html
    - Framework Summary https://www.governor.virginia.gov/media/governorvirginiagov/secretary-of-natural-resources/pdf/Coastal-Resilience-Master-Planning-Framework.pdf?4747
    - Full Report https://www.governor.virginia.gov/media/governorvirginiagov/governor-of-virginia/pdf/Virginia-Coastal-Resilience-Master-Planning-Framework-October-2020.pdf
- Building VA's Flooding Resiliency https://www.floodingresiliency.org/
- Climate Czar https://www.wvtf.org/post/virginia-coastal-adaptation-and-climate-czar-gets-work#stream/0 https://climateandsecurity.org/advisory-board/rear-admiral-ann-claire-phillips-usn-ret/
- Wetlands Watch-Sea Level Rise Adaptation Guide- Virginia-specific guide of existing programs https://wetlandswatch.org/adaptation-guide-directory
- Wetlands Watch: Collaboratory Resilience Research and Design Collaborative http://wetlandswatch.org/design-collaboratory

Regional Resources

- City of Chesapeake, Virginia Hazard Mitigation Plan: http://www.cityofchesapeake.net/Assets/documents/departments/fire/em/pdf/2014-chesapeake-hazard-mitigation-plan.pdf
- Getting Sea Level Wise: Introduction and motivation behind the Virginia Beach Sea Level Wise Program https://storymaps.arcgis.com/collections/5bde0a2b4cec4bf7966d0fc5d564d9d9?item=1
- City of Virginia Beach, VA: Seal Level Wise – City's comprehensive program for addressing rising sea levels and recurrent flooding risks 2020 https://www.vbgov.com/government/departments/public-works/comp-sea-level-rise/Pages/default.aspx
- City of Norfolk, VA: Flooding https://www.norfolk.gov/4832/Flooding
- Hampton Roads Region https://www.hrpdcva.gov/departments/water-resources/coastal-resiliency/
- Resilient Hampton, VA https://hampton.gov/3459/Resilient-Hampton
- Sea Level Rise: Impact on Northern Virginia https://nvrc.maps.arcgis.com/apps/MapJournal/index.html?appid=d36a7c30fbe3436e8ce5ceb91b38c3af
- William and Mary Law School: Resilience Funding Forum A Discussion of Innovative Options for Coastal Localities May 3, 2019 https://law.wm.edu/academics/programs/jd/electives/clinics/vacoastal/conferences/resiliencefundingforum/index.php
- Wetlands Watch: Innovative Resilient Zoning Proposal in Norfolk http://wetlandswatch.org/directors-blog/2017/10/19/innovative-resilient-zoning-proposal-in-norfolk

West Virginia

- Center on Climate Change https://saveblackwater.org/west-virginia-center-on-climate-change/

Chesapeake Bay Region and Outside the Watershed

- Summary of Stakeholder Concerns, Current Management and Future Needs for Addressing Climate Change Impacts on Stormwater Management https://chesapeakestormwater.net/wp-content/uploads/dlm_uploads/2020/02/FINAL-Climate-Change-and-Stormwater-Survey-Memo.pdf

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- U.S. EPA Resilient Design Assistance Tool (2019)
    - Piloted in **Seaford, DE** and **Huntington, WV** to support and enhance existing community integrative hazard mitigation objectives and address flooding from extreme storm events. https://www.epa.gov/green-infrastructure/resilient-design-assistance-mid-atlantic#:~:text=The%20Resilient%20Design%20Assistance%20Tool,a%20variety%20of%20environmental%20benefits.
- Chesapeake Quarterly Come High Water Sea Level Rise and Chesapeake Bay (2014) https://www.mdsg.umd.edu/sites/default/files/2019-12/CQ_v13n2-3_0.pdf
- Climate Change Vulnerabilities in the Coastal Mid-Atlantic Region April 2018 https://mde.maryland.gov/programs/Air/ClimateChange/MCCC/ARWG/ClimateChangeVulnerabilitiesCoastalMidAtlanticRegion.pdf
- South Wilmington, DE Wetlands Park Project (ongoing) https://www.wilmingtonde.gov/government/city-departments/public-works/south-wilmington-wetlands-park
- Planning for Flood Recovery and Long-Term Resilience in Vermont: Smart Growth Approaches for Disaster-Resilient Communities https://www.epa.gov/smartgrowth/planning-flood-recovery-and-long-term-resilience-vermont
- NPR Article: Major Real Estate Website Now Shows Flood Risk. Should They All? https://www.npr.org/2020/08/26/905551631/major-real-estate-website-now-shows-flood-risk-should-they-all
- Every $1 Invested in Disaster Mitigation Saves $6: Spending to reduce risk saves lives and creates jobs, key study finds https://www.pewtrusts.org/en/research-and-analysis/articles/2018/01/11/every-$1-invested-in-disaster-mitigation-saves-$6
- Naturally Resilient Communities: Using Nature to Address Flooding http://nrcsolutions.org/

National

- EPA Climate Change Adaptation Resource Center-interactive resource for local governments https://www.epa.gov/arc-x
- NASA Global Climate Change https://climate.nasa.gov/
- National Park Service Coastal Adaptation https://www.nps.gov/subjects/climatechange/coastaladaptation.htm
- US Climate Alliance (bipartisan coalition of 25 governors) http://www.usclimatealliance.org/
- US Climate Resilience Toolkit https://crt-climate-explorer.nemac.org/
- Federal Funding Opportunities For Flood Resilience: A Guide For Small Cities https://mcusercontent.com/ec9c20819838d6547c69401b2/files/1253f254-be8c-4425-a9fd-7fd397e2e359/AFC_small_cities_funding_guide_FINAL_042820_20_DIGITAL.pdf
- US Climate Resilience Toolkit: Planning Framework for a Climate-Resilient Economy https://toolkit.climate.gov/tool/planning-framework-climate-resilient-economy
- EPA Planning Framework for a Climate-Resilient Economy April 2016 https://www.epa.gov/sites/production/files/2016-05/documents/planning-framework-climate-resilient-economy-508.pdf
- Resilience Hubs: Shifting Power to Communities and Increasing Community Capacity http://resilience-hub.org/wp-content/uploads/2019/07/USDN_ResilienceHub.pdf
- Urban Sustainability Directors Network https://www.usdn.org/index.html#/

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- EPA: Climate Change Adaptation Resource Center (ARC-X) https://www.epa.gov/arc-x EPA : Regional Resilience Toolkit https://www.epa.gov/smartgrowth/regional-resilience-toolkit
- EPA: Building Blocks for Sustainable Communities (workshop and assistance information) https://www.epa.gov/smartgrowth/building-blocks-sustainable-communities
- NRDC: How States Stack Up On Flood Disclosure https://www.nrdc.org/flood-disclosure-map
- EPA Flood Resilience Checklist https://www.epa.gov/sites/production/files/2014-07/documents/flood-resilience-checklist.pdf
- 2019 State of U.S. High Tide Flooding with a 2020 Outlook (NOAA Technical Report NOS CO-OPS 092) https://tidesandcurrents.noaa.gov/publications/Techrpt_092_2019_State_of_US_High_Tide_Flooding_with_a_2020_Outlook_30June2020.pdf
- How State Governments Can Help Communities Invest in Climate Resilience https://climateresilienceconsulting.us14.list-manage.com/track/click?u=814ca6ca39640751488350b40&id=a2a15463b0&e=99f4bc03a6
- Silver Jackets Teams Facilitate Collaborative Solutions To State Flood Risk Priorities https://silverjackets.nfrmp.us/

International

- UN Framework Convention on Climate Change https://unfccc.int/resource/climateaction2020/
- UN Intergovernmental Panel on Climate Change https://www.ipcc.ch/
- Climate Change https://www.un.org/en/sections/issues-depth/climate-change/
- US Climate Resilience Toolkit https://toolkit.climate.gov/
- Center for Climate and Energy Solutions https://www.c2es.org/
- Scaling Local And Community-based Adaptation: Commissioned by the Global Commission on Adaptation https://cdn.gca.org/assets/2020-06/Local_Adaptation_Paper_-_Global_Commission_on_Adaptation.pdf
- Climate Adapt: Sharing Adaptation Information Across Europe. The economics of managing heavy rains and stormwater in Copenhagen - The Cloudburst Management Plan. https://climate-adapt.eea.europa.eu/metadata/case-studies/the-economics-of-managing-heavy-rains-and-stormwater-in-copenhagen-2013-the-cloudburst-management-plan