Resilient Fairfax

Audit of Existing Policies, Plans, and Programs

March 2022

A Fairfax County, Virginia publication

Acknowledgements

This Report is the result of a collaborative effort between the Office of Environmental and Energy Coordination (OEEC), consultants, county personnel and partners, infrastructure managers, and community members. Resilient Fairfax is supported by three advisory groups: the Planning Team, Infrastructure Advisory Group, and Community Advisory Group. This Report would not be possible without the contributions of the many individuals who played a part in developing or reviewing this Report.

Prepared By

This Report was prepared by the Cadmus Group in coordination with OEEC and the Planning Team.

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Fairfax County Office of Environmental and Energy Coordination

Resilient Fairfax Planning Team: composed of technical leads and subject matter experts from 20 relevant county departments and agencies. The Planning Team is responsible for providing interdepartmental information and coordination, reviewing and providing technical feedback on deliverables, developing recommendations, and assisting OEEC in coordinating between Resilient Fairfax and related initiatives of other county departments.

Department of Emergency Management and Security (DEMS)

Office of Environmental and Energy Coordination (OEEC)

Facilities Management Department (FMD)

Department of Family Services (DFS)

GIS and Mapping Services (GIS)

Health and Human Services (HHS)

Health Department (HD)

Department of Housing and Community Development (DHCD)

Land Development Services (LDS)

Neighborhood and Community Services (NCS)

Northern Virginia Soil & Water Conservation District (NVSWCD)

One Fairfax

Fairfax County Park Authority (FCPA)

Department of Planning & Development (DPD), Planning Division (PD)

Department of Planning and Development (DPD), Zoning Administration Division (ZAD)

Department of Public Safety Communications (DPSC)

Fairfax County Public Schools (FCPS)

Department of Public Works and Environmental Services (DPWES)

Department of Transportation (FCDOT)

DPWES Urban Forest Management Division (UFMD)

Department of Vehicle Services (DVS)

Resilient Fairfax Infrastructure Advisory Group: composed of representatives from utilities and authorities, building industry groups, transportation commissions and authorities, and infrastructure partners at the d. The IAG is responsible for reviewing and providing feedback on key deliverables.

American Society of Highway Engineers (ASHE)

Columbia Gas of Virginia

Cox of Northern Virginia

Dominion Energy

Engineers & Surveyors Institute

Fairfax County Department of Emergency Management and Security (DEMS)Fairfax County Public Schools (FCPS)

Fairfax County Department of Public Works and Environmental Services (DPWES)

Fairfax County Department of Transportation (FCDOT)

Fairfax Water

Federal Emergency Management Agency (FEMA)

Metropolitan Washington Council of Governments (MWCOG)

National Association of Industrial & Office Properties (NAIOP)

Northern Virginia Building Industry Association (NVBIA)

Northern Virginia Electric Cooperative (NOVEC)

Northern Virginia Regional Commission (NVRC)

Northern Virginia Transportation Authority (NVTA)

United States Department of Defense (DOD)– Fort Belvoir Public Works

Verizon

Virginia Department of Conservation & Recreation (VDCR)

Virginia Department of Emergency Management (VDEM)

Virginia Department of Environmental Quality (VDEQ)

Virginia Department of Transportation (VDOT)

Washington Gas

Washington Metropolitan Area Transit Authority (WMATA)

WTS International

Resilient Fairfax Community Advisory Group: composed of representatives from each of the nine magisterial districts, environmental, religious, non-profit, and civil rights organizations, businesses, residential communities, and the county's boards, authorities, and commissions. The CAG is responsible for reviewing and providing feedback on key deliverables.

350 Fairfax

Board Appointed Residents from the following Districts: Braddock, Dranesville, Hunter Mill, Lee, Mason, Mount Vernon, Providence, Springfield, and Sully.

Cornerstones

EcoLatinos

Environmental Quality Advisory Council (EQAC)

Faith Alliance for Climate Solutions (FACS)

Federation of Citizens Associations

George Mason University (GMU)

League of Women Voters

Multicultural Advisory Council

National Association for the Advancement of Colored People (NAACP)

Northern Virginia Chamber of Commerce

Northern Virginia Soil & Water Conservation District (NVSWCD)

Resilient Virginia

Reston Association

Sierra Club, Great Falls Group

Small Business Commission

Tysons Partnership

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Acronyms

BDCD – Building Design and Construction Division
BMP – Best Management Practice
BOS – Board of Supervisors
CAG – Community Advisory Group
CAP – Conservation Assistance Program
CBPA – Chesapeake Bay Preservation Act
CBPO – Chesapeake Bay Preservation Ordinance
CECAP – Community-wide Energy and Climate Action Plan
CIP – Capital Improvement Program
CO-OP – Continuity of Operations Plans
C-PACE – Commercial Property Assessed Clean Energy and Resiliency program
CREAT – Climate Resilience Evaluation and Awareness Tool
CRS – Community Rating System
CRVA – Climate Risk and Vulnerability Assessment
CZM – Virginia Coastal Zone Management
DEMS – Department of Emergency Management and Security
DFS – Department of Family Services
DHCD – Department of Housing and Community Development
DPD – Department of Planning and Development
DPSC – Department of Public Safety Communications
DPWES – Department of Public Works and Environmental Services
D-SNAP – Disaster Supplemental Nutrition Assistance Program
DVS – Department of Vehicle Services
EAP – Emergency Action Plan
EDRB – Environmental and Development Review Branch
EEA – Equity emphasis area
EEAC – Environmental and Energy Advisory Committee
EIP – Environmental Improvement Program
EQC – Environmental Quality Corridor
ESRFV – Empowerment and Support for Residents Facing Vulnerability
FCDOT – Fairfax County Department of Transportation
FCHD – Fairfax County Health Department
FCPA – Fairfax County Park Authority
FCPS – Fairfax County Public Schools
FEMA – Federal Emergency Management Agency
FMD – Facilities Management Department
GIS – Geographic Information Systems
HHS – Health and Human Services
HMP – Hazard Mitigation Plan
IAG – Infrastructure Advisory Group
ICPRB – Interstate Commission on the Potomac River Basin

IDF – intensity-duration-frequency
JET – Joint Environmental Task Force
LDS – Land Development Services
LEED – Leadership in Energy and Environmental Design
LID – Low Impact Development
MARISA – NOAA Mid-Atlantic Regional Integrated Sciences and Assessment Team
MS4 – Municipal Separate Storm Sewer System
MWCOG - Metropolitan Washington Council of Governments
NOAA – National Oceanic and Atmospheric Administration
NCS – Neighborhood and Community Services
NFIP – National Flood Insurance Program
NOVEC – Northern Virginia Electric Cooperative
NVRC – Northern Virginia Regional Commission
NVSWCD – Northern Virginia Soil and Water Conservation District
OEEC – Office of Environmental and Energy Coordination
OES – Operational Energy Strategy
OPEH – Office to Prevent and End Homelessness
PFM – Public Facilities Manual
PT – Planning Team
RL – Repetitive Loss
RPA – Resource Protection Area
SRL – Severe Repetitive Loss
USBC – Uniform Statewide Building Code
VCAP – Virginia Conservation Assistance Program
VDOT – Virginia Department of Transportation
VEPGA – Virginia Energy Purchasing Governmental Association
VRA – Vulnerability and Risk Assessment
WMATA – Washington Metropolitan Area Transit Authority
WTD – Wastewater Treatment Division

Executive Summary

Audit Purpose and Background

Climate change has already amplified hazards such as extreme heat, severe storms, and heavy precipitation in Fairfax County, Virginia. In June 2020, the Board of Supervisors Environmental Committee (BOSEC) resolved to develop a Climate Adaptation and Resiliency Plan to better prepare for and strengthen the resilience of county services, residents, businesses, and infrastructure to climate hazards. The plan is being developed as part of the "Resilient Fairfax" program. The plan is composed of numerous technical reports and analyses, including this report, the Audit of Existing Policies, Plans, and Programs ("Audit").

For this report, the term "Audit" simply refers to an assessment or general examination of governance processes; the term should not be interpreted as a formal legal audit such as those conducted by an auditor.

The purpose of the Audit is to assess existing Fairfax County government policies, plans, and programs through a climate resilience lens. This assessment identifies 1) where Fairfax has already begun to implement best practices for increasing resiliency, 2) opportunities to expand, extend, or accelerate existing initiatives, and 3) gaps where new strategies or policy updates may be needed to address climate resiliency needs. This approach provides a strong foundation for the strategy identification phase of the planning process, ensuring that the selection and development of strategies build upon Fairfax's existing initiatives and address key policy gaps.

The Audit was developed in parallel with the Climate Projections Report and the Climate Vulnerability and Risk Assessment (VRA). Taken together, these analyses supported the identification and prioritization of potential strategies to enhance Fairfax County's resilience to climate change effects.

Audit Structure

This Audit is organized as a series of adaptation and resilience-focused questions under the following sectors, developed to align with the VRA:

- **Population (P)**
- **Governance (G)**
- **Interdisciplinary/Other (I)**
- **Buildings (B)**
- **Water Infrastructure (W)**
- **Energy (E)**
- **Transportation (T)**
- **Natural and Cultural Resources (NR)**

Each sector includes a series of questions containing the following elements: Relevance, Consultant Score, Findings, Opportunities, and Key Supporting Resources. The Consultant Score responds to the question:

"To what extent is this action area a strength in Fairfax County?" where 1 indicates 'Not Strong At All' and 5 indicates 'Very Strong.'

Key Findings

The Audit finds that Fairfax County is active and engaged across all sectors relevant to climate resilience. Fairfax County has numerous areas of strength and important fundamental policies and programs upon which to build. The graphic below outlines the scores for the 49 Audit questions.

Population	P-1	P-2	P-3	P-4						
Governance	G-1	G-2	G-3	G-4	G-5	G-6	G-7	G-8		
Interdisciplinary/Other	I-1	I-2	I-3	I-4	I-5	I-6	I-7			
Buildings & Sites	B-1	B-2	B-3							
Water	W-1	W-2	W-3	W-4	W-5	W-6				
Energy	E-1	E-2	E-3	E-4	E-5	E-6	E-7	E-8		
Transportation & Telecommunications	T-1	T-2	T-3							
Natural & Cultural Resources	NR-1	NR-2	NR-3	NR-4	NR-5	NR-6	NR-7	NR-8	NR-9	NR-10

Scoring Key				
1: Not Strong At All	2: Not So Strong	3: Neutral	4: Strong	5: Very Strong

The Letter-Number code indicates the Audit question per sector. For example, 'P-1' represents Question 1 in the Population Sector.

Main findings for each sector are summarized below:

- **Population:** While Fairfax County is strong in its provision of resources to vulnerable populations in the event of extreme weather, the work to identify vulnerable communities, invest in and engage with these communities is under development and not yet a systematic approach. There is significant work underway to implement the One Fairfax Policy that can ultimately be integrated with Resilient Fairfax to ensure more inclusive processes and more equitable outcomes for vulnerable communities.
- **Governance:** Governance is generally an area of strength for Fairfax County. The county has commitments in place in support of climate action, has dedicated funding and capacity, are working with regional partners, and are supporting cross-sector collaboration through the newly established Office of Energy and Environmental Collaboration. The county is less strong in its work to engage with local entities to take climate action and does not currently have standards for including climate change impacts in the Capital Improvement Plan process.
- **Interdisciplinary/Other:** Interdisciplinary efforts require work to integrate climate action across departments including emergency management, public health and human services, GIS/data

services, and economic development. These efforts are generally less strong and are identified as areas of opportunity for the county. One Interdisciplinary effort identified as an area of strength for the county is the inclusion of climate hazards in the hazard mitigation and emergency response plans.

- **Buildings and Sites:** Fairfax County has limited ability to influence building codes and the current codes do little to require resilient building construction. Fairfax County has strong site development guidelines, with thorough requirements for flooding and stormwater management. There is an identified opportunity for a more systematic approach to implementation resilience measures for county-owned buildings and critical facilities.
- **Water Infrastructure:** Water infrastructure considered plans, policies and programs related to drinking water, wastewater, and stormwater infrastructure. Fairfax Water oversees drinking water infrastructure and has taken steps to increase resilience of these assets. Wastewater and stormwater infrastructure are areas of strength for Fairfax County, with robust efforts underway to improve resilience, such as consideration of climate impacts for the Wastewater Management Program and ongoing development of a comprehensive flood mitigation program.
- **Energy:** Fairfax County has limited ability to directly address energy infrastructure; however, the county has completed significant work to assess back-up power to critical facilities and complete infrastructure upgrades for vulnerable components. Opportunities have been identified to advance energy resilience through increasing energy efficiency, energy diversity, and deployment of energy storage. Additional opportunities include feasibility assessments of solar-plus-storage projects on county property.
- **Transportation**: Fairfax County, the Virginia Department of Transportation (VDOT) and its transportation partners have made notable strides in considering climate projections and vulnerabilities in infrastructure planning. There are opportunities to further integrate climate projections more systematically across departments and entities and for Fairfax to improve collaboration other agencies who plan and maintain transportation infrastructure.
- **Natural and Cultural Resources:** Fairfax County has a strong history of natural resource conservation, particularly related to water quality and stream valley protection. There are numerous policies and programs in place that support protection of the natural environment, including comprehensive regulations for Resource Protection Areas and for floodplains. The county also has numerous initiatives, pilots, and policies related to green infrastructure and nature-based solutions, such as living shorelines.

The Audit identifies more than 100 potential opportunities for the county to consider as it builds out the Resilient Fairfax program. These opportunities and gaps will be considered in the next phase of the Resilient Fairfax planning process and used to inform the development of the county's climate adaptation and resilience strategies.

I. Introduction and Purpose

Fairfax County has made impressive progress in advancing climate action, enabling the county to become a leading example in the region. Across its various departments and agencies, the county has numerous initiatives already in place to address many of the key sectors and impacts that climate change is likely to impact. To better understand the county's existing efforts, the Consultant team conducted an Audit of Fairfax's policies, plans, and programs related to addressing climate vulnerabilities and risks or adaptation and resilience. The Audit was conducted by investigating a series of sector-specific resiliency questions to subjectively gauge the county's progress in various aspects of resiliency. This assessment helps to illuminate opportunities and gaps for strategic implementation.

Purpose

The Consultant Team conducted an Audit of the county's policies, plans, and programs to identify 1) where Fairfax has already begun to implement best practices for increasing resiliency, 2) opportunities to expand, extend, or accelerate existing initiatives, and 3) gaps where new strategies or policy updates may be needed to address climate resiliency needs. The Audit seeks to understand the extent to which Fairfax has taken steps to assess climate impacts in each sector and has incorporated climate change into planning, programming, and policy. This approach provides a strong foundation for the strategy identification phase of the planning process, ensuring that the selection and development of strategies build upon Fairfax's existing initiatives and address key policy gaps.

This document is inherently subjective and qualitative in nature. It does not encompass all climate action underway in the county.

How This Document Fits in Resilient Fairfax

"Resilient Fairfax" is a climate resiliency and adaptation initiative led by the Fairfax County Office of Environmental and Energy Coordination (OEEC). Resilient Fairfax will ultimately be a long-term program of iterative climate planning and implementation that will allow the county to better anticipate, prepare for, respond to, and cope with the changing climate. This overarching planning process is designed to identify top climate hazards, vulnerabilities and risks, gaps in existing policies and programs, strategies to address those gaps, and strategic implementation plan.

The Audit was developed in parallel with the Climate Projections Report and the Climate Vulnerability and Risk Assessment (VRA). Taken together, these analyses supported in identifying and prioritizing potential strategy areas to enhance Fairfax County's resilience to climate change effects.

Climate Projections — **What will Fairfax County's climate look like in 2050 and 2085? What hazards will we face?**

- How hot will it be?
- How severe will the storms be?
- How much precipitation will the County get, and how intense will the rain events be?

Climate Vulnerability & Risk Assessment — **Given the predicted climate hazards, where are we vulnerable? What the the top risks?**

- Which of our infrastructure, populations, and systems are *exposed* to climate hazards?
- Which are sensitive (may shut down) when exposed to climate hazards?
- Which lack the adaptive capacity to easily change to cope with changing condtions?

Audit of Existing Plans, Policies, and Programs — **What is the status of our policies, plans, and programs in terms of climate resilience**?

- How do our policies, plans, and programs compare to best practices? Are they meeting the needs revealed in the Vulnerability & Risk Assessment?
- Which programs are working well and should be potentially expanded?
- Where are the gaps or opportunities to update policies and programs?

Climate Adaptation & Resilience Strategies — **What should we do to enhance the county's resilience to climate hazards?**

- Which strategies would help the county address our climate vulnerabilities and risks?
- Which of these strategies are top priority?

Implementation Roadmap — **What is the plan to implement the priority strategies**?

- How would the strategies be funded?
- Who would be responsible for implementation?
- What is the timeframe for implementation?

Methodology

As a first step, the Consultant team proposed a structure for the Audit, including a proposed list of Audit questions and a proposed list of policies, plans, and programs to be reviewed. The framework is informed by national best practice and experience. OEEC staff sent the proposed structure for review to the Planning Team (PT), Infrastructure Advisory Group (IAG), and Community Advisory Group (CAG). Feedback from these groups was gathered and conveyed to the consultant. To help ensure that relevant documents were reviewed, OEEC provided a spreadsheet of resources with links to 100+ documents.

The Consultant team then independently conducted a literature review, starting with documents indicated as a priority by county staff, and conducting further desk research as needed. To supplement findings from the literature review, stakeholders from various county departments and agencies with extensive firsthand experience related to the policies, plans, and programs shared insight on how those documents translate into actual work on the ground. This feedback was crucial to the thoroughness and accuracy of the assessment as many day-to-day county operations are not apparent or documented in policy and planning documents. Staff feedback was collected through PT meetings, sub-group meetings, questionnaires, review sessions, and follow-up correspondence. Often times, agency feedback offered a comprehensive answer to the Audit question from the agency's perspective and/or provided orientation on the resources to review.

To aid the Consultants in identifying key areas of opportunity for strategies, the 20 county departments on the PT provided preliminary self-assessment "scores" for each question. They answered the following question: *"Based on the Audit findings and your knowledge of Fairfax programs, policies, and actions to date, to what extent do you consider this action area a strength?"* with responses ranging from 1 (not strong at all) to 5 (very strong). The Consultant team then independently evaluated the PT's input on each Audit question and their averaged scores and updated the scores as needed based on national best practice and industry experience.

After revising the document based on PT feedback, the working draft was shared to the IAG, CAG, and PT again for final input. The groups had over one month to provide comments. Stakeholder meetings with the CAG, IAG, and PT, respectively, also provided the opportunity for comment. All comments were then documented and incorporated as applicable and appropriate. The Consultant team then made final revisions of the Audit document, including revising any scores.

How This Document is Organized

This Audit is organized as a series of adaptation and resilience-focused questions under the following sectors, developed to align with the Vulnerability and Risk Assessment:

- **Population**
- **Governance**
- **Interdisciplinary/Other**
- **Buildings**
- **Water Infrastructure**
- **Energy**
- **Transportation**
- **Natural and Cultural Resources**

Each sector includes a series of questions with the following elements:

- **Relevance.** A brief description on the relevance of the question for climate resiliency.
- **Consultant Score.** A subjective and qualitative score developed by findings from an extensive literature review and stakeholder engagement process. The score responds to the question: *"To what extent is this action area a strength in Fairfax County?"* where 1 indicates 'Not Strong At All' and 5 indicates 'Very Strong.'
- **Findings.** The results from the literature review and stakeholder feedback process are documented in this section.
- **Opportunities.** In many instances, this section identifies gaps in policies, plans, and programs that were then later re-assessed during the strategy development phase of Resilient Fairfax. Opportunities listed are written from the lens of actions within the county's control.
- **Key Supporting Resources.** The list of main resources reviewed to answer the Audit question. See the *Citations Matrix* for a thorough list of resources used by sector and their citations.

II. Population

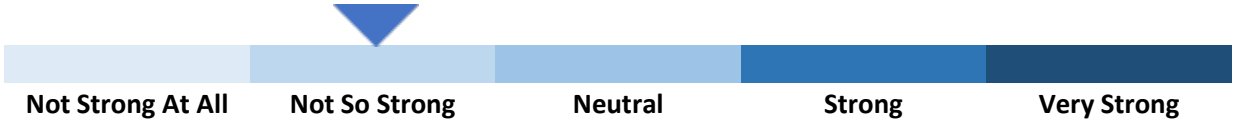
P-1 Has the local government identified communities most vulnerable to climate impacts?

Relevance:

Certain communities may be more vulnerable to climate impacts because they have either higher exposure (i.e., proximity to flooding), higher sensitivity (e.g., pre-existing health conditions), or lower adaptive capacity (i.e., limited resources to adapt to changed conditions). It is imperative that the local government identify these communities to ensure that assistance is allocated equitably.

Findings:

❖ ***Consultant score: 2***



State and regional assessments: The Metropolitan Washington Council of Governments (MWCOG) completed a Regional Climate Risk and Vulnerability Assessment (CRVA) in 2020 that included an assessment of populations vulnerable to climate effects. The results of the CRVA are summarized in the Metropolitan Washington 2030 Climate and Energy Action Plan; these brief summaries are supported by detailed databases and analyses. "Vulnerable populations" identified by MWCOG included low-income, minority and marginalized groups, women and girls, persons in sub-standard housing, people with limited English proficiency, the elderly, children, people with chronic health problems, or disabled persons. Where possible, the regional CRVA overlaid these populations with the Equity Emphasis Areas (EEAs) developed by MWCOG previously for transportation planning purposes. The vulnerability of these populations to a range of climate hazards was assessed.

County-level assessments: Fairfax County has previously identified communities vulnerable to climate change in the Housing and Community Development Five-Year Consolidated Plan (FY 2022-2026). Specifically, item MA-65 Hazard Mitigation includes descriptions of "the jurisdiction's increased natural hazard risks associated with climate change" and "the vulnerability of these risks of housing occupied by low- and moderate-income households based on an analysis of data, findings, and methods." These sections noted that there are 71,172 persons below the poverty line who "have less access to public support and fewer resources to prepare, respond, and recover from a disaster." The section also notes that 38.9 % of Fairfax residents aged 5 and older speak a language other than English at home, which creates an outreach challenge for climate-related disaster notifications. The section also includes

discussion of populations with lack of renter's insurance, lower internet access, poor health conditions, and other vulnerabilities.

The Resilient Fairfax process involves a continuation and expansion of this analysis of communities most vulnerable to climate impacts. Specifically, the Resilient Fairfax Vulnerability and Risk Assessment (VRA) includes analyses of impacts on vulnerable populations for each of the climate hazards identified. Each hazard is analyzed for current and projected (2050) climate conditions. "Vulnerability" is calculated based on levels of exposure, sensitivity, and adaptive capacity. Risk is calculated based on likelihood and severity of consequence. To map locations of population vulnerability, the climate hazards are overlaid with the One Fairfax Vulnerability Index.

In addition to the Resilient Fairfax process, One Fairfax staff are leading a One Fairfax Data Group, composed of representatives of numerous county departments, many of which are also represented on the Resilient Fairfax Planning Team. The One Fairfax Data Group aims to operationalize racial equity tools and data to develop strategies and drive results, normalize shared analysis and definitions, and organize equity leads and teams across county departments. The group is identifying "Communities of Opportunity" for prioritized attention, based on numerous indicators across all sectors, including climate vulnerability indicators as well.

The Department of Public Works and Environmental Services (DPWES) Stormwater Management is in the early planning stages on determining how to best identify communities that are vulnerable to climate change-based flooding.

Opportunities:

- While One Fairfax Vulnerability Index is based on where people live, it is equally important and often more challenging to assess the exposure of populations when they travel or work. While the VRA identifies these considerations (for example, exploring the exposure of outdoor workers and transit riders to extreme heat) there is an opportunity for further assessment of climate risks and mitigation opportunities for vulnerable communities based on work locations.
- There is an opportunity to build in additional climate change specific indicators into the development of "Communities of Opportunity" that would more fully capture vulnerability related to climate change. The indicators currently include income, health access, language, housing cost burden, Urban Island, tree canopy, transportation access, and numerous other factors. Additional climate-related indicators could include energy cost burden and power reliability, flood vulnerability, impaired water bodies, proximity to hazardous waste facilities, and access to cool centers.
- "Communities of Opportunity," once identified, should be integrated into Resilient Fairfax strategies, outreach, and implementation.
- There is an opportunity to support on-going work by DPWES to identify and take action to support communities that are most vulnerable to flooding.

Key Supporting Resources:

- Five-Year Consolidated Plan for FY 2022-2026- and One-Year Action Plan for FY 2022
- Getting Ahead: The Uneven Opportunity Landscape in Northern Virginia
- Healthy Places Index: A New Resource for Measuring Opportunity in Northern Virginia
- Metropolitan Washington 2030 Climate and Energy Action Plan
- Northern Virginia Hazard Mitigation Plan
- NVSWCD Virginia
- One Fairfax Vulnerability Index
- Region Floodplain Management Progress Report 2019: Actions 2, 10, 12
- Richmond Climate Equity Index
- Uneven Opportunities: How Conditions for Wellness Vary Across the Metropolitan Washington
- Virginia Department of Health - Health Opportunity Index

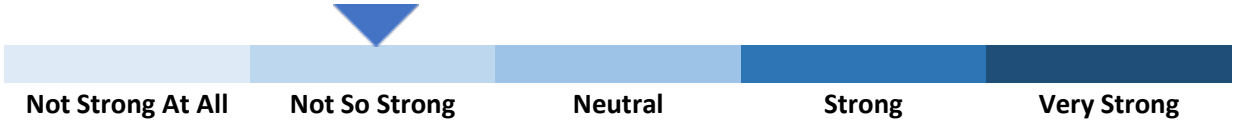
P-2 Does the local government have a process for engaging members of vulnerable communities in climate-related strategy development and implementation?

Relevance:

To develop and implement climate resilience strategies that meet the needs of vulnerable communities, it is imperative that members of vulnerable communities can inform and shape those strategies. Meaningful engagement in strategy development and implementation increases the likelihood of success. In addition, engagement provides the opportunity to build understanding and educate the community about the impacts/risks of climate change. Many resilience strategies require local community action and buy-in and cannot be achieved without community engagement (examples include implementation of green infrastructure, building retrofits, and emergency preparedness actions).

Findings:

❖ ***Consultant score: 2***



The Resilient Fairfax project includes a process for engaging members of the communities in climate-related strategy development and implementation. However, there are opportunities to improve this process for more representative engagement and participation from vulnerable communities. The Resilient Fairfax project engagement process is described below:

- The Resilient Fairfax process includes virtual public meetings during each stage of the process, a web-based public survey, a public comment period, regular news releases and website updates, and OEEC staff contact information available at all times for comment.
- The engagement process also includes the Community Advisory Group (CAG), which is composed of non-profit organizations who work with vulnerable communities, advocacy organizations, and residents of each Supervisor District. However, it should be noted that the demographics of the CAG members themselves are not proportionately representative of Fairfax County's demographic diversity nor the most vulnerable populations. CAG members were nominated by the Board of Supervisors.
- The first Resilient Fairfax public survey was made available online for one month and widely publicized. This survey gathered information on climate vulnerability and concerns from the public. The survey was translated into four languages. However, it should be noted that out of over 600 responses, no respondents used the translated versions.
- The Vulnerability and Risk Assessment (VRA) includes analyses of all climate hazards in relation to vulnerable populations, as defined by the One Fairfax Vulnerability Index.
- OEEC is working with Cornerstones, Neighborhood and Community Services (NCS), and the Office of Public Affairs to improve engagement of vulnerable communities in the Resilient Fairfax process.

In addition to Resilient Fairfax, many Fairfax County departments engage members of vulnerable communities as part of their strategy development, planning, and implementation. All departments are guided by their departmental Equity Impact Plans and by One Fairfax. One Fairfax states that outreach and public participation processes will be inclusive of diverse races, cultures, ages, and other social statuses. Strategies include effective listening, transparency, flexibility, and adaptability to overcome barriers that prevent or limit participation in public processes. Inclusion is not defined through One Fairfax and is open to interpretation.

Additionally, over the past year, a cross-departmental team formed to develop a framework for inclusive, accessible, and authentic community engagement and public participation. The framework is intended to serve as a guide to ensure all voices, including historically underrepresented communities, are welcome in the county's planning and decision-making processes. NCS will have a central role in advancing equitable engagement as part of the new framework, which presents an opportunity for greater partnership and collaboration in planning for climate adaptation and resilience.

For communities with physical vulnerabilities, the Floodplain Management Plan Progress Report (2021), specifies a mitigation action that the Stormwater Planning Division will identify specific outreach techniques for private dam owners. This process assists them with proper dam operation and maintenance. Action 29 is to conduct annual outreach to each FEMA-listed repetitive loss (RL) property owner, providing information on mitigation programs that can assist in reducing their flood risk. This is done by forwarding a letter annually to all properties in the mapped RL areas which shares information on how to prepare for flooding and flood protection measures.

Opportunities:

- There are additional opportunities to enhance OEEC's engagement with vulnerable communities, including those with vulnerable occupations, in the Resilient Fairfax process, by leveraging and deepening existing stakeholder groups, community-based organizations, and the networks and relationships held by entities with established trust in affected communities. Relationship building with community-based organizations and focused outreach in vulnerable communities can work towards ensuring the voices of those community members are an active part of Resilient Fairfax strategy development and implementation.
- There is an opportunity to utilize the county's proposed Inclusive Community Engagement Framework, which provides direction for improving current community engagement practices, allowing department to continue effective strategies while integrating inclusive engagement concepts to expand and deepen participation.
- Expanding opportunities for "citizen science" should be considered to deepen the engagement of citizens. These opportunities provide the space for citizen to be directly involved with plan implementation/local climate adaptation action, as well as providing space for relationship building between the county and community and education opportunities.
- There is an opportunity to use the Community Liaison model to support planning and implementation related to Resilient Fairfax. This strategy involves hiring community-based organizations or individual representatives from environmental justice communities as part of a project team to manage public involvement and community engagement in a culturally competent and meaningful way that delivers more equitable outcomes.

Key Supporting Resources:

- Floodplain Management Plan Progress Report (2021)
- Inclusive Community Engagement Framework
- OEEC Equity Impact Plan
- One Fairfax
- Resilient Fairfax Scope of Work

P-3 Is the county prioritizing investments in areas of greatest need (in terms of population equity)?

Relevance:

Historically, many vulnerable communities have experienced under-investment. In terms of population equity, prioritizing investments in areas of greatest need ensures that investments are made in an equitable way and that the needs of vulnerable communities are prioritized. This approach is fundamental to the pursuit of community resilience.

Findings:

- ***Consultant score: 2***

Investments in Fairfax County are prioritized in areas of greatest need, yet there are opportunities for notable improvement. Numerous county departments regularly use demographic and other vulnerability assessment data to prioritize plans, projects, and investments in areas of greatest need. However, there is room for improvement in streamlining these processes, and in ensuring that these equity evaluations translate to equitable investments.

The One Fairfax Vulnerability Index is the most common source of equity data for investment prioritization by county departments. For example, OEEC is using One Fairfax as a base layer for the climate vulnerability and risk assessment. Some agencies within Health and Human Services (HHS) use the One Fairfax Vulnerability Index for service and program prioritization. The Urban Forest Management Division has used One Fairfax's Vulnerability Index to analyze tree canopy countywide and to prioritize the DPWES service provision. Beyond identification of these vulnerable areas, the Urban Forest Management Division has launched a pilot program in partnership with Casey Trees to plant trees on residential properties in vulnerable neighborhoods, using the One Fairfax lens. DPWES' other divisions, such as stormwater planning and wastewater management, use One Fairfax's Vulnerability Index to prioritize infrastructure and service provision in areas of greatest need.

Other departments do not use One Fairfax's Vulnerability Index specifically, but still aim to equitably distribute projects. For example, Fairfax County Park Authority (FCPA) prioritizes projects with an intent to evenly distribute park upgrades across all Supervisor Districts. However, there is some variability in this approach because some parks facilities are clustered within certain districts. For FCPA Natural Resources work, prioritization is based on ecological need, but there is still an effort to distribute work across Supervisor Districts.

Fairfax County's Department of Transportation (FCDOT)'s Active Fairfax program uses a "needs" map for prioritization purposes. Fairfax Connector and FCDOT's Capital Project's group use equity considerations

for their processes, guided by methodology from US DOT, FHWA, and FTA. To identify and align the transit service to those populations with the greatest transit needs, the Transit Services Division has developed a continuous planning effort referred to as route optimization. Each year, the transit network within a different route optimization area will be analyzed for origin-destination patterns, inefficiencies, potential short-term service changes, and recommended service changes for inclusion in the Transit Strategic Plan annual and ten-year updates. The route optimization studies utilize a series of data inputs and a tier analysis methodology to identify the transit network that best aligns with travel demands, while assessing the productivity and performance of existing routes. Data inputs are generated by the Fairfax Connector Intelligent Transportation System fleet technology, which tracks boardings and alightings by stop and route, peak bus loads, on-time performance, and travel time by segment and time of day. Other data inputs include online and onboard surveys of non-riders and riders, social-economic data expressed as a transit propensity measure, and origin-destination model outputs.

Equitable distribution of investments was an issue raised by the BOS Chairman's Task Force on Equity, which recommended the county undertake the following: "Evaluate Fairfax County systems, including the proffer system and the contracting and procurement systems, to promote equitable and transparent asset, investment and resource distribution countywide."

For certain departments, work needs to be prioritized based on immediate need, rather than countywide equity evaluations. For example, the Facilities Management Department (FMD) capital renewal project prioritization is based on facilities and equipment that are currently failing, nearing the end of their life cycle, or in immediate need of attention.

Opportunities:

- Currently, the sources and methodologies of equity data for investment prioritization vary slightly because certain departments are guided by different regulations at the state and federal levels. Several county departments use the One Fairfax Vulnerability Index as a guide, but there is need for better coordination between these departments. To facilitate this greater coordination, the One Fairfax Data Group (an interdepartmental group) is currently working to identify, update, streamline, and coordinate equity indicators to facilitate county prioritization of investment in "Communities of Opportunity," or areas of greatest need. There is opportunity for improvement in terms of infrastructure and facility prioritization in communities of greatest need.
- Currently the Capital Improvement Program (CIP) scoring criteria does not prioritize communities most "in need" over other communities. Therefore, there is an opportunity to incorporate criteria in the CIP scoring and budgeting process to help prioritize investments in communities of greatest need.

Key Supporting Resources:

- ActiveFairfax Transportation Plan
- Capital Improvement Program (CIP)

- Chairman's Task Force on Equity Recommendations & Presentation to the BOS
- EIP Scoring Rubric
- FCPA 2021 Equity Impact Plan
- FCPA Natural Resource Management Plan
- Non-native Invasive Assessment Prioritization Protocol (2015)
- Northern Virginia Hazard Mitigation Plan
- One Fairfax Vulnerability Index
- Resilient Fairfax Scope of Work
- Urban Forestry Document: "Where Should we Plant Trees?"
- Virginia Conservation Assistance Program (VCAP)

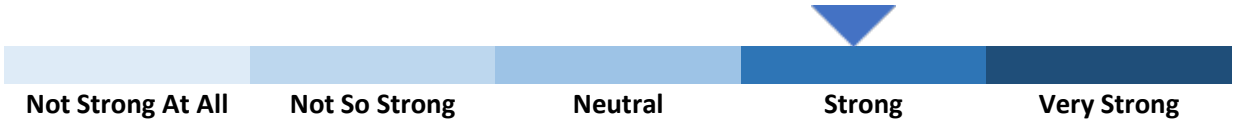
P-4 Does the local government offer resources to vulnerable populations in the event of extreme weather?

Relevance:

Vulnerable communities are more likely to be impacted by extreme weather and are likely to have a harder time recovering. To bolster the resilience of these communities requires targeted support and resources before, during, and after an extreme weather event

Findings:

❖ ***Consultant score: 4***



Fairfax County government offers numerous resources to vulnerable populations in the event of extreme weather. The Fairfax County Emergency Operations Plan specifies that the county may open a Service and Information Center to assist residents after a disaster, provide temporary shelter if needed, facilitate loans or grants for damages from a disaster, and meet unmet needs through nonprofit assistance.

The Department of Family Services (DFS), on behalf of the Virginia Department of Social Services, offers Energy Assistance for those who are unable to afford air conditioning during extreme heat, or heating during extreme cold. Additionally, during declared disasters, DFS may be authorized to administer the Disaster Supplemental Nutrition Assistance Program (D-SNAP) which allows modifications to the ordinary SNAP program. These modifications help eligible low-to-moderate income households who do not normally receive SNAP benefits with help buying or replacing groceries due to lost income or damages

following a disaster such as a hurricane. SNAP clients are also eligible for food replacement due to loss of power.

The Department of Emergency Management and Security (DEMS)' Ready Fairfax encourages residents to create an emergency plan, make an emergency kit, and sign up for emergency alerts. The program is focused more on advance preparation than on providing resources in the case of an emergency.

Fairfax County's Neighborhood and Community Services (NCS) offers a Basic Needs and Assistance program which is supported by a hotline to call for assistance with any difficulties such as food, shelter, utility costs, employment, financial assistance, healthcare, or other needs. This program is not specific to disaster response. They also provide cooling and heating centers, shelters, and evacuation centers.

Additionally, the county partners closely with non-profit organizations such as Cornerstones, Good Shepherd Housing, Ecumenical Community Helping Others, For Immediate Sympathetic Help, Koinonia, United Community, Lorton Community Action Center, and others. The Office to Prevent and End Homelessness (OPEH) works with Cornerstones, FACETS, and New Hope Housing on the Hypothermia Prevention Program, which exists to protect from the "extreme weather" of winter.

Opportunities:

- There are opportunities for Fairfax County to specifically identify preventative initiatives, programs, and other resources that are not currently offered to reduce vulnerable populations' susceptibility to extreme weather events.
- Because "resilience" is a broad framework that incorporates so many components of social and physical well-being, there is an opportunity to bring together a variety of programs, such as food security, energy affordability, housing, health, and mobility together with shared messaging and collaborative programming in ways that will better meet the needs of the community.

Key Supporting Resources:

- D-SNAP
- Emergency Operations Plan
- Energy Assistance
- Neighborhood & Community Services (NCS) Programs, Basic Needs and Assistance Hotline
- Ready Fairfax
- Shelter Plan (Annex to Emergency Operations Plan)

III. Governance

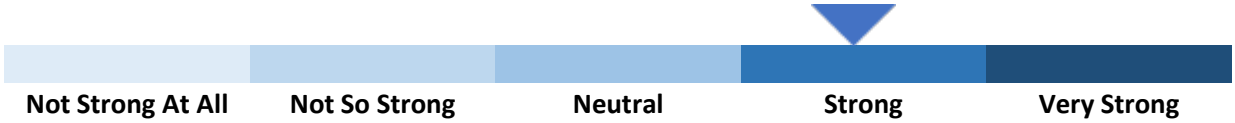
G-1 Has the local government made a formal commitment to prepare for climate change impacts?

Relevance:

Government commitments to climate initiatives help ensure that adequate funding, resources, and political will are available to bring climate resilience efforts to fruition.

Findings:

❖ ***Consultant score: 4***



The Fairfax County Board of Supervisors (BOS) has set the framework for the county's climate initiatives through its vision, goals, and policies. To date, the majority of Fairfax County government commitments relating to climate change have related to emissions reductions, but there has been an increasing focus on resilience and adaptation as well. The BOS initiatives and declarations related to climate change include:

- **Cool Counties Declaration (2007):** Fairfax County led a national pledge to reduce emissions to 80% below 2005 levels by 2050. While the declaration was focused on emissions reduction, it cited climate impacts such as "extreme weather events, droughts, floods" and other impacts as the basis for the action. This declaration was superseded by the Carbon Neutral Counties Declaration in 2021.
- **Region Forward Vision and Greater Washington 2050 Compact (2010)**: The compact is a set of regional planning goals shared by local governments in the National Capital Region to support the Metropolitan Washington Council of Governments (MWCOG) Region Forward Vision. The Vision includes a "climate and energy" section. While the document is mainly focused on emissions reduction, the Vision does mention resilience, largely in reference to economic resilience.
- **Environmental Vision (2017 update):** The county's Environmental Vision helps to guide environmental sustainability initiatives, strategies, policies, and programs. The 2017 update included the following resilience text: "identify climate change impacts likely to affect the county and its population, engage in resilience planning to prepare for these impacts, and implement appropriate adaptation actions." This was one of the documents that catalyzed the creation of Resilient Fairfax.

- **Joint Environmental Task Force (JET) Final Report (2019-2020)**: JET was a collaboration between the Fairfax County BOS and the Fairfax County School Board to jointly address climate change and environmental sustainability. The JET released its Final Report in November 2020 which included a number of recommendations for county operations on energy, transportation, waste management and workforce development.
- **Fairfax Green Initiatives #1 (February 2019)** and **#2 (July 2020**): These are a set of environmental and energy-related initiatives adopted by the BOS to advance sustainability and climate action in the county. Initiative 4f includes the following climate resilience text, "identify timeframe for developing a county-specific Climate Resiliency and Adaptation Plan." This recommended plan evolved into Resilient Fairfax.
- **Operational Energy Strategy Update (OES) (2021 update)**: Originally adopted in 2018, the OES sets goals, targets, and actions across major focus areas for energy use in county government operations.
- **Carbon Neutral Counties Declaration (2021)**: This declaration is a commitment by the BOS to carbon neutrality for government operations by 2040, supported by the Fairfax County OES, updated in 2021. This declaration is largely focused on emissions reduction but does cite climate impacts as the basis for the declaration.
- **Fairfax County Community-wide Energy and Climate Action Plan (CECAP) (2021):** Accepted by the BOS in 2021, Fairfax County's first greenhouse gas emission reduction plan was developed by the community. CECAP outlines greenhouse gas reduction goals, strategies, and actions community members, such as residents, businesses, organizations, and other stakeholders in Fairfax County, can take to help reduce their collective carbon emissions.
- **Fairfax Countywide Strategic Plan (2021):** The county's first countywide strategic plan included several mentions of climate change, including preparation for climate effects.
- **Sustainability Initiatives (Annual):** This report provides an overview of the county's many environmental sustainability and stewardship projects and programs that support the county's energy and environmental goals as identified in the Board of Supervisors' Environmental Vision, Energy Policy, and Comprehensive Plan.
- **Resilient Fairfax (Ongoing):** This Resilient Fairfax process is being conducted at the direction of the Board to help the county prepare for climate change impacts.

Opportunities:

- There is an opportunity for stronger resilience-focused commitments, as most Fairfax County climate-related commitments focus on emissions reduction. The Resilient Fairfax process itself is designed to close this gap.
- In some cases, there is a gap between declarations made by the BOS and the funding, staffing, and procedures of the departmental staff responsible for implementation. For example, the BOS

may commit to climate-related goals for internal county government operations, but operational staff may lack the funding, capacity, procedures, or infrastructural ability to fully meet those goals. For countywide (non-governmental) goals, parallel changes may also need to be made to state and federal legislation, technology advancements, utility company commitments and infrastructure upgrades, Zoning Ordinance, Public Facilities Manual (PFM), Comprehensive Plan, Building Code, and other ordinances to enable the county to meet those goals.

Key Supporting Resources:

- Carbon Neutral Counties Declaration (2021)
- Community-Wide Energy and Climate Action Plan (CECAP) (2021)
- Cool Counties Declaration (2007)
- Environmental Vision (2017 update)
- Fairfax County Comprehensive Plan
- Fairfax Countywide Strategic Plan
- Fairfax County Sustainability Initiatives Report
- Fairfax Green Initiatives #1 (February 2019) and #2 (July 2020)
- Joint Environmental Task Force Final Report
- Operational Energy Strategy Update 2021
- Public Facilities Manual (PFM)
- Region Forward Vision and Greater Washington 2050 Compact (2010)
- Resilient Fairfax Charters and Scope of Work
- Virginia Uniform Statewide Building Code (USBC)

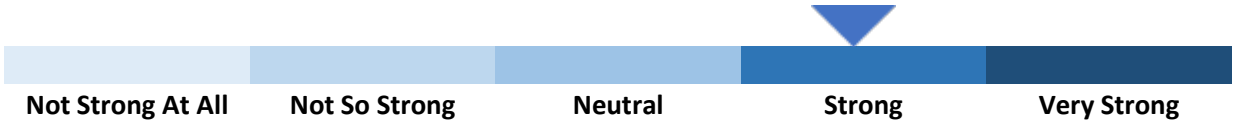
G-2 Does the local government have dedicated funding and capacity for climate planning and resiliency staff?

Relevance:

Climate resiliency planning requires dedicated staff and funding to be successful.

Findings:

❖ ***Consultant score: 4***



Climate planning and related staff: Fairfax County, particularly OEEC, has dedicated staff capacity for ongoing climate planning, resiliency, energy, and other related environmental initiatives. As of October 2021, OEEC has thirteen (13) staff members, and is in the process of hiring additional staff to further support climate planning, environmental policy, and energy initiatives. In addition to OEEC, several other departments and entities such as the Department of Public Works and Environmental Services (DPWES), the Department of Planning and Development (DPD), Fairfax County Health Department (FCHD), Fairfax County Park Authority (FCPA), the Department of Emergency Management and Security (DEMS), and others have staff that tangentially support climate resilience-related planning. The need for additional resources and funding related to climate change resiliency will be assessed during the development of strategies and the implementation roadmap, based on the results of the VRA.

Funding: Fairfax County has funding for ongoing climate planning and climate related initiatives. Funding and financial resources for climate and environmental initiatives are incorporated into various agencies' programs, as outlined in the FY 2022 Adopted Budget Plan. The Environment and Energy Program fund directly supports the BOS' environmental initiatives managed by OEEC, including climate action planning and implementation. In addition to the annual budget process, additional funding and staffing for initiatives included in the Environmental and Energy Program have also been allocated during the third quarter and carryover budget process. For example, the FY2021 carryover package includes $18.68 million for continued support of the county's environmental and energy strategies. This includes $15.48 million to support the investment needed to begin reducing carbon emissions consistent with the BOS' Carbon Neutral Counties Declaration, the goals, and targets of its updated OES, and the goals of the CECAP. Additionally, the Environment and Energy Program includes the Environmental Improvement Program (EIP) that funds additional environmental and energy action-oriented projects proposed by Fairfax County staff of various departments. The approved FY 2022 budget for this program alone is approximately $4.6 million.

In addition to this funding, various county entities such as DPWES, FCPA, DPD, FCHD, DEMS, and others have budget items that tangentially support climate resilience related initiatives. For example, the county's Stormwater service district, established in FY 2010, provides a dedicated funding source for both operating and capital project requirements, by levying a service rate of $0.0325 per $100 of assessed real estate value. This revenue funds implementation of watershed master plans, public outreach efforts, stormwater monitoring activities, water quality improvements, stormwater conveyance system maintenance, regulatory requirements, and flood mitigation. An ultimate rate of $0.0400 per $100 of assessed value has been estimated to be required to fully support the stormwater program in the future. Other DPWES agencies, like Wastewater and Solid Waste, have enterprise funds or service charges that generate revenue to support staff, operations, and Capital Improvement Program (CIP). The majority of funding for other capital facilities (police and fire, libraries, administrative buildings, and road improvements) uses general obligation bonds. The General Fund and grants make up most of the remaining sources for these capital facility programs. These programs do not currently include resources to specifically address climate adaptation and resilience.

Opportunities:

- There is currently no dedicated funding source specific to climate adaptation and resiliency implementation; the current annual budget amounts support planning – CECAP/Resident Fairfax as well as a certain level of OES implementation. The Resilient Fairfax Implementation Roadmap will establish the need for a dedicated funding source for future fiscal years and 5-year CIP.
- There is an opportunity to better leverage state and federal funding through collaboration on grant applications between county departments and at the regional level.

Key Supporting Resources:

- Board of Supervisors Questions on the FY 2022 Budget
- Capital Improvement Program (CIP)
- Carbon Neutral Counties Declaration (2021)
- Carryover Budget Package FY2021
- Community-Wide Energy and Climate Action Plan (CECAP) (2021)
- Environmental Improvement Program (EIP)
- FY 2022 Adopted Budget Plan
- Operational Energy Strategy Update 2021

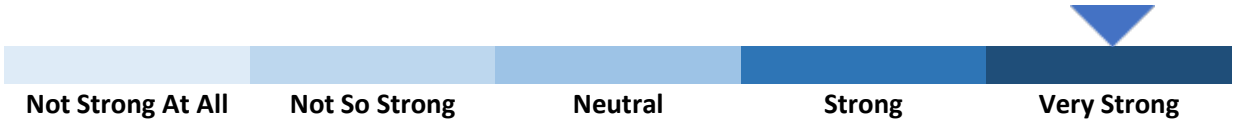
G-3 Does the local government have a collaborative cross-sector body empowered to lead climate adaptation efforts across departments?

Relevance:

Climate resiliency is an interdisciplinary topic relevant to most departments. For example, a severe hurricane affects residents (Department of Family Services (DFS), Neighborhood and Community Services (NCS), Fairfax County Health Department (FCHD), infrastructure (Department of Public Works and Environmental Services (DPWES), Fairfax County Department of Transportation (FCDOT), buildings and sites (Land Development Services (LDS), Department of Planning and Development (DPD), and requires emergency response (Department of Public Safety Communications (DPSC), Department of Emergency Management and Security (DEMS), police, Fire and Rescue Department, Department of Vehicle Services (DVS), to name a few. Collaboration and coordination across different departments and agencies is critical to success.

Findings:

❖ ***Consultant score: 5***



Fairfax County has a collaborative, cross-sector body empowered to lead climate adaptation planning and implementation across departments: the Office of Environmental and Energy Coordination (OEEC). This office supports development and implementation of effective environmental and energy policies, goals, programs, and projects across and between county agencies. By reporting directly to the County Executive, rather than being housed within any specific department, OEEC is structured to provide this inter-agency collaboration. OEEC was created in July 2019.

In addition to OEEC itself, there are other interdepartmental groups that work collaboratively for specific purposes within the larger umbrella of climate planning and implementation. The following are examples of such groups:

- The Environmental and Energy Advisory Committee (EEAC) was formed to achieve the goals and targets of the Environmental Vision, the Operational Energy Strategy, One Fairfax, and Health in All Things, a policy approach that actively embeds health considerations into decision-making processes within Fairfax County government agencies.
- The Resilient Fairfax Planning Team (PT) was formed as an interagency body to support collaboration on the Resilient Fairfax Plan specifically. The PT includes 20 county entities, including the following: OEEC, Department of Emergency Management and Security (DEMS), Department of Family Services (DFS), Department of Housing and Community Development (DHCD), Department of Planning and Development (DPD), including both Planning Division and Zoning, Department of Public Safety Communications (DPSC), Department of Vehicle Services (DVS), Department of Public Works and Environmental Services (DPWES), including Urban Forestry, Stormwater, and Wastewater, Fairfax County Department of Transportation, Fairfax County Health Department (FHCD), Fairfax County Park Authority (FCPA), Fairfax County Public Schools (FCPS), Geographic Information Systems (GIS), Land Development Services (LDS), Neighborhood and Community Services (NCS), Northern Virginia Soil and Water Conservation District (NVSWCD), and One Fairfax.
- The Emergency Response Plans (which address climate hazards, such as flooding) are created through coordination with the following entities: Fire and Rescue Department, Police Department, DPWES, FCHD, DFS, Office of Public Affairs, DEMS, NCS, DPSC, FCDOT, FCPS, FCPA, and National Weather Service.

Opportunities:

- There is an opportunity to strengthen engagement with the county's Health and Human Services (HHS) agencies on the subject of climate resilience. Many departments within HHS, such as NCS, DFS, DHCD and Fairfax County Redevelopment and Housing Authority, already conduct strong community engagement with populations that may be the most vulnerable when exposed to climate effects. Engagement should include consideration for how climate impacts Social Determinants of Health. Social Determinants of Health are conditions that impact a variety of health, quality of living outcomes, and risks such as access to transportation, safe housing, food, clean water and air, employment, and economic stability. Stronger collaboration with these entities could help to involve and raise awareness of potential climate change impacts among vulnerable populations and historically underrepresented communities who are more likely to experience barriers to resources. In addition, the HHS Planning and Development Review Network, a forum for HHS agencies to coordinate collaboratively on cross-agency land development and planning priorities, can be more intentionally engaged with climate adaptation planning and implementation.

Key Supporting Resources:

- Environmental and Energy Advisory Committee (EEAC) Charter
- OEEC Webpage and Mission
- Resilient Fairfax Planning Team Charter

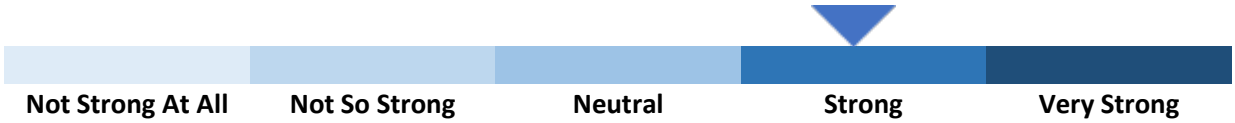
G-4 Does the local government engage with a regional entity taking action to address climate change?

Relevance:

Climate change impacts such as flooding and severe storms do not stop at jurisdictional boundaries. Additionally, some actions taken by localities (such as flood mitigation) may unintentionally and negatively affect neighboring localities if not coordinated well. Regional collaboration on climate resilience helps ensure the success of each locality in the region.

Findings:

❖ ***Consultant score: 4***



Fairfax County regularly engages and collaborates with regional entities such as the Metropolitan Washington Council of Governments (MWCOG) and the Northern Virginia Regional Commission (NVRC), to address climate change. Additionally, county staff are active participants in numerous other regional and statewide initiatives and groups relating to climate resilience, including but not limited to the following: the Virginia Municipal Stormwater Association, the Virginia Forestry Association, the Virginia Association of Forest Health Professionals, Southeast Sustainability Directors Network, American Planning Association local and state chapters, Resilient Virginia, and the Virginia Energy and Sustainability Peer Network, among others. Specific examples include:

- **OEEC:** OEEC staff regularly attend MWCOG's Climate Energy and Environment Policy Committee meetings and coordinate regularly with NVRC on resiliency planning, including through the NVRC Flood Mitigation and Resiliency Workgroup. OEEC is also an active participant in the Northern Virginia Hazard Mitigation Plan (HMP), a regional planning process facilitated by emergency management staff. OEEC is leading the county's collaboration with Virginia's Secretary of Natural Resources on the Virginia Coastal Resilience Master Plan. Other agencies within Fairfax County have been asked to participate in portions of this project, including DPD, LDS and DPWES. Additionally, OEEC participates in the Urban Stormwater Workgroup, Southeast Sustainability Directors Network, Virginia Municipal Stormwater Association, American Planning Association, Virginia Energy and Sustainability Peer Network, Virginia Energy Efficiency Council and meets periodically with environmental staff from neighboring jurisdictions.
- **DPD:** The Department of Planning and Development regularly attends several MWCOG committee meetings and provides presentations on environmental Comprehensive Plan amendments, including the Planning Directors meetings, Region Forward, Cooperative Forecasting, and Subcommittee meetings among others.
- **DPSC:** The Department of Public Safety Communications participates in the Public Safety Answering Point Managers' Forum, facilitated by MWCOG. Additionally, there are regional Mutual Aid Agreements to share police and fire department staff across jurisdictions. DPSC's technological staff lead regional and national groups to stay up to date on the latest technologies for public safety alerts.
- **DPWES:** The Department of Public Works and Environmental Services (DPWES) attends MWCOG committee meetings such as the Water Resources Technical Committee, the National Capital Region Water Utility Coordination call, and the Regional Tree Canopy Subcommittee, among others. DPWES's Wastewater Management Program also participates in the National

Association of Clean Water Agencies, the Water Environment Federations, and the Virginia Water Environment Association.

- **FCHD:** Fairfax County Health Department (FCHD) has participated in Region Forward and in MWCOG health committee meetings.
- **NCS:** Neighborhood and Community Services (NCS) collaborates regularly with the Virginia Cooperative Extension Office to provide access to community resources and programs, including natural resources and health programs. Although the Virginia Cooperative Extension is a statewide organization, the local office in Fairfax is embedded in the county's NCS.
- **NVSWCD:** Northern Virginia Soil and Water Conservation District (NVSWCD) is not technically a county department but is a close partner of the county and member of the Resilient Fairfax Planning Team. NVSWCD conducts regional programs and works regularly with NVRC and MWCOG. Their regional climate resiliency work includes the rain barrel program, education campaigns, Municipal Separate Storm Sewer System (MS4) programs, urban agriculture groups, the Potomac Watershed roundtable, and the Virginia Soil Health Coalition, among others.
- **DEMS**: The Department of Emergency Management and Security (DEMS) collaborates with Regional Preparedness Specialists, a group facilitated through MWCOG, and works actively with other northern Virginia localities to develop the Northern Virginia HMP. DEMS and its county partnering agencies also participate with the Regional Hazard Mitigation Group. Fairfax County is also part of state-wide mutual aid agreement related to Emergency Management.

Fairfax County is a signatory of the Greater Washington 2050 Region Forward Compact, which sets out shared goals across the Greater Washington region.

Opportunities:

- Build on regional partnerships to improve and fund outreach and education, develop, and implement best practices and collaborate on projects in neighboring communities.
- Recent legislation requires the Virginia Department of Transportation (VDOT) to consider resilience for individual transportation projects as well as the statewide transportation plan. This might present an opportunity to strengthen collaboration between FCDOT and VDOT on resilience.

Key Supporting Resources:

- Metropolitan Washington Council of Governments (MWCOG) Metropolitan Washington 2030 Climate and Energy Action Plan
- Northern Virginia Hazard Mitigation Plan
- NVRC Resilient Critical Infrastructure: A Roadmap for Northern Virginia
- Region Forward Vision and Greater Washington 2050 Compact (2010)

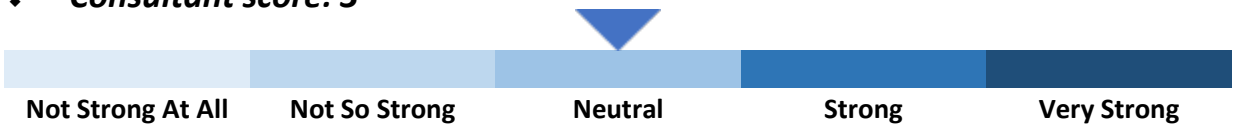
G-5 Does the local government engage with local entities taking action to address climate change?

Relevance:

Climate resilience planning implementation is more successful and context-sensitive if local entities such as non-profit organizations, advocacy groups, homeowner's associations, universities, and local businesses are meaningfully engaged in the process.

Findings:

❖ ***Consultant score: 3***



Fairfax County engages with local businesses and community partners through a variety of different programs and initiatives in both formal and informal ways. OEEC engages with business and community partners during specific planning processes, as shown in the CECAP Working Group and the Resilient Fairfax Community Advisory Group (CAG). OEEC also engages with local entities on an ongoing basis through programs such as Energy Action Fairfax, HomeWise, Green Business Partners, Commercial Property Assessed Clean Energy and Resiliency program (C-PACE), and Solarize Fairfax County.

Fairfax Green Business Partners is an example of an ongoing effort to engage with local businesses that could be leveraged for enhanced engagement on climate resilience. This is a free, membership-based program. To join, a business must have at least one location in Fairfax County, must take at least five sustainability actions, and must have at least one quantitative result, such as 'energy saved' or 'waste reduced.' The required actions are related broadly to sustainability (management and leadership, energy, waste, water, and transportation). Membership is renewed every three years. There are currently 19 members.

In addition to OEEC, other departments engage with local entities on climate change. For example, the Fairfax County Health Department (FCHD) has engaged with Faith Alliance for Climate Solutions and Coalition for Smarter Growth. The Department of Public Safety Communications (DPSC) engages with local entities for follow up after disaster events. The Northern Virginia Soil and Water Conservation District (NVSWCD) focuses on local engagement and has a large number of local partnerships with environmental groups and the nursery and landscape industry. Additionally, NVSWCD works with the public on the Virginia Conservation Assistance Program (VCAP) and other technical assistance for natural resource concerns including flooding.

Opportunities:

- While each of these engagement efforts provide a means to engage with some community members and organizations, there is an identified need to strengthen partnerships and ongoing collaboration/engagement with community organizations on climate concerns. Some departments currently separately engage with the same community groups; coordination on this engagement would be helpful for consistent messaging and enhanced coordination.
- County departments such as NCS, DFS, and DHCD currently conduct robust community engagement in areas highly sensitive to climate effects. There are opportunities to leverage this existing trust and outreach to ensure these communities are meaningfully engaged in climate resilience initiatives.
- Fairfax Green Business Partners is an existing OEEC program that could be expanded and leveraged to include climate resilience initiatives.
- C-PACE, which helps to fund substantial resiliency improvements for commercial properties, should be more widely used.

  Local universities such as George Mason University have expressed interest in partnering with the county for environmental engagement.

Key Supporting Resources:

- Community-Wide Energy and Climate Action Plan (CECAP) (2021)
- C-PACE Webpage
- Energy Action Fairfax Webpage
- Fairfax County Sustainability Initiatives Report FY 2020
- Green Business Partners Webpage
- HomeWise Webpage
- NVSWCD Strategic Plan
- Resilient Fairfax IAG and CAG Charters
- Solarize Fairfax County Webpage
- Virginia Conservation Assistance Program (VCAP) Webpage

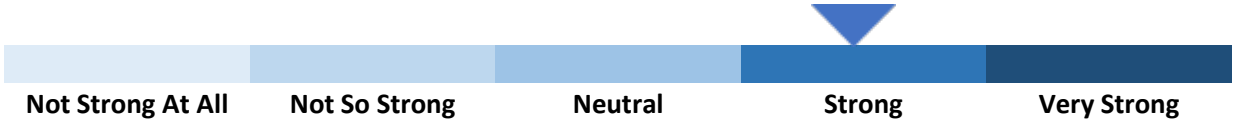
G-6 Does the local government have a stated policy for the inclusion of equity in their climate planning? Is equity tied to project evaluation and/or funding criteria?

Relevance:

Climate change disproportionately impacts certain populations, such as those who live in areas of historic underinvestment and outdated infrastructure, those with lower income levels, those with pre-existing health conditions, among others. Climate planning should meaningfully include equity considerations in every step of the process, including community engagement, vulnerability assessments, strategies, and implementation.

Findings:

- ***Consultant score: 4***



At the regional level, Northern Virginia jurisdictions, including Fairfax County, established an objective of "ensuring equitable access to resilient critical infrastructure" through the "Regional Collaboration to Build Community Resilience in Northern Virginia" initiative.

At the county level, Fairfax County has a stated policy, "One Fairfax" (2017), for the inclusion of equity in decision-making and all actions. This policy does not specifically mention climate planning, but it does require that the BOS and School Board must "consider equity in decision-making and in the development and delivery of future policies, programs, and services." One Fairfax provides an accountability framework, specifies considerations to achieve equity, and aims to ensure that all persons can fully participate in the opportunities of Fairfax County regardless of age, race, color, sex, sexual orientation, gender identity, religion, national origin, marital status, disability, socio-economic status, or neighborhood. The One Fairfax Policy is supplemented by resources, including the Vulnerability Index, which is a countywide map to facilitate equity evaluations. While evaluation criteria are not defined, departments use the Vulnerability Index in their planning initiatives to follow One Fairfax's intent. Resilient Fairfax is using the One Fairfax Vulnerability Index as a base layer of the Vulnerability and Risk Assessment (VRA).

In terms of countywide funding criteria and project evaluation, the Department of Management and Budget now has requirements to consider equity in the budgeting process. Additionally, there is currently an interdepartmental, interdisciplinary "One Fairfax Data Group" that is working to create an extensive list of measurable, mappable equity indicators. Climate-related indicators are included in the "health and environment" category of the data, and the goal of this effort is to direct resources to "Communities of Opportunity" and evaluate success over time. The development of these measurable

indicators will lay the groundwork for criteria for resource allocation and project evaluation coming in the near future.

In addition to One Fairfax, the county's first proposed Countywide Strategic Plan (2021) includes stated policies for inclusion of equity. The Countywide Strategic Plan is intended to provide a framework for funding and resource allocation. The priority area "Empowerment and Support for Residents Facing Vulnerability" (ESRFV) could be interpreted as applicable to climate vulnerability. This section guides county staff to proactively engage residents experiencing vulnerability, to improve access, provide people-centered and integrated services, and sustain self-sufficiency. Strategy ESRFV 4 states, "use all available sources of data to identify and understand emerging and existing vulnerabilities in order to proactively engage impacted residents, identify service gaps and efficiently allocate resources."

Within climate planning initiatives specifically, OEEC is guided by the OEEC Equity Impact Plan, which details OEEC's commitment to and processes for incorporation of equity. Resilient Fairfax and the CECAP actively promote racial equity and social justice for equitable implementation of climate mitigation and resiliency strategies. Both climate initiatives' charter documents and Scopes of Work include stated policies relating to equity. The Vulnerability and Risk Assessment prepared for Resilient Fairfax will include a section on vulnerable populations, covering each hazard and related implications for residents facing vulnerability to climate impacts. Strategies for climate resilience will be based upon the results of this VRA, and strategies will be prioritized based on scoring criteria that include equity considerations. The Implementation Roadmap will list equity considerations for each strategy.

Opportunities:

- There is an opportunity to strengthen collaboration between OEEC and the county's Health and Human Services (HHS) agencies to address climate vulnerability and implementation of the ESRFV priority area of the Countywide Strategic Plan.
- Decisions concerning infrastructure and policymaking should include an equity lens and consider impacts to vulnerable populations.

Key Supporting Resources:

- Community-Wide Energy and Climate Action Plan (CECAP) Scope of Work
- Fairfax Countywide Strategic Plan (Tollgate #1 Summary, Health and Environment)
- OEEC Equity Impact Plan
- One Fairfax
- Resilient Fairfax Scope of Work

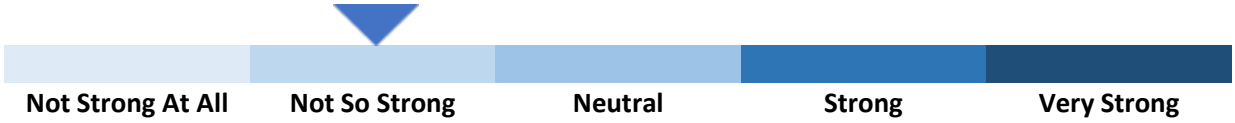
G-7 Does the local government include standards for considering climate change impacts in Capital Improvement Program (CIP) project assessment criteria?

Relevance:

The Capital Improvement Program (CIP) guides the investment of local resources for capital infrastructure. Incorporating considerations for climate change impacts and resilience benefits into project assessment criteria helps to ensure that projects adequately consider climate impacts and that resilience-enhancing projects are prioritized.

Findings:

❖ ***Consultant score: 2***



Fairfax County does not directly include standards or evaluation criteria for consideration of climate change impacts in its CIP process. However, the 2022 – 2026 CIP evaluation criteria do indirectly relate to climate change through following questions:

- Will the project improve unsatisfactory environmental, health and safety conditions?
- Is the project consistent with the Comprehensive Plan?
- Does the project eliminate an immediate threat to personal and public safety?
- Does the project alleviate immediate threats to property or the environment?

Some county officials have noted that their departments presently consider a range of climate-relevant factors during planning and funding allocation. For example, the Department of Public Works and Environmental Services (DPWES) plans capital improvements and upgrades on 20-year time horizons. Their upgrades include stormwater drainage projects, urban forestry management, and other climate-related infrastructure improvements, with a general acknowledgement of climate-relevant vulnerabilities. DPWES' Building Design and Construction Division (BDCD) follows the sustainability policy and the Operational Energy Strategy for all CIP projects. DPWES Capital Facilities applies Leadership in Energy and Environmental Design (LEED) standards in their design and construction of county infrastructure and public facilities. All Wastewater Treatment Division (WTD) CIP project alternatives are assessed using Envision System scoring, which includes climate and risk considerations. However, for other projects, DPWES does not currently take specific climate change projections into

account when upgrading sites and infrastructure or calculating maintenance costs that may result from climate change.

Health and Human Services (HHS) agencies noted that they do not explicitly incorporate a climate lens during planning and funding allocation. However, the HHS CIP includes facilities that often serve individuals who are most vulnerable to climate change impacts, as well as facilities that must continue operations during hazard events. These include facilities such as community centers, senior centers, early childhood facilities, health clinics, homeless shelters, and mental health treatment facilities.

In addition, Neighborhood and Community Services (NCS) coordinates with the Fairfax County Park Authority (FCPA) and Fairfax County Public Schools (FCPS) for the Athletic Field Program CIP, which facilitates the development, maintenance, and replacement of athletic fields throughout the county. Capital planning for athletic fields does not take specific climate change projections into account, although these assets are vulnerable to climate change impacts from increased precipitation and higher temperatures.

Opportunities:

- There is a need to evaluate the potential addition of climate resilience-related criteria for CIP assessment processes.

Key Supporting Resources:

- FY 2020 – FY 2024 Adopted CIP
- FY 2022 – FY 2026 Adopted CIP
- Operational Energy Strategy Update 2021

G-8 Do the county's staffing levels have adaptive capacity / sufficient capacity to handle changes or increased workload due to climate effects?

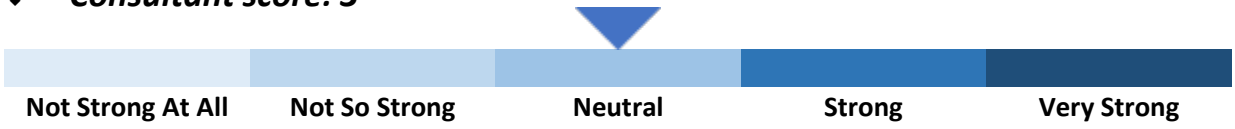
Relevance:

The impacts of climate change re likely to create additional workload for staff, particularly those who manage infrastructure, provide emergency response services, or directly serve vulnerable populations, such as responding to community needs during related disruptions, and managing the required infrastructure upgrades. Anticipating staffing needs and finding ways to create or manage capacity will

help ensure the county can continue to respond to current needs while also implementing projects and programs to mitigate future impacts.

Findings:

- ***Consultant score: 3***



Some departments will have to increase capacity as climate change effects become more severe. This applies to a range of staffing needs, including emergency response, planning and preparedness, services to vulnerable populations, infrastructure fortification, and general resilience staff.

Emergency Response and Public Services Staffing: During emergencies, staffing is temporarily higher to meet the need of the emergency at hand. County staff members have noted that staff and resources for emergency services in some cases are already capacity-constrained for certain events. If climate hazards increase in frequency and severity, the staffing capacities of certain departments such as the Department of Emergency Management and Security (DEMS), Department of Family Services (DFS), Department of Public Safety and Communications (DPSC), Fairfax County Health Department (FCHD), and Department of Housing and Community Development (DHCD), particularly the Office to Prevent and End Homelessness (OPEH), may be stressed. Presently, many shelter sites do not have the capacity to meet the number of individuals who can be affected by extreme weather. Unofficial shelters, such as Fairfax County Public Schools (FCPS), are not currently equipped to serve that purpose and lack the staffing, infrastructure, and resources to accommodate the displaced residents. Unless corrective action is taken, the strain is expected to worsen as climate change results in more frequent and catastrophic weather events and public health emergencies, increasing the need for emergency response.

In addition to emergency response, the county's Health and Human Services (HHS) programs, services, and facilities often provide long-term services to the populations most vulnerable to climate change impacts. However, these entities do not currently have dedicated resources and capacity to address climate vulnerabilities that may exacerbate existing vulnerabilities or vulnerabilities that are felt disproportionately by these populations. HHS entities affected may include the FCHD, DHCD, DFS, NCS, and others.

Operations, Maintenance, and Infrastructure Management Staffing: In addition to emergency situations, some departments have indicated that additional capacity may be needed for day-to-day operations given changing climate conditions. Climate effects may damage critical county infrastructure and equipment. DPWES may need increased staff to handle more frequent flood mitigation, debris blockage clearing, flood assessments, and repair of infrastructure damaged by increased flooding, heat,

and high winds. Additionally, severe weather may disrupt, delay, or block staff from providing vital community services.

Maintenance activities in an increasingly severe climate may increase operational costs. For example, the Fairfax County Park Authority (FCPA) notes that they are the largest landowner in the county, so additional capacity will likely be needed to manage the effects of climate change on FCPA property, for initiatives such as natural resource restoration and management. Climate change may also have an impact on the property and communities owned by the Fairfax County Redevelopment and Housing Authority. Similarly, increased flooding may require additional maintenance staff for athletic fields and recreational facilities in flood-prone areas. Some facilities may need to be upgraded to ensure they continue to be comfortably habitable. For example, blacktop facilities may need to be redesigned to mitigate urban heat island effects to ensure continued safety of children and other residents using the facilities. The planning and implementation of such upgrades may have staffing implications.

Additionally, for departments such as DPWES who include outdoor workers and field staff, climate change may present the need for staffing and schedule changes. For example, in times of extreme heat, additional breaks, schedule shifts, or additional staff capacity may be needed to maintain a safe work environment with protections from heat-related illnesses.

The Department of Vehicle Services (DVS) notes that their staff and vehicle fleets support the tasks of other departments, so if other departments have increased staffing and field work needs, so will DVS.

Planning, Permitting, and Development Review Staff: For climate resilience planning specifically, OEEC currently employs three full-time staff members who contribute to climate resilience efforts, supported by additional OEEC staff. Opportunities may exist for other county departments to expand adaptation and resiliency efforts by increasing operational capacity to relevant programs and distributing funding for capital projects and staffing needs under a climate lens.

Within the Department of Planning and Development (DPD), the Environmental and Development Review Branch (EDRB) employs a team of environmental planners who specialize in environmental planning and policy. These planners have subject-matter expertise in green building design, floodplain management, transportation noise impacts, soil quality, forestry, native landscape design, and environmental stream buffers. Planners within the EDRB review zoning applications for conformance with Comprehensive Plan environmental policies and guidance, draft and review proposed Comprehensive Plan Amendments, and serve as staff liaisons for three county-appointed Boards, Authorities, and Commissions. In the past two years, the BOS has initiated several environmentally focused Board Matters in which county staff have been asked to review or assess applicability to the Comprehensive Plan or Zoning Ordinance. These new activities have resulted in additional staff time to adequately respond to the BOS initiatives. In addition to EDRB, planners in other sections of DPD contribute to climate-related planning topics, such as the Green Initiatives on the Zoning Administration Division's Work Program and the JET. Currently, the Zoning Administration Division does not have a climate change subject matter expert. Any regulatory changes to the Zoning Ordinance and

Comprehensive Plan would require assistance from subject matter experts in DPD, LDS, and other applicable county agencies.

After extreme and damaging storm events, Land Development Services (LDS) had deployed building inspectors to assess structural damage and has dedicated staff to the processing of permits for repair of storm event damage. The dedication of staff and the prioritization of permits for these repairs decreases the capacity of staff devoted to other permits. Additionally, permitting staff note that as flooding issues continue to grow, the Site Development & Inspections Division (SDID) and the Customer and Technical Support Center staff are increasingly working with residents to find solutions. If such events increase in frequency, increased staff capacity may be needed.

Opportunities:

- There is a need to assess potential staffing constraints more thoroughly and potentially expand staff capacity where needed.
- There is a need for increased and coordinated collaboration between NCS and the DPWES to identify and address flooding of community center sites.

Key Supporting Resources:

- Fairfax County Comprehensive Plan
- Fairfax Green Initiatives #1 (February 2019) and #2 (July 2020)
- Joint Environmental Task Force Final Report
- Zoning Ordinance

IV. Interdisciplinary/Other

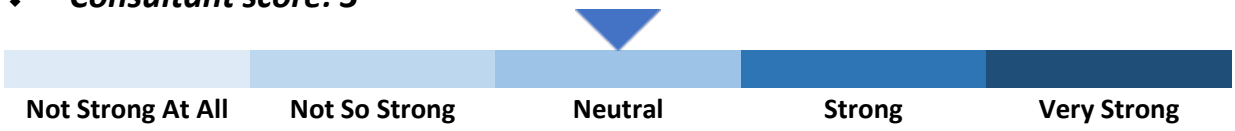
I-1 Has the local government utilized publicly available, locally downscaled climate projections to identify top hazards within the last 5 years? Is there a process in place to integrate and update data throughout local government planning documents and standards?

Relevance:

Climate resiliency strategies should be based on scientific projections of future climate hazards, customized for the locality. The county must be aware of projected climate conditions (i.e., how hot of temperatures? How much flooding and where? How severe of storms?) to prepare for those impacts.

Findings:

❖ ***Consultant score: 3***



Regional level: Prior to current Resilient Fairfax initiatives, climate projections have been developed at the regional level through the Northern Virginia Regional Commission (NVRC), the NOAA Mid-Atlantic Regional Integrated Sciences and Assessments Team (MARISA), the Metropolitan Washington Council of Governments (MWCOG), the US Army Corps of Engineers, the Northern Virginia Hazard Mitigation Plan, and others. These climate projections have been utilized by Fairfax County.
NVRC's Climate Resilience Dashboard features downscaled data including:

- Number of days of precipitation above 1", 2", and 3" thresholds for a lower (RCP4.5) and higher (RCP8.5) scenarios;
- Average number of days per year with minimum temperatures above 70F, 75F, and 80F; and
- Coastal flood maps at 1, 3, and 5 feet of rise and considers the number of parcels and acres that could be flooded under the scenarios along with value of exposed properties.

Additionally, NVRC has incorporated climate projection data into a range of reports including "Resilient Critical Infrastructure: A Roadmap for Northern Virginia," "Regional Collaboration to Build Community Resilience in Northern Virginia," and others.

MWCOG's climate projections, summarized in the Metropolitan Washington 2030 Climate and Energy Action Plan include the following data:

- Business-as-usual GHG emissions projections (by sector) through 2030

- "What would it take" scenario projections wedge analysis to reduce emissions 50 percent by 2030 below 2003 levels for the Metropolitan Washington area
- Number of extreme heat days above 95F per year
- Number of days per year with over 1", 2", and 3" of precipitation
- Coastal flood maps at 6 feet of rise considering equity emphasis areas (EEAs) in the Metropolitan Washington area
- Inland and riverine floodplain maps considering EEAs in the Metropolitan Washington area

MARISA provides a tool that presents the projected intensity-duration-frequency (IDF) curves for the Chesapeake Bay watershed and Virginia (released in summer of 2021). This site provides projected changes for a few observation locations in and around Fairfax County, along with county aggregated values. The county's DPWES is closely following developments and analyses of IDF curves for potential use by the county.

The Northern Virginia HMP provides brief descriptions of future changes in extreme events pertaining to how current hazards today may evolve over the coming decades.

County Level: At the county scale the Resilient Fairfax plan includes a "Climate Projections Report" which is a detailed, downscaled, county-level analysis of climate projections. The Climate Projections Report includes six climate hazards projected for two emissions scenarios (RCP 4.5 and RCP 8.5) and two future time periods (centered in 2050 and 2085). To supplement the Climate Projections Report, the Office of Environmental and Energy Coordination (OEEC) partnered with NASA Develop to obtain high-resolution Urban Heat Island effect data for the county, based on numerous years of land surface temperature data. The Department of Public Works and Environmental Services (DPWES)'s Stormwater Management is also in the process of determining and generating updated county regulated floodplain maps that will allow the county to integrate climate change into the floodplain models. Further, the Wastewater Treatment Division (WTD) has used local climate projections to anticipate flooding and has designed and constructed facilities (floodwalls, hydraulic structures, and elevated electrical rooms) to reduce the risks.

Additionally, due to the recently adopted Chesapeake Bay Preservation Act (CBPA) amendment, the county will soon be required to consider climate projections (as specified by the Commonwealth of Virginia) when reviewing proposed developments.

Opportunities:

- While there is ample climate projection data available, there is a need to better integrate this data into county processes, projects, and decisions. Climate projections developed by the Resilient Fairfax plan should be integrated into county planning documents and standards where applicable.

Key Supporting Resources:

- Chesapeake Bay Preservation Act

- Climate Change and the Chesapeake Bay: State of the Science Review and Recommendations
- Coastal Sensitivity to Sea-Level Rise: A Focus on the Mid-Atlantic Region
- Metropolitan Washington 2030 Climate and Energy Action Plan
- National Capital Region Climate Change Report
- NOAA Mid-Atlantic RISA (MARISA) Climate Summaries
- Northern Virginia Hazard Mitigation Plan (2017)
- NVRC Climate Resilience Dashboard
- Resilient Critical Infrastructure: A Roadmap for Northern Virginia (2018)
- Virginia Coastal Resilience Master Planning Framework

I-2 Do the community's hazard mitigation and emergency response plans include climate hazards?

Relevance:

Hazard Mitigation Plans and Emergency Response Plans help prepare localities for both natural and man-made hazards. These plans overlap in scope with climate resiliency plans, and in some jurisdictions are combined. Traditionally, hazard mitigation and emergency response plans have been based on *past* events rather than *future* projections, and historically do not consider how climate change may increase the severity, impacts, and patterns of these hazards. Incorporating climate hazards into these plans helps ensure emergency response and hazard mitigation efforts meet these changed needs.

Findings:

❖ ***Consultant score: 4***

The state and regional hazard mitigation and emergency response plans applicable to Fairfax County do include climate hazards and acknowledgment of climate change as a general topic. The Commonwealth of Virginia Hazard Mitigation Plan addresses several climate hazards and contains information outlining future considerations as it relates to climate change. The 2017 Northern Virginia Hazard Mitigation Plan (which includes Fairfax County) includes acknowledgment that climate change may amplify existing hazards, and that as climate science evolves, future updates to the plan may consider climate change as a parameter in the ranking or scoring of natural hazards. Additionally, the Northern Virginia Hazard

Mitigation Plan includes “sea level rise” in the “flood” category and cites other climate studies in discussion of probability of future occurrence.

Furthermore, the “Resilient Critical Infrastructure: A Roadmap for Northern Virginia” report is focused on resilience of critical infrastructure and projecting climate stressors impact of heat, precipitation, and sea level rise over an 80-year planning horizon.

Additionally, the county’s Emergency Operations Plans and Emergency Action Plans (EAP) address climate hazards, even if they are not explicitly called “climate hazards” (e.g., extreme heat, severe storms, etc.). These plans are developed both at the county scale and for specific areas such as Huntington and state regulated dams. For example, the Huntington Response Plan (2021) creates an interagency coordination and communications structure for emergency response to severe flooding conditions in the Huntington community. Some high flood risk neighborhoods (e.g., Huntington, Reston) are included in Emergency Operations Plans and EAPs in coordination with police and fire and rescue departments. The main difference between the hazards described in these plans and “climate change” related hazards are that traditional emergency plans are based on *past* events that are likely to continue in the same fashion; climate change considerations add the element of *future change* in those events and accelerated rates of change.

At the time of writing, at the state level, the Virginia Coastal Resilience Master Plan is in development. The goal of this plan is to improve the Commonwealth's resilience and ability to adapt to rising seas, increased nuisance flooding, and more frequent and intense storms that result from climate change.

Opportunities:

- While there is currently strong coordination between OEEC and DEMS, (OEEC is actively involved in DEMS’ Hazard Mitigation Planning process, and DEMS is actively involved in Resilient Fairfax), there may be opportunities for streamlining these two processes (the Hazard Mitigation Plan and Resilient Fairfax) in future iterations.

Key Supporting Resources:

- Commonwealth of Virginia Hazard Mitigation Plan (2018)
- Emergency Operations Plan (2019)
- Fairfax County Code of Ordinances Chapter 14 - Emergency Management
- Huntington Response Plan (2021)
- Northern Virginia Hazard Mitigation Plan (2017)
- Pre-Disaster Recovery Plan (2020)
- Regional Collaboration to Build Community Resilience in Northern Virginia
- Resilient Critical Infrastructure: A Roadmap for Northern Virginia (2018)
- Virginia Coastal Resilience Master Plan (2020)

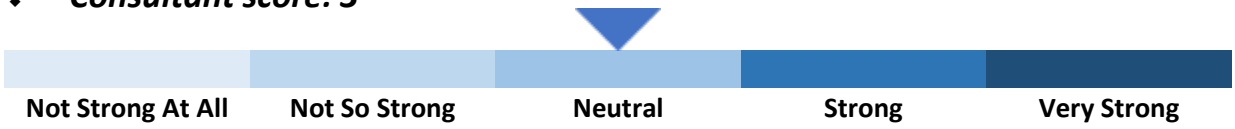
I-3 Does the local government make climate-related data, maps, and assessments accessible to community? Are these resources aggregated in one location? Are the maps and data being used to reduce climate risk and vulnerability?

Relevance:

Community awareness of climate hazards is enhanced if the community has access to user-friendly maps, data, and reports. Interactive maps, data, and tools allow community members to visualize their homes, place of employment, schools, and other key points of interest relative to climate hazards and projected impacts.

Findings:

❖ ***Consultant score: 3***



Fairfax County has a robust GIS and Mapping Services Program (situated with in the county's Department of Information Technology) that provides community access to a plethora of GIS maps and data layers. While much of the data available on the site relates to climate and community resilience (including vulnerable communities, watersheds and floodplains, stormwater management, infrastructure and buildings, greenspace, and social services), it is not currently organized into a climate-oriented app that would be easily accessible or understandable for community members wanting to learn more about climate hazards, risks, and vulnerabilities. However, while not yet publicly available, a centralized climate data portal or Map Viewer tool will be created as part of the Resilient Fairfax project. DPWES's Stormwater Management is also currently working on flooding maps that incorporate climate considerations.

Climate-specific maps and dashboards are currently provided at the regional and state level. NVRC maintains a Climate Resilience Dashboard. The Virginia Institute of Marine Science (VIMS) Center for Coastal Resources Management has resources and mapping tools on climate change, sea level risk, storm surge and shoreline conditions including tidal wetlands, living shorelines and bulk heads that are helpful resources and good examples of how to effectively share spatial information. However, these tools are not necessarily easy to understand or access for the public.

Opportunities:

There is an opportunity to create a climate data portal that integrates a range of climate-related maps and data including: climate hazard projections (i.e., urban heat island effects, coastal flooding, inland flooding), vulnerable infrastructure, vulnerable populations, and resources that help address climate

impacts (i.e., cooling centers, green infrastructure, emergency response facilities, etc.). This opportunity is already being pursued as part of the Resilient Fairfax process.

Key Supporting Resources:

- ADAPTVA: Interactive Map Tool: AdaptVA Viewer
- Fairfax County GIS and Mapping Service Webpage
- NVRC Climate Resilience Dashboard
- One Fairfax Vulnerability Index and Covid Vulnerability Index
- Virginia Institute of Marine Science (VIMS) Center for Coastal Resources Management Fairfax County Comprehensive Map Viewer

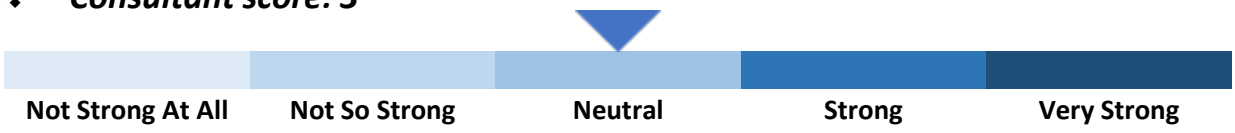
I-4 Are extreme temperature centers (cooling centers and hypothermia centers) available to the public? Are these resources allocated in an equitable way?

Relevance:

During extreme heat or cold events, residents without access to air conditioning or heating at home need access to facilities that are a livable temperature. Without such access, residents may be at risk of heat-related illness (for extreme heat) or hypothermia (for extreme cold).

Findings:

❖ ***Consultant score: 3***



Fairfax County has designated hypothermia centers (for extreme cold) and cooling centers (for extreme heat) available to the public. There are also many community centers, recreation centers, senior centers, libraries, shopping centers, and other facilities operated by Neighborhood and Community Services (NCS) and other departments across the county that effectively serve that purpose even if not the intent. The extent to which these resources are allocated in an equitable way has not yet been assessed beyond a preliminary review.

The Fairfax County Office to Prevent and End Homelessness (OPEH) provides dedicated hypothermia shelter space during winter months at several locations across the county. OPEH also partners with non-profits and places of worship to provide shelter for individuals at risk of hypothermia during the winter.

County agencies have indicated that during the Covid-19 pandemic, space was sometimes limited in these facilities, but the county has always been able to find room through creative means (such as partnering with hotels) and has not turned anyone away.

In addition to extreme temperature facilities, through the Department of Family Services (DFS), residents have access to numerous energy assistance programs that offer financial support to help low-income residents to help purchase equipment or pay high energy bills for both heating and cooling. DFS also offers Fan Care, an electric fan distribution program for residents over 60 years of age.

Additionally, the Department of Housing and Community Development (DHCD) conducts a Home Repair for the Elderly Program to provide minor home repairs for low and moderate-income elderly residents or residents with disabilities. This program could support home repairs that would allow individuals to remain in their home during heat events, such as providing air conditioning units and improving insulation.

The first Countywide Strategic Plan (2021) includes a priority action to "expand the home repair program for older adults and ensure tax assistance programs keep pace with those improvements to help maintain quality, affordable housing for aging populations." Similarly, OEEC's program "HomeWise" program provides energy-efficiency improvements for low- and moderate-income residents, which may make homes more livable during extreme heat and extreme cold events.

Opportunities:

According to the Department of Emergency Management and Security (DEMS), at the time of writing, the county does not have a formal written plan for cooling centers. The county does operate these facilities and does send messages to the community about public cooling centers during extreme temperature events. However, DEMS is currently pursuing development of a formal adverse weather plan for extreme temperatures. As part of this plan, there is an opportunity to establish a minimum level of service policy for cooling centers. There is an opportunity to conduct a gap analysis for extreme temperature centers and identify areas in need of such facilities to ensure that they are allocated in an equitable manner. As part of this gap analysis, it is recommended that the county identify barriers for community members to access extreme temperature centers (e.g., transportation to and from cooling centers, hours of operation, types of facilities, facility capacity, etc.).

Key Supporting Resources:

- Energy Assistance Program
- Fairfax Countywide Strategic Plan
- Family Services Fan Care Webpage
- HomeWise Webpage
- Home Repair for the Elderly Program for Elderly and Disabled Adults Webpage

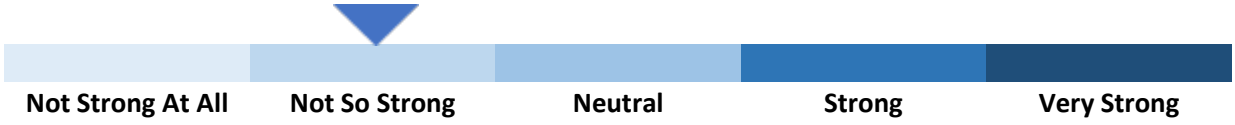
I-5 Has climate change been integrated into community health assessments and related planning?

Relevance:

Climate change is anticipated to have numerous effects on public health, including the potential for increased heat exposure, vector-borne disease, food security, power outages that impact those who require oxygen or refrigerated medications, and many other direct and indirect impacts.

Findings:

❖ ***Consultant score: 2***



The Fairfax County Health Department (FCHD) has created a draft Climate and Health Plan, but finalization of the plan was delayed by the COVID-19 pandemic. Topics in that draft plan include extreme heat, vector-borne diseases, urban heat islands, storm damage, flood mitigation, and air quality monitoring, with a focus on vulnerable populations.

Existing health assessments and planning indirectly relate to climate change, but do not specifically plan for climate impacts on health. The Health and Human Services Needs Assessment addresses the changes in population, economy, and infrastructure, but not specifically climate. Indirectly, the assessment mentions climate change by stating "Healthy people are those of all ages who… are free from exposure to environmental hazards…" One take-away from the 2019 Fairfax Community Health Assessment is that health outcomes differ greatly depending on race, gender, age, income, ZIP code and education. The Partnership for a Healthier Fairfax's 2019-2023 Community Health Improvement Plan focuses on healthy food, active living, and behavioral health. The Plan does not mention climate change, though each of these areas will be impacted by various aspects of climate change. The Fairfax 50+ Community Action Plan focuses on services for caregivers, safe and healthy communities, transportation, housing, and community engagement. The plan does not specifically mention climate change, though several of these areas could benefit from considering the impact climate change will have on the health and independence of seniors. The Fairfax County Youth Survey asks questions related to physical health and safety. This survey does not currently have any explicit relationship to climate but could be an opportunity to understand the experiences of youth related to climate risk and preparedness.

FCHD has piloted the use of Health Impact Assessments as a tool to help evaluate the potential health effects of a plan, project, or policy before implementation. This tool can help consider potential climate-related health impacts.

Opportunities:

- There is an opportunity to complete the draft Climate and Health Plan, which has been on hold due to FCHD focus on the COVID-19 pandemic.
- There are also opportunities to integrate climate-related hazards (i.e., heat-related illness, health impacts from natural disasters, food supply implications, and vector-borne diseases) into health assessments, Health Impact Assessments, surveys, and plans.

Key Supporting Resources:

- Community Health Assessment (2017)
- Community Health Improvement Plan (2019)
- Community-wide Energy and Climate Action Plan (CECAP) 2021
- Fairfax 50 + Community Action Plan (2019)
- Fairfax County Youth Survey (2020)
- Health and Human Services Needs Assessment (2019)
- Health Department - Strategic Plan (2014-2019)
- Live Healthy Fairfax Community Health Dashboard

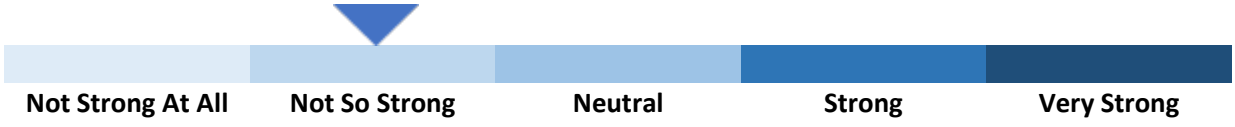
I-6 Is the local government working with businesses, organizations, and educational institutions to address and fill resilience-related workforce needs?

Relevance:

The implementation of projects and programs to build community resilience can have greater impact when they are also creating local jobs and economic value. By coordinating with local businesses, organizations, and educational institutions, Fairfax County can help create a trained workforce ready to support resilience projects and can help connect job opportunities to local businesses and workers.

Findings:

❖ ***Consultant score: 2***



Fairfax County actively works with businesses, organizations, and educational institutions to address and fill workforce needs in general. The Department of Economic Initiatives in particular is active in workforce

development. However, to date, workforce development activities have not been focused on resilience-related skillsets specifically.

County entities such as the Department of Public Works and Environmental Services (DPWES) and Neighborhood and Community Services (NCS) have noted that some resilience-oriented projects have been hindered by gaps in the local contractor workforce. For example, the county has attempted to install porous pavements and other green infrastructure projects and has found that while local engineers are able to design such facilities, there are not sufficient construction contractors or county construction managers with a background in green infrastructure to bring these designs to fruition.

More broadly, the county government is generally supportive and active in advancing workforce development needs once they are identified. The BOS adopted the Economic Success Strategic Plan (2015), a strategic roadmap with high-level policy recommendations to help the county expand and diversify its economy. In 2020, the BOS also directed the county Executive to run a feasibility analysis on the Energy Efficiency Funding Pool pilot. This pilot could provide a competitive grant process for funding local entities to provide training opportunities for various green jobs. Fairfax County also sponsors the Green Business Partners Program, allowing small businesses to showcase their quantitative and qualitative sustainability results. Additionally, from 2019 to 2020, the Fairfax County BOS and the Fairfax County School Board formed the Joint Environmental Task Force (JET), which provided several recommendations on engaging educational institutions to fill workforce needs. Recommendations include providing toolkits to guidance counselors on how to discuss green careers with students, working with solar installers to provide job opportunities, and developing a comprehensive plan to offer green career-related programs for high school students. The county also outlines its goal to collaborate with higher education, business, nonprofit, and other sectors to promote equity in the county, including discussing workforce development pathways to provide all Fairfax County residents with opportunities to develop knowledge and skills to enter the workforce.

Opportunities:

- There are opportunities to further integrate climate adaptation and resilience workforce needs and opportunities into existing economic development and job training programs, especially relating to porous pavements, green infrastructure, and other physical resilience installation needs.
- There is an opportunity for Fairfax County to scale up “green” procurement efforts to encourage the growth of the resilience-related workforce. For example, the county’s Architecture/Engineering Schedule Requests for Qualifications could potentially be updated to include skillsets relating to the installation of green infrastructure, wetland restoration, solar plus storage installation, and others.
- There are potential opportunities to strengthen partnerships with local universities, community colleges, trades schools, and other training programs to advance climate resilience-related workforce needs.

Key Supporting Resources:

- BOS Priorities
- Economic Success Strategic Plan (2015)
- Fairfax Green Initiatives #2
- Green Business Partners Program
- Joint Environmental Task Force (JET) (2020)
- One Fairfax

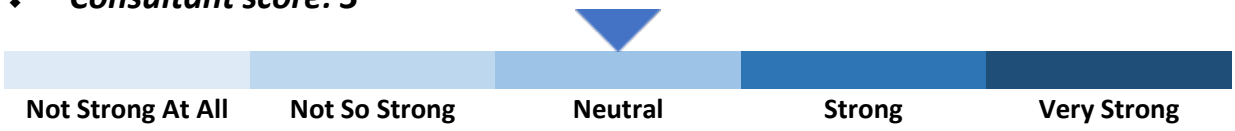
I-7 Is the local government incentivizing businesses, organizations, and institutions to implement resilience measures? If so, which?

Relevance:

The local government can make direct resiliency improvements to its own property, but incentives or regulations are often needed to stimulate implementation for private properties. If businesses or other property owners are incentivized to make resiliency improvements, they are more likely to be prepared for climate effects. Such improvements may result in substantial financial and resource savings in the long run. For example, if a building is elevated above or resilient to flood effects, it may reduce property damage or the need to be rebuilt after a severe storm.

Findings:

❖ ***Consultant score: 3***



Fairfax County has a number of programs that incentivize residents and businesses to implement resilience measures.

General Resilience Incentives: The Commercial Property Assessed Clean Energy (C-PACE) program incentivizes commercial businesses to make mitigation and adaptation/resilience upgrades with little to no up-front cost. This program is a financial tool designed to provide funding to building owners for energy-saving, water-saving, and resilience projects within commercial properties. The Fairfax County C-

PACE program is the first in Virginia to include resilience improvements to buildings. However, to date, the program has not had significant participation.

Fairfax County also has a Green Business Partners and Small Green Business Partners Program. To become a Green Business Partner, a business must highlight at least five sustainability actions in the areas of management and leadership, energy, waste, water, and transportation.

Additionally, the Green Bank model is currently under examination by OEEC and, if adopted, would further incentivize businesses, organizations, and institutions to implement resilience measures.

Stormwater Management and Flood Resilience Incentives: Fairfax County provides both technical and financial assistance to private property owners to implement voluntary stormwater management techniques, retrofits, and living shoreline practices. In support of the MS4 and the Federal Emergency Management Agency (FEMA) Community Rating System (CRS) Programs, the county partners with the NVSWCD to deliver services to private property owners and managers that encourage the implementation of voluntary stormwater management and flood mitigation techniques through workshops, brochures, and other direct technical and financial assistance, including the Conservation Assistance Program (CAP). In the 2017 fiscal year, 225 rain barrels were distributed, two homeowners underwent impervious surface removal, and one homeowner's association constructed an infiltration trench, among other results.

Energy Resilience Incentives: The Department of Planning and Development (DPD) and Land Development Services (LDS) currently incentivize, or ease processes required for renewable energy, which can enhance energy resilience. Specifically, the new Zoning Ordinance adopted as part of the Zoning Ordinance Modernization project added solar power facilities (utility-scale) and solar collection systems (accessory) as new uses and added flexibility in permissions and standards. Solar power facilities are permitted with no entitlement requirements in certain industrial districts, and a special exception process is available in most other zoning districts. Roof-mounted solar collection systems are now permitted by right to exceed the maximum building height by up to five feet, allowing for installation on existing buildings that were constructed to the maximum permitted height limitations. For those developments subject to an entitlement approval, a minor modification may be approved by the Zoning Administrator to allow an increase in building height up to ten feet to allow for solar collection systems. Under current LDS processes, residential solar and geothermal systems projects receive an expedited permitting and review process to incentivize property owners to install these systems. The county waives the associated permitting and review fees for residential solar projects and provides typical solar construction plans, which may be used in lieu of a formal plan submission for qualifying projects. For commercial solar panel projects, the county waives the associated permitting fees, collecting only the fire marshal fees and any subsequent resubmission fees, should the original building plan review be disapproved. In addition, it is possible to obtain a same-day solar permit if sufficient structural and electrical design information is provided at the county's Permit Application Center.

County incentives for solar installations include zero cost for the permit fee (for solar hot water or solar photovoltaic projects) and a limited solar tax incentive in accordance with Virginia Code Section 58.1-3661 and included in Article 18, Chapter 4 of the Fairfax County Code. Essentially, qualifying solar equipment can result in a tax credit (not an exemption) against the amount of property taxes due. The credit is

determined by applying the local tax rate to the value of the solar equipment (the value is typically the cost of the equipment).

The tax credit is available the first tax year following the date of application; the credit is good for five years. Although the concept for this was generally aimed at homes, both commercial and multi-unit residential properties qualify.

Since 2016, Fairfax County also encourages renewable energy through its promotion of LEAP's Solarize Fairfax, in addition to the C-PACE program, as described above. Solarize Fairfax is an annual demand aggregation campaign that reduces the cost and complexity of investing in solar energy for residents and businesses. In 2021, the Solarize program began offering participants the opportunity to install battery storage systems in connection with their arrays. A total of 540 Solarize Fairfax projects have been implemented to date.

The Environmental Element of the Comprehensive Plan includes an expectation for increased green building performance for zoning proposals with higher levels of intensity or density and added guidance regarding expectations for public-private development. Currently, expectations for third-party green building certifications for non-residential development are focused on special activity areas as outlined in the policy. However, all new residential development throughout the county is expected to achieve certification. These commitments are obtained during an entitlement process as a proffer or development condition. It should be noted that the county does not have delegated authority from the state necessary to adopt the International Green Construction Code nor the authority to impose more stringent building code requirements that exist under the Uniform Statewide Building Code (USBC).

As part of an entitlement application, DPD works with applicants to establish proffers or development conditions that can provide co-benefits or address numerous environmental recommendations. Some additional recommendations that create resiliency in developments include low impact development (LID) techniques, electric vehicle charging parking spaces, preservation of environmentally sensitive areas to include floodplains, and native plantings, among others. In certain environmentally friendly developments, LDS may expedite the building review and permitting components and assign an LDS Project Manager to facilitate the submission process.

Opportunities:

- There is an opportunity to expand the use of C-PACE financing to support resilience projects. This might require additional outreach and education to raise program awareness as well as increased capacity to provide a higher level of technical assistance to guide participants through the program.

Key Supporting Resources:

- 2017 Municipal Separate Storm Sewer System (MS4) Program Plan and Annual Report
- C-PACE Webpage

- Fairfax County Code of Ordinances Chapter 4 – Article 18
- Green Business Partners Program
- Neighborhood and Community Services Basic Needs and Assistance Webpage
- NVSWCD Virginia Conservation Assistance Program (VCAP) Webpage
- Solarize Fairfax County Webpage
- Zoning Ordinance

V. Buildings and Sites

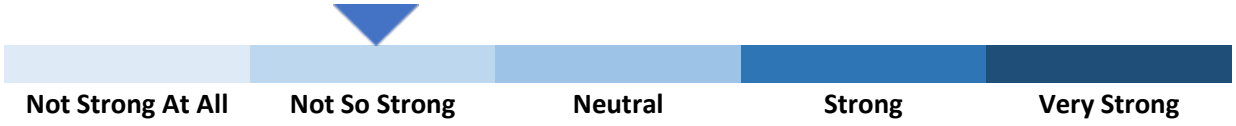
B-1 Has the local government implemented building design guidance or standards to increase climate resiliency?

Relevance:

How a building is designed impacts its resilience and ability to withstand climate change impacts. The decisions made by building owners and developers, as well as designers and builders are important to ensuring the long-term resilience of buildings to a changing climate.

Findings:

- ***Consultant score: 2***



Fairfax County does not have direct authority over the Building Code. Fairfax County's development processes do not currently require building developers to explicitly consider climate change impacts, nor does the Virginia Uniform Statewide Building Code (USBC) explicitly include climate resilience standards. Fairfax County is not an outlier in this regard. U.S. building codes and cited international standards do not currently address future climate projections; they focus instead on addressing risk based on *past* weather experiences and extreme events. Virginia is a Dillon Rule state, which means the county is required by the State to enforce the Virginia USBC. Virginia adopted the 2018 version on July 1, 2021.

However, while the county's building code does not explicitly refer to "climate resilience," it does account for existing climate-related hazards such as flooding, severe wind, and other natural disasters. Additionally, the county's Commercial Property-Assessed Clean Energy (C-PACE) program includes incentives for resiliency improvements, and the Comprehensive Plan provides guidelines for commercial entities to participate in the C-PACE program. The Sustainable Development Policy for Capital Projects specifies environmental requirements for capital (government) facilities.

Opportunities:

- There is an opportunity to increase advocacy and call for stronger codes and standards at the state level.
- The county can develop voluntary resilient design guidelines and/or resiliency checklists.
- The county can help expand educational opportunities for building owners, developers, and designers ensuring they have access to climate projections that will affect buildings and lead by example by implementing resiliency practices on county buildings.

Key Supporting Resources:

- C-PACE Webpage
- Fairfax County Code of Ordinances Chapter 61 – Building Provisions
- Fairfax County Code of Ordinances Chapter 127 – Commercial Property Assessed Clean Energy and Resiliency Program
- Fairfax County Virginia Sustainable Development Policy for Capital Projects

B-2 Has the local government implemented site design and permitting standards to increase climate resiliency?

Relevance:

How a site is developed, including the layout and orientation of buildings, grading, utilities, and impact on trees and soils are all fundamental decisions that impact the safety and resilience of a particular development and the community as a whole. Decisions about site design can preserve and protect ecosystems or dramatically impact them, for example, reducing the ability of wetlands and floodplains to store and clean water or reducing tree canopy and opportunities for shading and soil stabilization. Through site design standards, a community can help ensure sites are developed in ways that support climate resilience.

Findings:

❖ ***Consultant score: 4***

In accordance with Virginia's newly adopted amendment to the Chesapeake Bay Preservation Act (CBPA) Regulations, the county will be required within the next three years to amend the county's Chesapeake Bay Preservation Ordinance (CBPO) to assess the impacts of climate change and sea-level rise on any proposed land development in a Resource Protection Area (RPA) during the plan of development or project review process.

In terms of county ordinances that are currently in place as of October 2021, the ordinances do not explicitly refer to "climate resilience," but they do account for climate-related hazards such as flooding, storms, tidal waves, droughts, and other natural disasters. The county's current development standards do enhance the climate resiliency of sites because they include regulation of floodplains, RPAs, steep

slopes, stormwater management and drainage, wetlands, tree conservation, coastal primary sand dunes, impervious surface coverage, open space requirements, and renewable energy uses, among other relevant standards. These provisions can be found in the CBPO, Coastal Primary Sand Dune Zoning Ordinance, C-PACE Ordinance, the Comprehensive Plan, Public Facilities Manual, Subdivision Provisions, Sustainable Development Policy for Capital Projects, Stormwater Management Ordinance, Tree Conservation Ordinance, Wetlands Zoning Ordinance, and Zoning Ordinance, among others.

In addition to design standards, county departments are actively working on initiatives that translate to additional climate resiliency for sites. For example, DPWES is conducting countywide regulatory floodplain mapping, leveraging work completed as part of FEMA's updates to the county's Special Flood Hazard Areas. Flows for hydraulic modeling will be developed from a detailed rainfall-runoff model that will allow incorporation of future rainfall estimates to assess potential impacts of climate change on the regulatory floodplain. DPWES is also collaborating with FEMA to develop risk maps for the Cameron Run watershed and the Belle View communities. FCPA continues to acquire land in undeveloped floodplain areas via fee simple acquisitions, developer dedications, donations, and easements. This results in prevention of development in high-priority flood-prone areas and enhances resiliency.

Opportunities:

- There is an opportunity to create a consolidated natural resource management plan to facilitate streamlined interagency coordination on natural resource connectivity, green infrastructure, tree canopy, stream corridor protections, shoreline protections, and other work for environmentally sensitive areas.
- There is an opportunity to review and potentially update the county's site development processes to include climate resilience considerations, such as future projected flooding, more explicitly.

Key Supporting Resources:

- Chesapeake Bay Conservation Ordinance
- Chesapeake Bay Preservation Ordinance Area Designation and Management Regulation Amendment
- C-PACE Webpage
- Executive Order 45: Floodplain Management Requirements and Planning Standards for State Agencies, Institutions, and Property
- Fairfax County Code of Ordinances Chapter 101 – Subdivision Provisions
- Fairfax County Code of Ordinances Chapter 116 – Wetlands Zoning Ordinance
- Fairfax County Code of Ordinances Chapter 118 – Chesapeake Bay Preservation Ordinance
- Fairfax County Code of Ordinances Chapter 122 – Tree Conservation Ordinance
- Fairfax County Code of Ordinances Chapter 123 – Coastal Primary Sand Dune Zoning Ordinance
- Fairfax County Code of Ordinances Chapter 124 – Stormwater Management Ordinance
- Fairfax County Comprehensive Plan Policy Plan Amendment – Natural Landscaping at County Facilities
- Fairfax County Park Authority Policy Manual

- Public Facilities Manual (PFM)
- Zoning Ordinance

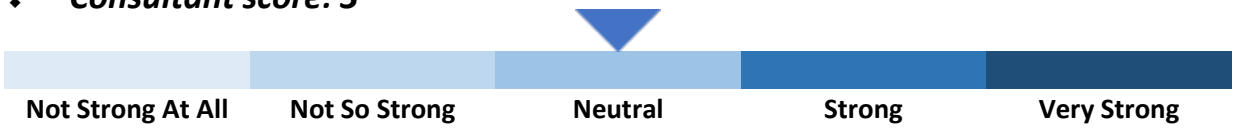
B-3 Has the local government implemented climate resilience measures for critical infrastructure and/or public buildings that are vulnerable to flooding?

Relevance:

Critical infrastructure such as hospitals, fire stations, water treatment plants, Emergency Operations Centers and other such facilities are imperative to the continued functioning of the community during extreme weather events. A community's resilience is enhanced when critical infrastructure and public buildings are flood resilient.

Findings:

❖ ***Consultant score: 3***



Fairfax County has implemented certain best practice flood resilience measures for critical infrastructure and/or public buildings that are vulnerable to flooding. It should be noted that this flooding vulnerability is not limited to "floodplains," because many flooding issues in Fairfax County are located outside of floodplain areas. However, there are certain facilities that are by nature located in floodplains, especially including drinking water, wastewater, and stormwater facilities. Additionally, there are some public facilities (even if not defined as "critical facilities" in the HMP), such as the Eleanor Kennedy Homeless Shelter, that are located in the 100-year floodplain and experience flooding issues.

At the regional level, the Northern Virginia Hazard Mitigation Plan process has facilitated the planning and funding of some of these projects. However, due to the large number of public facilities, the wide variation on when the facilities were built, and the variability of flooding exposure, "flood resilience measures" have been applied on an as-needed basis rather than across the board to all facilities. Each jurisdiction is responsible for implementing specific actions as prescribed in their locally adopted mitigation action plan. Each action is assigned to specific applicable departments.

At the county level, flood mitigation and related projects are facilitated through the Fairfax County Stormwater Management program and detailed in the DPWES Capital Improvement Program. The county's Stormwater Service District, established in FY 2010, provides a dedicated funding source that

funds a range of projects including flood mitigation. The county has also conducted a Repetitive Loss Area Analysis as part of the National Flood Insurance Program.

Specific examples of flood resiliency projects for critical and public facilities include but are not limited to:

- The Huntington Levee and Storm Water Pump Station was completed in 2019. This project protects the Huntington community from storms up to and including 100-year flooding events. The neighborhood protected includes the Huntington Community Center (a public facility run by Neighborhood and Community Services) that was previously impacted by flooding. Actions to address tidal and riverine flooding included installation of an emergency generator, monitoring equipment, and an I-wall with swing gate completed, interior storage ponding area to divert stormwater during high-intensity storm events, and ongoing site stabilization (as of Feb. 12, 2019). (Fairfax County Mitigation Action 2).
- Six new cameras were installed in July 2020 to monitor critical components of the Huntington Levee to monitor all critical components of the levee and pump station. (Fairfax County Mitigation Action 5).
- The Noman M. Cole Pollution Control Plant has implemented an extra equalization tank, elevation of new and improved buildings beyond the 500-year storm water surface, backup generators at all pump stations, a backflow preventer program.
- The Maintenance and Stormwater Management Division maintain and utilize a remote advance flood warning system that provides rainfall and water level information at the county's state regulated dams and flood prone areas (Mitigation Action 6).
- The New Alexandria / Belle View pump station fuel oil storage tank relocation is currently under construction to replace the underground tank with an aboveground tank.

In addition to these direct flood mitigation actions, the Fairfax County Sustainable Development Policy for Capital Projects commits Capital Facilities to LEED standards which include "Resilient Design pilot credits" and energy and water efficiency requirements for new construction, additions, and renovations. However, as noted in B-1, LEED is not a full proxy for resiliency.

Opportunities:

- The county should complete an inventory of public buildings and critical facilities currently experiencing flooding issues, prioritized by severity, building upon information gathered in the Resilient Fairfax planning process.
- The county should create an inventory of public buildings and critical facilities projected to be exposed to flooding by 2050. (This item should be completed through the Resilient Fairfax Vulnerability and Risk Assessment).
- There is an opportunity to update the Fairfax County Sustainable Development Policy for Capital Projects to include flood resiliency more explicitly.

- There is an opportunity to leverage the Environmental Improvement Program (EIP) to prioritize, or weight in the evaluation of projects, improvements to public buildings that are vulnerable to flooding.

Key Supporting Resources:

- Capital Improvement Program (CIP)
- Northern Virginia Hazard Mitigation Plan (2017)
- Public Facilities Manual (PFM)

VI. Water Infrastructure

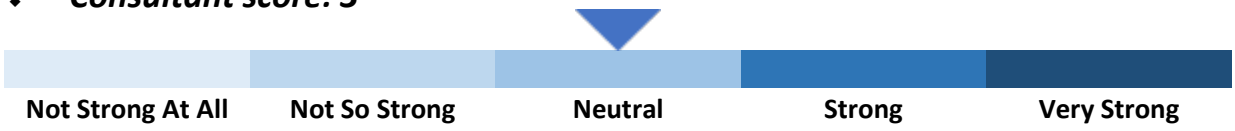
W-1 Has the local government assessed the vulnerability of water infrastructure based on latest climate projections?

Relevance:

Water infrastructure (i.e., stormwater pipes, drinking water treatment facilities and water lines, wastewater treatment facilities and sewer lines, etc.) may be vulnerable to climate effects. Assessing the vulnerability of this infrastructure helps with the identification of resilience strategies that may be needed.

Findings:

❖ ***Consultant score: 3***



The Metropolitan Washington Council of Governments (MWCOG) included water infrastructure (stormwater, drinking water, and wastewater infrastructure) in their Climate Risk and Vulnerability Assessment (CRVA), as summarized in the Metropolitan Washington 2030 Climate and Energy Action Plan. The plan notes that water infrastructure is vulnerable to extreme weather events, extreme temperatures, coastal and storm surge flooding, drought, and flash and riverine flooding. For example, the plan notes that "water utilities [have] experienced power outages, flooding, or sewer overflows," "more intense rainfall can damage and overwhelm water infrastructure," "sewer systems may be damaged due to the overwhelming level of water," and "coastal flooding posts a risk of human health including injuries, death, and illnesses associated with contaminated water," among other insights. In addition to the CRVA, MWCOG conducts emergency preparedness exercises with water utilities to help prepare for emergency events.

Additional information on drinking water infrastructure vulnerability to climate change effects has been provided by the Interstate Commission on the Potomac River Basin (ICPRB) Cooperative Section for Water Supply Operations (CO-OP). The CO-OP provides regular studies to assess whether the current water supply system will be able to meet the needs of the region at least 20 or more years into the future. The most recent, the *2020 Washington Metropolitan Area Water Supply Reliability Study: Demand and Resource Availability Forecast for the Year 2050* is the seventh edition in the series, and includes climate change projection scenarios, downscaled to the Potomac River basin area. The ICPRB evaluation is

comprehensive and well-regarded compared with other evaluations of water supply in the United States. ICPRB also provides drought monitoring, exercises, and operations.

The Commonwealth of Virginia Hazard Mitigation Plan (2017) details impacts of past flood events, including impacts on potable water and wastewater. The plan also describes relationships between climate-related hazards and water systems. For example, the plan notes "long-term hydrologic drought can impact public water supplies, forcing local governments to enact water conservation restrictions."

Climate projections are not yet systematically integrated into stormwater infrastructure and floodplain modeling, and current watershed management plans do not yet systematically consider future climate projections. However, for wastewater infrastructure, the Department of Public Works and Environmental Services (DPWES)' Wastewater Treatment Division (WTD)'s Capital Improvement Program (CIP) project alternatives are assessed using Envision System scoring, which includes climate and risk. WTD used local climate projections to anticipate flooding and then designed and/or constructed facilities (floodwalls, hydraulic structures, elevated electrical rooms) to reduce the risk. Assessments have been done and are ongoing to determine appropriate infrastructure upgrades and flood mitigation strategies to protect vulnerable infrastructure.

Additionally, water infrastructure (drinking water, stormwater, and wastewater infrastructure) vulnerabilities will be included in the Resilient Fairfax Vulnerability and Risk Assessment.

Opportunities:

- There is an opportunity to integrate climate projections more systematically into stormwater and floodplain modeling and watershed management plans.

Key Supporting Resources:

- 2020 Washington Metropolitan Area Water Supply Reliability Study: Demand and Resource Availability Forecast for the Year 2050
- Capital Improvement Program (CIP)
- Commonwealth of Virginia Hazard Mitigation Plan (2017)
- Metropolitan Washington 2030 Climate and Energy Action Plan
- Northern Virginia Hazard Mitigation Plan
- Resilient Critical Infrastructure: A Roadmap for Northern Virginia
- Resilient Fairfax
- Watershed Management Plans
- Wastewater Utility Management Plan (under development)

W-2 Do Water Supply Plans consider climate change impacts? Do they account for service or demand interruptions?

Relevance:

Water supply can be notably affected by climate change impacts. For example, drought can diminish water supply; severe storms or flooding may result in water supply contamination; warmer and wetter climate translates into extended nitrification season and distribution water quality problems. If Water Supply Plans consider climate change impacts, they are more likely to be able to mitigate impacts and minimize disruptions.

Findings:

❖ ***Consultant score: 4***

Drinking Water Supply Plans for Fairfax County do incorporate climate change considerations. These plans are coordinated at several levels of governance.

Interstate Commission on the Potomac River Basin (ICPRB): Drinking water in Fairfax County is provided by the Fairfax County Water Authority, or "Fairfax Water." Fairfax Water is a public, non-profit water utility and a party to the Water Supply Coordination Agreement of 1982. As specified in the Agreement, the ICPRB CO-OP assumes a direct role in managing water supply resources and withdrawals during Potomac River drought periods. Every five years since 1990, the CO-OP has conducted a water demand and resource availability forecast for the Washington D.C. metropolitan area. These studies assess whether the current water supply system will be able to meet the needs of the region at least 20 or more years into the future. The most recent, the *2020 Washington Metropolitan Area Water Supply Reliability Study: Demand and Resource Availability Forecast for the Year 2050* is the seventh edition in the series. The study forecasts water demands for the metropolitan Washington region throughout the planning horizon, considering potential impacts of changing climate and upstream water use on system resources, projected demographic and societal changes that may affect future water use, forecasts of water availability, and an evaluation of the ability of current and planned system resources to meet the forecasted demands. The ICPRB analysis includes an analysis of the water supply reliability for the metropolitan Washington region including Fairfax Water's service area, for a range of future climate change projection scenarios. The ICPRB modeling and analysis is intended to capture the range of uncertainty in global climate precipitation and temperature forecasts for future global carbon emissions scenarios, downscaled to the Potomac River basin area. The ICPRB evaluation is comprehensive and well-regarded compared with other evaluations of water supply in the United States. ICPRB also provides drought monitoring, exercises, and operations.

Regional Plans: Additionally, Fairfax County follows the declarations of the Metropolitan Washington Water Supply and Drought Awareness Response Plan, which provides a plan of action that would be implemented during drought conditions. This plan was originally created by the Metropolitan Washington Council of Governments (MWCOG)'s Regional Task Force on Water Supply Issues. As part of the fulfillment of this plan, MWCOG issues monthly drought reports from May to October. MWCOG also has a Drought Coordination Committee and a Water Supply Emergency Plan. Additional regional coordination is provided by the Northern Virginia Regional Commission (NVRC). In 2011, NVRC developed the Northern Virginia Region Water Supply Plan, which includes a compilation of the local drought contingency plans for jurisdictions in Northern Virginia, including Fairfax County. This plan was based on 1) precipitation deficits drawn from the U.S. Drought Monitor for Virginia, 2) groundwater levels from four United States Geological Survey observation wells in the Northern Virginia Region (one located in Fairfax County), and 3) the ICPRB water reliability assessment (included as an Appendix), which evaluated climate change projections. An update to this Plan is anticipated in 2023. Further, the Northern Virginia Hazard Mitigation Plan considers climate change impacts on the water supply, and encourages "public and private water conservation plans, including consideration of rainwater catchment system."

Fairfax County Plans and Policies: Chapter 113 of the Fairfax County Code of Ordinances (Water Use, Emergency Regulations) includes language that gives authority for the restriction of water use or the absolute curtailment of water use during certain conditions. While this ordinance does not specifically identify climate change as a potential cause of drought, it does include three stages of drought, and specifies penalties, appeals, and termination clauses. Additional general water supply protection is provided through the Zoning Ordinance and the Comprehensive Plan.

Additional water supply protection is provided through the Zoning Ordinance. Specifically, the Occoquan watershed is protected through the Residential Conservation (R-C) District, which was the result of downzoning nearly 41,000 acres of land to the R-C District, or one dwelling unit per five acres, on July 26, 1982 (RZ 82-W-054) by the BOS. The R-C District protects the quality of public water, water courses, stream valleys, marshes, forest cover in watersheds, aquifer recharge areas, rare ecological areas, and areas of natural scenic vistas by minimizing impervious surface and encouraging open areas for agricultural and large lot single-family subdivisions. Other uses allowed in the R-C District are subject to rigorous review to ensure water quality protection measures are provided, including the use of undisturbed open space to meet best management practice (BMP) and water quality requirements. Only 75 zoning applications have been approved in the R-C District, with 60 of those applications being uses in the public, institutional, and community category.

In addition, the Board created a Water Supply Protection Overlay District, which implemented strict stormwater controls on approximately 63,000 acres (RZ 82-W-051). The Water Supply Overlay District is implemented by Land Development Services (LDS).

The Comprehensive Plan contains additional guidance regarding land use within the Occoquan Watershed. Very low-density development (0.1 to 0.2 dwelling units per acre) and undisturbed contiguous open space are identified in the Comprehensive Plan as key practices for the protection of the Occoquan Reservoir.

With rapid growth in the region, drinking water consumption and demand could become strained in the long term. As a result, in 2015, the BOS voted to transform Vulcan's rock quarry in Lorton into a water storage reservoir. This addition will bring another 17 billion gallons of extra drinking water storage for residents of the Washington region.

Opportunities

- Fairfax County can continue to coordinate with the entities leading water supply planning, including Fairfax Water, MWCOG and NVRC to ensure that plans are periodically updated to reflect the most current climate projections and changing conditions.

Key Supporting Resources:

- 2020 Washington Metropolitan Area Water Supply Reliability Study: Demand and Resource Availability Forecast for the Year 2050
- Drought Monitoring and Operations (ICPRB)
- Fairfax County Code of Ordinances Chapter 113 – Water Use, Emergency Regulations
- Fairfax County Comprehensive Plan
- Metropolitan Washington Water Supply and Drought Awareness Response Plan (MWCOG, 2000)
- Northern Virginia Hazard Mitigation Plan (2017)
- Northern Virginia Region Water Supply Plan (NVRC, 2011)
- Regional Drought and Water Supply Status Reports (MWCOG, Monthly)
- Zoning Ordinance Section 3103.5: Water Supply Protection Overlay District
- Zoning Ordinance Section 2102.2: Residential Conservation (R-C) District

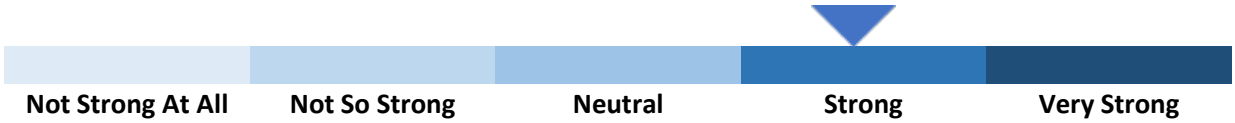
W-3 Have drinking water facilities and infrastructure implemented actions to address climate risk?

Relevance:

As discussed in W-2, water infrastructure can be notably affected by climate change impacts. Drinking water treatment facilities, pump stations, transmission infrastructure, and distribution may be impacted by flooding, power outages, drought, or other climate related disruptions. Implementation of actions to reduce risk and minimize disruption supports the resilience of these facilities and the communities that depend on them for clean water.

Findings:

❖ ***Consultant score: 4***



Fairfax Water has implemented actions to address climate risk to drinking water infrastructure. Specific actions taken include the following:

- Strengthened electrical system reliability at drinking water treatment facilities.
- Regular coordination with Dominion Power to identify and address threats to power reliability for water facilities, including trees at risk of falling during storms.
- Plans for a phased conversion of Vulcan's quarry in Lorton to a Fairfax Water reservoir ultimately capable of storing up to 17 billion gallons of water. The reservoir will provide significant additional storage for use in the event of a prolonged regional drought. The northern part of the quarry will be transferred to Fairfax Water by end of 2035, and the remainder of the quarry will be transferred to Fairfax Water in 2085.
- Installation of a system to oxygenate water that may be of poor-quality following storm events.
- Insulation of water meters that have frozen.
- Coordination of public alerts to provide instruction to Fairfax Water customers during extreme weather events.

Opportunities:

- Continue to maintain and enhance backup power systems at water facilities and coordinate with Dominion Power to improve power reliability.
- Future work to build upon the climate adaptation planning and implementation completed to date could include consideration of asset-specific adaptation measures through use of the U.S. Environmental Protection Agency's Climate Resilient Evaluation and Awareness Tool (CREAT) and facilitated training.

Key Supporting Resources:

- 2020 Washington Metropolitan Area Water Supply Reliability Study: Demand and Resource Availability Forecast for the Year 2050
- FairfaxWater Webpage
- Northern Virginia Hazard Mitigation Plan (2017)

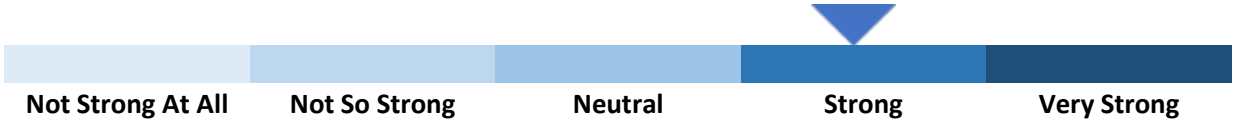
W-4 Do Wastewater Plans consider climate change impacts? Have wastewater treatment facilities implemented actions to address climate risk?

Relevance:

Wastewater treatment systems can be notably affected by climate change impacts including flooding, power outages, drought, or other climate related disruptions. For example, wastewater treatment facilities are often located in flood prone areas. If wastewater plans consider climate change impacts, they are more likely to be able to mitigate impacts and minimize disruptions. Implementation of actions to reduce risk and minimize disruption supports the resilience of these facilities and the communities that depend on them to provide wastewater treatment.

Findings:

- ***Consultant score: 4***



The Department of Public Works and Environmental Services (DPWES)' Wastewater Treatment Division (WTD)'s Capital Improvement Program (CIP) project alternatives are assessed using Envision System scoring, which includes climate and risk. WTD uses local climate projections to anticipate flooding and then designs and/or constructs facilities (floodwalls, hydraulic structures, elevated electrical rooms) to reduce the risk. Assessments have been done and are ongoing to determine appropriate infrastructure upgrades and flood mitigation strategies to protect vulnerable wastewater infrastructure.

Fairfax County's DPWES Wastewater Management operates the Noman M. Cole Jr. Pollution Control Plant and wastewater collection system including pump stations within the county. Wastewater is also conveyed to five other regional facilities managed through interjurisdictional agreements. Design standards for sanitary sewer pipes and manholes near streams or subject to infiltration of surface flow require watertight systems as well as pipe cover and protection requirements for stream crossings. In addition, facilities like pump stations also have special design requirements when located in floodplains. The WTD has considered climate change impacts including power outages, flooding, and sewer overloading. Additional electric generators, flood walls, and influent equalization tanks have all been installed.

Northern Virginia Hazard Mitigation Plan Mitigation Action 5 stipulated to armor the stream bank and construct a flood wall to prevent stream bank erosion and flooding at the Noman M. Cole Jr Pollution Control Plant. The second of two projects to armor the stream bank was completed in February 2018 and that flood walls around three basins were complete in 2019. The Plant was also equipped with an extra

equalization tank, elevation of new and improved buildings above the 500-year flood level, backup generators at all pump stations, a backflow preventer program.

Opportunities:

- There is a need to continually review and update wastewater treatment plans to reflect best available climate data and projections.
- Future work to build upon the climate adaptation planning and implementation completed to date could include consideration of asset-specific adaptation measures through use of the U.S. Environmental Protection Agency's Climate Resilient Evaluation and Awareness Tool (CREAT) and facilitated training. CREAT supports water utilities assess their climate risks at an asset-specific level, quantify potential consequences from climate-related threats, design adaptation plans, and evaluate economic consequences based on different climate and implementation scenarios.

Key Supporting Resources:

- Capital Improvement Program (CIP)
- Floodplain Management Plan Progress Report (2021)
- Noman M. Cole Jr. Pollution Control Plant Environmental and Sustainability Program Presentation (2021)
- Northern Virginia Hazard Mitigation Plan (2017)
- Public Facilities Manual 10-0000 Sewage and Solid Waste

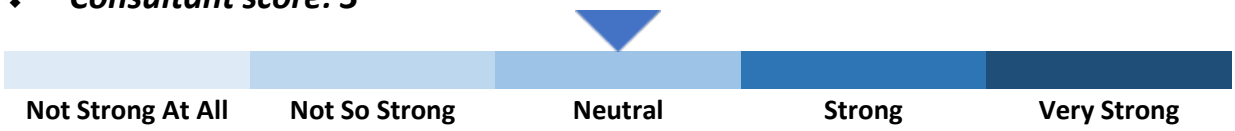
W-5 Do the stormwater management plans consider climate change impacts?

Relevance:

Stormwater management infrastructure can be notably affected by climate change impacts. Stormwater infrastructure and the water quality and quantity in local waterways is most significantly impacted by flooding, but also experiences effects from extreme temperatures and drought. Stormwater plans that consider climate change impacts are more likely to be able to mitigate impacts.

Findings:

❖ ***Consultant score: 3***



Many of the county's stormwater related plans consider climate change impacts, either explicitly or indirectly. For example, the Floodplain Management Plan Progress Report 2021 notes that the current

rainfall data of today does not match historic rainfall data and may not accurately represent future rainfall patterns. The Progress Report notes it impossible to retrofit all stormwater infrastructure with each change in rainfall data. Regarding service/demand interruptions, some facilities have been targeted for flood mitigation retrofit actions. Additionally, while the current Stormwater MS4 Annual Report does not explicitly consider climate change impacts, county staff have noted that an update that is in progress will. Dam Emergency Action Plans (EAP)s have been published for each state-regulated dam located in the county, and while not explicit in considering climate change impacts, do address some impacts, primarily flooding and extreme precipitation (i.e., rainfall). EAPs rely upon engineering analyses to determine flood inundation zones produced by potential dam failures.

In response to recent intense storm events and resulting flooding, DPWES Stormwater Management is continuing to identify and prioritize flood prone communities by building on existing watershed plans, infrastructure condition assessment reports and drainage inquiries from residents. Many of these communities are areas built before 1970 that have aging and inadequate stormwater infrastructure not designed to today's standards let alone future conditions related to climate change. In addition, residential infill development within these older established neighborhoods adds to the cumulative amount of stormwater runoff and related impacts. Residential infill development includes smaller subdivisions on vacant or underutilized parcels as well as additions or teardowns of older homes that are replaced by larger homes. Redevelopment on existing residential parcels does not include offsite public improvements like road, stormwater, or sanitary sewer infrastructure that are traditionally built with new subdivisions. DPWES is working with LDS to build on lessons learned from flood response to inform the land development design and review process.

Individual Stormwater Capital Improvement Program (CIP) projects including ongoing neighborhood stormwater improvement projects that address flooding are listed by watershed on the county's Stormwater Improvement Projects site.

Staff note that the majority of stormwater management infrastructure is gravity-based, passive systems, with generators available for the few exceptions to gravity-based systems.

Additionally, the county has taken numerous flood mitigation actions that enhance the county's resilience, such as:

- The Huntington Levee, completed in 2019 at a cost of $41.2 million, is designed to protect the Huntington community from storms up to and including 100-year flooding events. The levee project consists of an earthen embankment with a concrete I-wall, pump station and storage ponding area to divert interior stormwater around the levee during high-intensity storm events, emergency generator, and monitoring equipment.
- The Maintenance and Stormwater Management Division and Stormwater Planning Division maintain and use an advance flood warning system to monitor rainfall and water level at dams and flood-prone areas.
- For county-owned, state regulated dams, annual inspections are required, and the preparation of annual inspection reports must be submitted to Virginia DCR.

- For county-owned, non-state regulated dams, biennial inspections are required to be made by qualified consultant.
- For privately-owned dams, 5-year inspections are required to be made by a qualified consultant.
- The Northern Virginia Hazard Mitigation Plan Mitigation outlines actions to prevent stream bank erosion and flooding at Noman M. Cole Jr. Pollution Control Plant (see W-4).

Opportunities:

- Develop long-term neighborhood stormwater improvement program to address flooding and infrastructure reinvestment needs that consider existing and future climate conditions.
- Continue to implement actions identified in Flood Management Plan Progress Report that is part of the Northern Virginia Hazard Mitigation Plan.

Key Supporting Resources:

- Dam Emergency Action Plans (EAP)
- Flood Response Lessons Learned for LDS
- Flood Response Plan (2010, 2014)
- Floodplain Management Plan Progress Report (2021)
- Huntington/Belleview Flood Response Plan
- Huntington Levee Flood Response Plan
- Huntington Levee project Webpage
- NASA DEVELOP Program Results and Presentation
- Stormwater Capital Improvement Projects (by watershed) Webpage
- Stormwater MS4 Annual Report

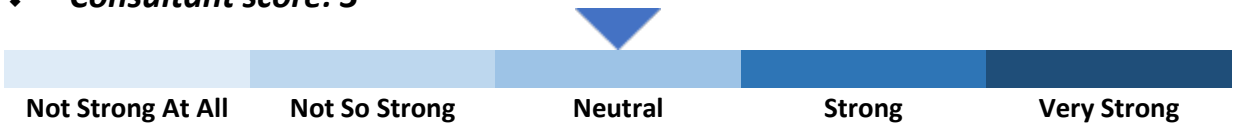
W-6 What are the current stormwater management requirements and design standards, and do they consider climate projections?

Relevance:

Stormwater regulations and design standards include criteria to provide public safety and the protection of property including reducing the risk of impacts from flooding. Future climate conditions are important to ensure that these facilities continue to provide the same level of protection and service in the future.

Findings:

❖ ***Consultant score: 3***



The Fairfax County stormwater management regulations and policies do not explicitly address climate change adaptation and resilience. However, the regulations do include design standards and safety factors to reduce flooding impacts. Land Development Services (LDS) and Department of Public Works and Environmental Services (DPWES) staff have initiated conversations to consider climate change impacts in county stormwater standards and projects.

The Fairfax County Stormwater Management Ordinance, Chapter 124, incorporates State and Federal requirements for the management of the stormwater runoff quality and quantity in Sections 124-2-6, 2-7, and 2-8. Requirements for downstream channel protection and flood protection are defined under the water quantity design section, 124-4-4. Design storms' (the 1-year 24-hour storm, 2-year 24-hour storm, and the 10-year 24-hour storm) prediction models including TR-20, TR-55, and the rational method, are defined in Section 124-4-6. However, these requirements do not consider future climate predictions, as the design storms and methodology are based on USDA NRCS statistics, including IDF curves (NOAA Atlas 14). The current practice of designing infrastructure using historical precipitation data from the last half century underestimates current and future precipitation, leading to a loss of stormwater BMP efficiency and increased risk of flooding and infrastructure failure.

In the near future, the county will be required to consider climate change as part of the development review process. In response to legislation adopted by the Virginia General Assembly in 2020, the State Water Control Board adopted amendments to the Chesapeake Bay Preservation Area Designation and Management Regulations. These regulations require, among other things, that the county amend their ordinances to require the locality to assess the impacts of climate change and sea-level rise on any proposed land development in the Resource Protection Areas during the development review process. The county's assessment must, at a minimum: be based on a 30-year impact range, utilize a model, or forecast developed by or on behalf of the Commonwealth, identify potential impacts from sea-level rise using the NOAA intermediate-high scenario project curve, storm surge based on NOAA SLOSH model, and flooding based on FEMA Special Flood Hazard Area and Limit of Moderate Wave Action, among other conditions. The amended final regulations were published in the Virginia Register August 30, 2021. Virginia Department of Environmental Quality is developing a guidance document that will provide essential clarification for localities in the development of ordinance amendments. The county will initiate the process to amend the Chesapeake Bay Preservation Ordinance (CBPO) when the guidance document is published. Localities have three years from the effective date to adopt amendments to the local ordinance.

Similarly, the Fairfax County MS4 Program complies with State and Federal requirements (Virginia Stormwater Management Program Permit No. VA0088587). The program includes MS4 Action ID B.2.j.1.i

to encourage private property owners to implement voluntary stormwater management techniques and/or retrofits. The county works with the Northern Virginia Soil and Water Conservation District (NVSWCD) to encourage measures to capture and infiltrate stormwater runoff on private property prior to its flow into storm sewers via workshops, brochures, and assistance. Examples implemented in 2020 include two rain gardens, 20 rain barrels, conservation landscaping at 9 properties (according to the 2020 MS4 Program Plan and Annual Report).

In addition, the MS4 program lists several stormwater management projects that incorporate measures that would provide climate resilience, specifically by providing infiltration and retention of stormwater runoff. For example, according to Appendix P2 of the MS4 Program Plan and Annual Report, measures including bioretention, constructed wetlands, infiltration, and permeable pavement, have been constructed, are under construction, and are in the design phase.

Opportunities:

- There is an opportunity to incorporate climate change impacts more systematically in county stormwater standards and projects.
- Following the Department of Environmental Quality's completion of the guidance document, the county will take action to integrate climate change more explicitly into the development review process when it amends its ordinances to come into compliance with the Chesapeake Bay Preservation Area Designation and Management Regulations.
- As noted in the Fairfax County Flood Mitigation Program Summary, there is a need to (re)assess infill development stormwater management standards and overland relief evaluation. This isa challenge to overcome as the county currently lacks the ability to mitigate the cumulative effects of increases in impervious area created by residential infill redevelopment.

Key Supporting Resources:

- Chesapeake Bay Preservation Area Designation and Management Regulations
- Developing Future Projected Intensity-Duration-Frequency (IDF) Curves: A Technical Report on Data, Methods, and IDF Curves for the Chesapeake Bay Watershed and Virginia
- Fairfax County Code of Ordinances Chapter 118 – Chesapeake Bay Preservation Ordinance
- Maximum Infiltration Rates for the Design of Stormwater Management Facilities
- Mid-Atlantic IDF Curve Tool
- Public Facilities Manual (PFM)
- Stormwater Management Ordinance – Chapter 124
- Stormwater MS4 Annual Report
- Virginia Stormwater Management Program Permit No. VA0088587

VII. Energy

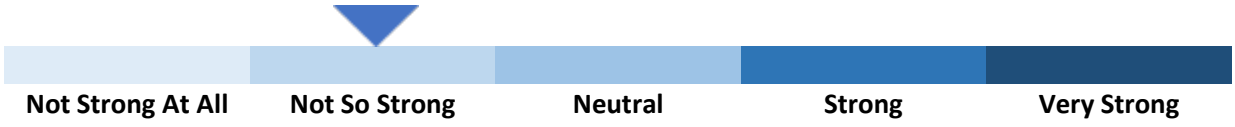
E-1 Has a vulnerability assessment been completed for the electrical grid or key components of the energy system?

Relevance:

Energy infrastructure can be notably affected by climate change impacts, including extreme storms, flooding, and heat which can cause disruptions in service. Power outages impact critical services such as water treatment, hospitals and communications and impact residents, particularly those who rely on ventilators or refrigerated medications. Understanding the vulnerabilities of the energy system allows decision-makers to plan and take action to mitigate impacts and minimize disruptions.

Findings:

- ***Consultant score: 2***



The energy system (electricity and natural gas) in Fairfax County is under the management of entities such as Dominion Energy, NOVEC, Washington Gas, and Columbia Gas. These entities are not within the county's control. Information regarding the vulnerability of the electrical grid is largely confidential and difficult to assess the extent to which climate projections are integrated into energy system planning. Dominion Energy and the Northern Virginia Electric Cooperative (NOVEC) are responsible for these assessments.

However, these entities do communicate and coordinate with the county. Each of these entities is a participant in the Resilient Fairfax Infrastructure Advisory Group (IAG). The Resilient Fairfax planning process includes a Vulnerability and Risk Assessment (VRA), which will include assessments of climate vulnerabilities to the electricity and natural gas systems. At the time of writing this Audit, the VRA is simultaneously being written, using feedback from these entities. For information on specific energy system vulnerabilities and actions taken to enhance resilience, please see the VRA.

Additionally, Additionally, Fairfax County participates in workshops hosted by the Metropolitan Washington Council of Governments (MWCOG) for the national capital region stakeholders to consider strategic consequences and operational implications of long-term outage of electric grids. These workshops are not available to the public due to safety and security reasons. During the workshops, participants examine categories of plausible electric grid failure and likely response scenarios. Participants also identify potential resource needs and missing components in existing energy emergency plans.

For discussion on back-up generators, please see E-4.

Opportunities:

- To achieve robust, secure, and consistent energy infrastructure that can restore services rapidly in the event of an emergency, the county should consider coordinating with energy providers for the development of an Energy Assurance Plan. Energy Assurance Plans promote energy resilience through consideration of a community's energy profile, providers, and critical facilities.
- There is an opportunity for Fairfax County to more thoroughly identify buildings and neighborhoods that experience unreliable power and frequent outages and to advocate for action.
- Fairfax County can continue coordinating with utilities and partnering with MWCOG and other regional partners to build in resilience to the energy supply.

Key Supporting Resources:

- MWCOG Energy Emergency Exercises
- Resilient Fairfax Vulnerability and Risk Assessment

E-2 Is the local government actively engaged with local utilities and in state processes regarding energy infrastructure upgrades?

Relevance:

As extreme weather events intensify and become more frequent, energy infrastructure (particularly above ground infrastructure, like power lines) may be at risk of damage and therefore service disruption. Infrastructure must be properly protected and reinforced to withstand climate hazards and ensure continuity of operations. Energy infrastructure decisions are made by energy utilities and state regulators. While Fairfax does not have direct control over these decisions, the county can still actively engage with these decision-makers to shape and influence the plans and processes that will ultimately be implemented to address energy system resilience and ensure that local priorities and concerns are represented in these processes.

Findings:

❖ ***Consultant score: 2***

Certain Fairfax County departments are engaged to the extent feasible with utilities and state processes regarding energy infrastructure (electricity grid) upgrades. The Office of Environmental and Energy Coordination (OEEC) and Fairfax County Park Authority staff lead and participate in Virginia Energy Purchasing Governmental Association (VEPGA) meetings. VEPGA tracks energy developments in Virginia and negotiates electricity contracts on behalf of over 170 local government entity members. Additionally, OEEC staff actively keep track of and participate in State Corporation Commission (SCC) processes. The SCC is a state agency with regulatory authority over public utilities, among other economic interests. The Fairfax County Attorney is also involved in energy infrastructure upgrades. Further, OEEC staff participate in regional meetings hosted by the Metropolitan Washington Council of Governments (MWCOG) focused on energy supply and reliability and critical infrastructure protections. Other county departments have indicated they are not actively engaged in such processes. The extent to which this involvement includes discussions of climate-related utility upgrades varies. For Fairfax County to be more directly responsible for processes related to the resilience of the electricity grid, substantial shifts in utility regulatory proceeding involvement would be required at the state level.

For the Resilient Fairfax process specifically, OEEC has included the following energy utilities in the Resilient Fairfax Infrastructure Advisory Group (IAG): Dominion Energy, NOVEC, Washington Gas, and Columbia Gas.

For discussion on back-up generators, please see E-4.

Opportunities:

- There is an ongoing need and opportunity for Fairfax County to engage with Dominion and NOVEC and the Virginia Division of Public Utility Regulation to align and encourage climate and energy resilience planning.

Key Supporting Resources:

- Resilient Fairfax Infrastructure Advisory Group Charter
- State Corporation Commission (SCC) Webpage
- Virginia Energy Purchasing Governmental Association (VEPGA) Webpage

E-3 Are plans in place to upgrade, retrofit, or relocate vulnerable components of the energy system within the local government's control?

Relevance:

For those aspects of the energy system that are within the local government control, including back-up power supplies and renewable energy installations, the county can take action to reduce vulnerabilities and increase the resilience of these assets. In some instances, locally owned renewable energy systems and energy storage can be designed to support grid resilience or provide reliable power supply during outages.

Findings:

❖ ***Consultant score: 4***

The energy system (electricity and natural gas) is under the management of entities such as Dominion Energy, NOVEC, Washington Gas, and Columbia Gas. These entities are not within the local government's control. See E-1 for more details. Energy system components "within the local government's control" are largely limited to on-site or building-related energy systems. Fairfax County has various programs and policies proposed or currently in place to update and upgrade vulnerable energy systems. (For discussion on back-up generators, please see E-4.)

The Facilities Management Department (FMD) manages the county's Capital Renewal Program. During new renovation or construction, critical facilities are provided with a 100% generator back-up, and energy performance of building systems are reviewed as part of the design analysis to select the best suitable system for the particular use. The Capital Renewal Program includes infrastructure replacements and upgrades of generators, electrical systems, building energy management, and building sub-system assessments. Additional benefits of this program include the management and mitigation of facility or subsystem failure and safety risk, addressing requirements to meet legal compliance, assessment reporting that provides perspective on 10-year capital planning needs, detailed sub-system analysis within

each building assessed, avoidance of expensive emergency repairs from major system failures, reduction of deferred maintenance, and energy and sustainability advancements.

A specific example of a vulnerable energy system component relocation can be seen at the New Alexandria / Belle View pump station. The fuel oil storage tanks were upgraded from underground to aboveground to reduce vulnerability (Fairfax County Mitigation Action 16).

Furthermore, the Department of Vehicle Services (DVS) is partnering with FMD and the Department of Public Works and Environmental Services (DPWES) to install electric vehicle charging stations at county-owned and new facilities. Fairfax County is also using state grants for emergency shelter upgrades.

In addition to direct energy vulnerability actions, Fairfax County is working to increase its energy efficiency and energy diversity, which can enhance resilience in the event of power failures. For example, the Energy Policy looks to increase and encourage coordination of energy efficiency and conservation efforts. The Operational Energy Strategy (OES) establishes energy-related actions for county government to take to reach the goal of carbon neutrality for county buildings by 2040. The Sustainable Development Policy for Capital Projects also includes energy-related components, and requires that new county government facility construction, additions, and major renovations greater than 10,000 square feet must achieve LEED Gold, incorporate solar and EV readiness features, and provide on-site renewable energy generation as practicable, among other requirements. Furthermore, Fairfax County supports green building in private sector development.

Opportunities:

- There are opportunities to support and coordinate with the various county departments to make energy system upgrades and improvements.
- Through annual reporting there is an opportunity to increase awareness of energy resilience improvements and utilize county projects as models.

Key Supporting Resources:

- Capital Improvement Program (CIP)
- Energy Policy
- Environmental Improvement Program
- Fairfax Green Initiatives #1
- Floodplain Management Plan Progress Report (2021): Action 13, 16, 30
- Operational Energy Strategy (2021)
- Sustainable Development Policy for Capital Projects

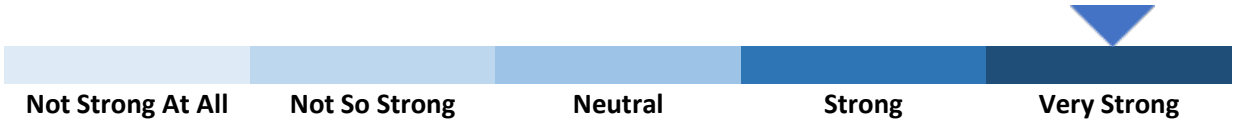
E-4 Has the local government assessed the back-up power at critical facilities?

Relevance:

Critical facilities perform vital community services, so their continuous operation underpins community resilience. To minimize disruptions, these facilities should have adequate back-up power to support their essential functions.

Findings:

- ***Consultant score: 5***



Fairfax County has assessed back-up power at critical facilities. The Facilities Management Department (FMD) is responsible for providing a full range of facility management services for 245 county-owned and designated leased facilities. Additionally, DPWES' Building Design and Construction Division (BDCD) coordinates back-up generator requirements during the design phase. According to FMD, climate change adaptation and resiliency, including back-up power, is addressed in every aspect of FMD's operations. FMD's emergency generator systems are independent sources of electrical power that support Building Code required life safety systems and, in some circumstances, other critical building systems in the event of the loss of commercial utility power. To provide for the continuity of business and safety of residents and property, at the most critical Fairfax County Government structures, emergency generator systems provide back-up power to all critical building systems (mechanical, electrical, HVAC, and plumbing). Supported critical facilities include police and fire stations, McConnell Public Safety and Transportation Operations Center, Judicial Courthouse Complex, radio towers, health centers, data centers, and the Government Center. Emergency Generator Systems include generators, transfer switches, power electronics, batteries, and fuel cells integrated into a unified system, all with required auxiliary equipment such as cabling and connectors, fuel tanks, racks, cabinets, and enclosures.

In addition to regular Facilities Management Department (FMD) management, Ft. Belvoir's energy personnel provide generator assessments for Fairfax County's critical infrastructure, such as the hospitals, Government Center, wastewater treatment facilities, and other critical facilities. These assessments provide Ft. Belvoir troops with energy assessment practice, and they provide Fairfax County with valuable data, so it is a mutually beneficial arrangement. Additionally, the Department of Emergency Management and Security (DEMS) has conducted generator studies with Fairfax County Park Authority (FCPA) and Fairfax County Public Schools (FCPS). Specifically, FCPA conducted a review of RECenters for possible installation of back-up generators and completed a design for a plug-in generator at Spring Hill RECenter. FCPA already has backup power at one recreational center that may serve as a shelter, and they are

looking to increase backup power at other shelter facilities. DEMS is working to connect these agencies with state grant funding for generators. The Department of Public Works and Environmental Services (DPWES) Wastewater Management operates and maintains 54 wastewater pump stations and three stormwater facilities that require emergency backup power generators. The recently completed Huntington Levee project includes an emergency generator sized to provide stand-by power for the three high-flow submersible pumps and critical building systems. In addition, five generators were installed at the Noman M. Cole Pollution Control Plant. Fairfax County FCDOT's major transit facilities (three bus garages) have back-up generators to maintain the Fairfax Connector service. DVS has four vehicle maintenance facilities, all of which have backup generators to run the facilities.

Opportunities:

- There are opportunities to increase deployment of back-up power at shelters.
- The county should explore the potential to deploy solar-plus-storage for back-up power rather than fuel-powered generators as an opportunity to align climate resilience more closely with greenhouse gas emission goals.
- The Northern Virginia Hazard Mitigation Plan called out the promotion of structural mitigation to assure redundancy of critical facilities, to include upgrade of electrical panels to accept generators. Relatedly, the Floodplain Management Plan stated the need to identify critical public facilities in need of backup generators, communications and/or vehicles.

Key Supporting Resources:

- Floodplain Management Plan: Action 7, 13, 30
- Northern Virginia Hazard Mitigation Plan (2017)

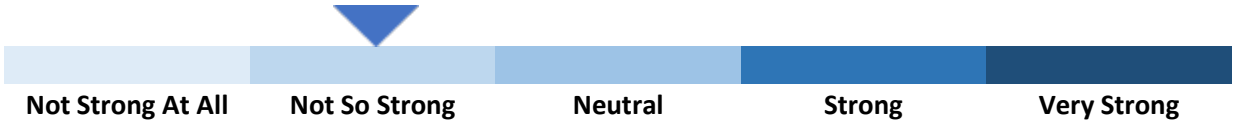
E-5 Has the local government assessed the feasibility of microgrids for critical infrastructure and/or economic centers?

Relevance:

Microgrids that can "island" from the grid and include energy generation and storage capacity are increasingly being considered as an approach to ensure more reliable power for critical facilities and other clustered development, including campuses, economic centers, and neighborhoods. While microgrids can be expensive and technically complex, there are emerging technologies and innovations that are likely to increase their feasibility over time.

Findings:

❖ ***Consultant score: 2***



There is currently a microgrid being considered for Fort Belvoir military base in Fairfax County. However, the feasibility of microgrids have not notably or systematically been assessed at other sites. The establishment of microgrids requires action from Dominion Energy; that is, the local government cannot lead this implementation on its own.

Opportunities:

- While Fairfax County cannot implement a microgrid without utility leadership, the county can take steps to conduct initial feasibility studies and explore collaboration with the utility on pilot project implementation.

Key Supporting Resources:

- Northern Virginia Hazard Mitigation Plan (2017)
- US Department of Energy CHP and Microgrid Installation Database

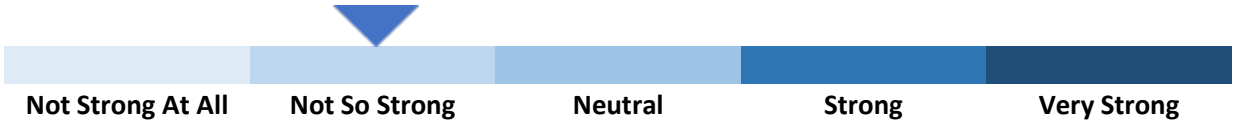
E-6 Has the local government assessed feasibility for solar-plus-storage on public buildings?

Relevance:

Solar-plus-storage can enable buildings to “island” from the grid during power outages and continue to use solar energy. This solution can provide clean back-up power for facilities and does not rely on the availability of fuels (as do traditional back-up generators).

Findings:

❖ ***Consultant score: 2***



Fairfax County has not implemented solar-plus-storage on public buildings; however, the county does have several ongoing power purchase agreements for solar on and around county buildings. Those projects have not included a battery storage component yet to date. The Sustainable Development Policy for Capital Projects states that the BOS encourages sustainable buildings and maintains that facilities that occupy an area greater than 10,000 square feet should be designed and built under the LEED program and incorporate solar features. County departments and agencies including Fairfax County Park Authority (FCPA) and the Department of Public Works and Environmental Services (DPWES)' Building Design and Construction Division (BDCD) coordinate with the Office of Environmental and Energy Coordination (OEEC) on solar energy options available.

Opportunities:

- As the county implements future solar projects, they should consider opportunities to include storage in the system design. At minimum, systems should be installed to easily accommodate the addition of batteries in the future.
- The county should conduct a review of existing solar energy projects to assess the potential to add energy storage.

Key Supporting Resources:

- Operational Energy Strategy (2021)
- Sustainable Development Policy for Capital Projects (2021)

E-7 Does the local government have a clear permitting process for energy storage?

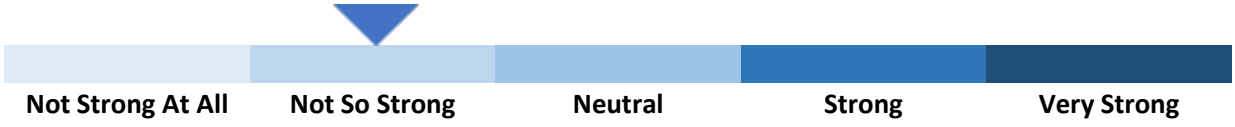
Relevance:

As described in E-5 and E-6, energy storage (i.e., batteries) can support energy resilience for buildings and groups of buildings. If the permitting process for energy storage is unclear, it can add costs and unintentionally create barriers for potential projects. Local governments can help clarify the permitting process and help potential applicants understand what permits and inspections are necessary and how to

navigate the process most efficiently. This process may include zoning definitions, electrical permits, building permits, utility interconnection permits and compliance with fire code.

Findings:

❖ ***Consultant score: 2***



In the Fairfax County Zoning Ordinance, energy storage would be classified as either a component of a "Solar Power Facility," or "solar collection system," or as an "Accessory use or structure," depending on the details of the facility at hand. The Public Facilities Manual does not currently include guidance for solar energy storage.

As per the National Electric Code, the county implements the following requirements:

- Racks for batteries storage be rigid, structurally sound, and made from materials resistant to deteriorating action by electrolyte and provided with non-conducting materials supporting the cells/batteries, OR with continuous insulating material other than paint on conducting member.
- Trays /frames/shallow boxes for storage batteries, shall be made of wood or non-conductive materials constructed / treated to be resistant to deteriorating action by electrolyte.
- Adequate ventilation shall be provided consistent with battery technology for sufficient ventilation and diffusion of gases from the battery, if present, to prevent accumulation of explosive mixture.
- Spaces around battery system shall be accordance with National Electric Code 110.26, to provide for necessary working space.
- Gas piping is not permitted in battery rooms.

Opportunities:

- Fairfax County could develop a resource (such as a brief guidance document) to help potential applicants understand and navigate the process of permitting energy storage.

Key Supporting Resources:

- Building Provisions
- National Electric Code
- Public Facilities Manual (PFM)
- Zoning Ordinance

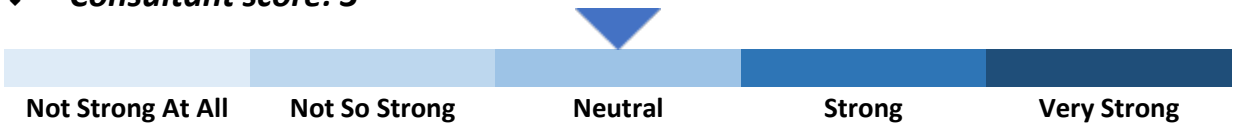
E-8 Does the local government offer incentives or technical support for energy storage?

Relevance:

As described in E-5 and E-6, energy storage (i.e., batteries) can help to support energy resilience for buildings and groups of buildings. While the cost of energy storage is declining, the market is still relatively nascent. Local governments can help accelerate the deployment of energy storage by offering incentives and/or technical support.

Findings:

❖ ***Consultant score: 3***



Fairfax County provides incentives and technical support for solar energy storage. The county promotes the Local Energy Alliance Program (LEAP)'s Solarize Fairfax County program. Solarize Fairfax County aims to reduce the cost and complexity of investing in solar energy, including discounts for battery storage associated with solar systems. The program also provides home energy assessments to identify energy-saving opportunities. Since 2014, more than 540 solar systems have been installed in Northern Virginia through the Solarize program.

The county is also currently researching the possibility of establishing a Green Bank, which may facilitate the funding of sustainability projects in the future.

At the state level, the Virginia Energy Development and Energy Storage Authority is working to promote the deployment of solar and energy storage; however, the State does not currently seem to offer any direct technical or financial assistance to support energy storage.

Opportunities:

- There are opportunities to support further expanding the Solarize program (run by an independent non-profit organization) and to continue enhancing community understanding of and access to energy storage specifically.

Key Supporting Resources:

- Local Energy Alliance Program
- Solarize Fairfax County Webpage
- Virginia Energy Development and Energy Storage Authority

VIII. Transportation

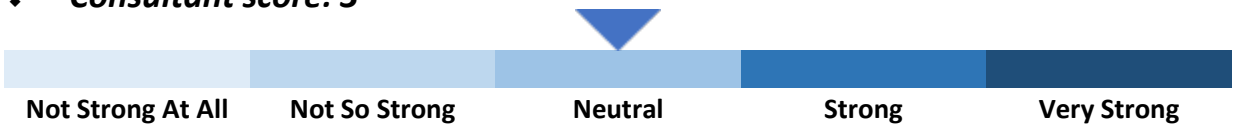
T-1 Has a vulnerability assessment been completed for transportation infrastructure across jurisdictions/ levels of government?

Relevance:

Transportation infrastructure (including roadways, bridges, public transportation, rail, bicycle, scooter, and pedestrian infrastructure, and fueling stations) can be highly vulnerable to climate effects. Impacts to transportation infrastructure can cause cascading additional impacts, such as lack of access to emergency services or evacuation routes. Transportation infrastructure is often maintained and planned by multiple levels of government or jurisdictions (i.e., Virginia Department of Transportation (VDOT), Fairfax County Department of Transportation (FCDOT), Metropolitan Washington Council of Governments (MWCOG), Washington Metropolitan Area Transit Authority (WMATA), Virginia Department of Public and Rail Transit (DPRT), and others). Therefore, vulnerability assessments that are coordinated across these authorities may be helpful in planning for comprehensive transportation network resilience.

Findings:

❖ ***Consultant score: 3***



Federal and State-level assessments: At the federal level, FEMA collects Preliminary Damage Assessments after natural disasters. FEMA then uses those estimates to determine the type and amount of aid that is made available. These estimates typically include loss estimates to infrastructure, property, and crops. The National Oceanic and Atmospheric Administration (NOAA) and the US Army Corps of Engineers also conduct studies and maintain robust data on natural disasters and vulnerabilities, such as vulnerabilities to severe storms, projected sea level rise and coastal storm surge, among other hazards. The National Climate Data Center database also tracks impacts from extreme weather events.

It should be noted that the existing roadway network in Fairfax County is largely maintained and operated by VDOT, and not FCDOT. At the state level, VDOT maintains a comprehensive database of roadway conditions.

Currently, the Commonwealth of Virginia is conducting transportation climate vulnerability and risk assessments related to coastal flooding as part of the Virginia Coastal Resilience Master Plan. Transportation assets evaluated for coastal flooding include roadways, bridges, rail and public transit lines, and other infrastructure.

Recent legislation (HB 1217) requires VDOT to identify public transportation infrastructure in Planning District 8 that is at risk of deterioration due to recurrent flooding. Fairfax County is in Planning District 9, but VDOT staff note that they are identifying vulnerable infrastructure statewide.

Regional assessments: MWCOG has conducted numerous climate risk and vulnerability assessments, including the latest Regional Climate Risk and Vulnerability Assessment (CRVA) for the region summarized in the Metropolitan Washington 2030 Climate and Energy Action Plan (2020) report. The CRVA included extreme heat, drought, lightning and thunderstorms, flash and riverine flooding, coastal flooding, and extreme winter conditions. The CRVA also evaluated factors impacting adaptive capacity such as infrastructure conditions and maintenance. The methodology was based on the Global Covenant of Mayors framework. The CRVA identified transportation system vulnerabilities including:

- Extreme heat: road surface damage and pavement softening, increase in rail infrastructure deterioration, aviation runway damage, bridge deterioration, plane takeoff disruption, and increased cost of maintenance.
- Flash, riverine, and coastal flooding: roadway flooding, roadway damage, roadway closures causing loss and disruption to critical and emergency services
- Severe thunderstorms: transportation routes blocked due to downed trees and power lines
- Extreme winter conditions: transportation infrastructure damages and closures due to snow, ice, downed trees, abandoned vehicles, and vehicle accidents.

The Northern Virginia Regional Commission (NVRC) has conducted multiple vulnerability assessments and compilations of assessments, including "Resilient Critical Infrastructure: A Roadmap for Northern Virginia," and "Regional Collaboration to Build Community Resilience in Northern Virginia," among others. NVRC also conducted a 2019 Risk Assessment workshop, which evaluated critical infrastructure and effects by climate stressors, through the lens of a system rather than a single asset. The workshop found that the sea level rise stressor caused approximately $3.0 million in damage to critical infrastructure including transportation systems.

The Northern Virginia Hazard Mitigation Plan (HMP) qualitatively defines some of the vulnerabilities within the transportation sector related to climate change and there are efforts to mitigate vulnerabilities in specific locations in the county. However, there does not appear to be network-level climate vulnerability assessments completed for the transportation sector.

Regarding public transportation, WMATA continues to aim to protect the region's investments by making their assets less vulnerable to extreme weather. For example, recent projects include securing vent shafts, upgrading pumping stations and waterproofing and improving interior drainage in Metrorail tunnels. Metro launched an effort to develop a strategic approach for a climate resilience strategy that will better help the agency prepare and prioritize strategic investments in alignment with regional resilience planning efforts such as Resilient Fairfax.

County-level assessments: The Resilient Fairfax Vulnerability and Risk Assessment (VRA) will include high-level assessments of climate vulnerability for roadways, public transportation, and bicycle and pedestrian

networks. Prior to Resilient Fairfax, several relevant (but disconnected) analyses have been conducted relating to transportation infrastructure climate vulnerability.

Numerous Fairfax County departments and entities currently have maps and databases documenting roadway flooding, drainage complaints, and obstructions. Departments and entities with flooding-related databases include the Department of Public Works and Environmental Services (DPWES), Department of Code Compliance (DCC), Northern Virginia Soil and Water Conservation District (NVSWCD), Department of Emergency Management and Security (DEMS), Fire and Rescue Department (FRD), and Land Development Services (LDS). There are efforts currently underway to consolidate these databases. The flood-prone roadways are often either situated in low-lying areas of the county or are in areas with older infrastructure not built to today's design standards.

The Department of Vehicle Services (DVS) (which provides county vehicle fleets including transit buses, school buses, public safety vehicles, maintenance vehicles, and county staff fleet cars, among others) maintains 53 fuel sites that are potentially vulnerable to climate effects. Additionally, DVS is beginning to work on the establishment of electric vehicle charging stations. A few vulnerabilities of concern include summertime heat impacts on vehicle batteries and fuel economy as the county transitions to an all-electric fleet. There is further concern that the vehicle maintenance sites may be affected if drought or heavy precipitation events affect water quality as well as stormwater management. To date, a Vulnerability Assessment has not yet been conducted for those fueling/charging stations.

To date, a network-level vulnerability assessment has not been conducted within FCDOT for the transportation network. It may be the case that this work is more appropriate for VDOT, which maintains most roads in Fairfax County, and/or MWCOG, which maintains rail transit infrastructure in Fairfax County.

Opportunities:

- Consolidation of existing databases documenting flood-prone and storm-affected roadways and neighborhoods would enable a more comprehensive documentation of vulnerabilities. As part of this consolidation, the county could integrate the findings from the WMATA climate vulnerability and risk assessment for Metro infrastructure to the database.

Key Supporting Resources:

- Floodplain Management Plan Progress Report (2021): Action 4, 12
- Metropolitan Washington 2030 Climate and Energy Action Plan
- Northern Virginia Hazard Mitigation Plan (2017)
- Regional Collaboration to Build Community Resilience in Northern Virginia
- Resilient Critical Infrastructure: A Roadmap for Northern Virginia
- Resilient Fairfax Vulnerability and Risk Assessment
- Transit Development Plan
- Transportation Priorities Plan (TPP)

- Transportation Status Report
- Virginia Coastal Resilience Master Plan
- Virginia HB 217
- WMATA Climate Resilience Initiative

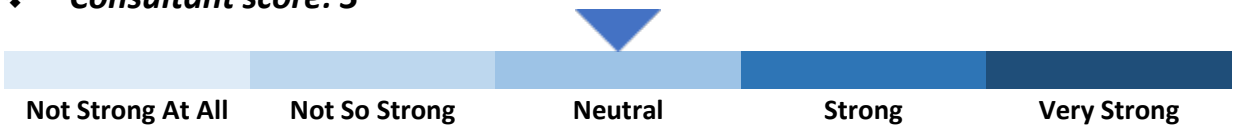
T-2 Are climate projections factored into transportation planning, design, and engineering decisions?

Relevance:

As the climate changes, historically sound transportation design standards are becoming increasingly less effective. For example, hotter extreme heat conditions result in faster deterioration of pavement. Transportation and stormwater management infrastructure previously designed to handle historic flooding levels may be overwhelmed by increasingly severe storms and higher flooding levels. There are instances of bridges washing away while their abutments are left standing. When transportation planning, design, and engineering decisions take projected climate conditions into account, infrastructure is more likely to be resilient to these changing conditions.

Findings:

❖ ***Consultant score: 3***



This is an emerging process for the county. With new transportation projects, Fairfax County Department of Transportation (FCDOT) follows all federal and Virginia regulations. As the Virginia Department of Transportation (VDOT) and federal agencies continue to evaluate how resilience is included in that process, the county will ensure compliance and prepare for future conditions.

For transportation facility design and standards, the county relies on the Public Facility Manual (PFM) and VDOT standards. Currently, VDOT's methodology includes consideration of climate change and coastal storms for bridge design specifically (see VDOT Bridge Manual – Chapter 33 – Consideration of Climate Change and Coastal Storms). VDOT's Design Manual Chapter 12 – Riverine Analysis was updated to include the 200-year design storm for certain stream crossings. Additionally, VDOT currently recommends designing well beyond the minimum standards. It is common practice for storm sewer systems to be designed at 80% capacity to consider future development and changes in climate. The Commonwealth

also offers resources, such as the Commonwealth Center for Recurrent Flooding Resiliency, for considering coastal resilience in terms of adaptation and protection.

Consideration of climate vulnerability, especially flooding and stormwater management, is typically done at the individual facilities level rather than the network as a whole. There do not appear to be county level recommendations for agencies to integrate future climate projections into network-level transportation planning, design, and engineering. There are guides such as the Fairfax County Comprehensive Plan – Policy Plan – Transportation (2017) that instruct transportation planners to "anticipate future operating conditions," "plan and design transportation facilities to minimize adverse impacts on [Environmental Quality Corridors] EQCs and [Resource Protection Areas] RPAs," "minimize adverse impacts of storm water runoff from transportation facilities," and "plan and prepare to assist with orderly evacuations in the event of an emergency." However, the transportation guide does not mention climate resilience within its objectives and policies.

For public transportation, on June 2021, the WMATA Board of Directors adopted a sustainability vision and principles. One of the principles states that WMATA commits to "build, operate, and maintain a resilient transportation system to improve livability, the environment, equity, and access to opportunity."

Opportunities:

- There are opportunities to integrate climate projections more consistently and systematically into the county's transportation planning, design, and engineering decisions.

Key Supporting Resources:

- Fairfax County Comprehensive Plan - Policy Plan - Transportation
- Northern Virginia Hazard Mitigation Plan (2017)
- Resilient Critical Infrastructure: A Roadmap for Northern Virginia
- Transit Development Plan
- Transportation Priorities Plan (TPP)
- Transportation Status Report
- VDOT Bridge Manual - Chapter 33 - Consideration of Climate Change and Coastal Storms
- VDOT Drainage Manual – Chapter 12
- VDOT Road and Bridge Standards
- VDOT Road Design Manual
- VDOT State Highway Plan
- VDOT Statewide Multimodal Plan
- WMATA Climate Resilience Initiative
- WMATA Sustainability Vision

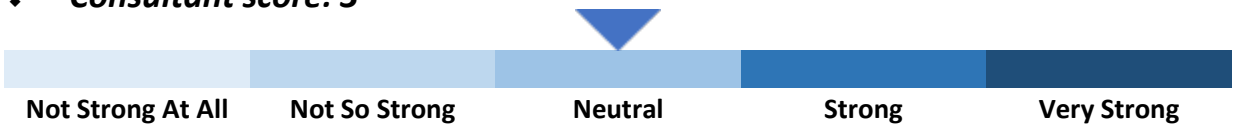
T-3 Have transportation standards within local government control been upgraded to account for latest climate vulnerability assessment?

Relevance:

To ensure that transportation infrastructure is consistently designed and constructed based on best available information, standards should be reviewed and updated periodically as vulnerabilities are better understood.

Findings:

❖ ***Consultant score: 3***



Many transportation assets are under the control of the Virginia Department of Transportation (VDOT) and Washington Metropolitan Area Transit Authority (WMATA), rather than Fairfax County Department of Transportation (FCDOT). Both VDOT and WMATA are considering climate resilience updates. Transportation assets that fall under the county's domain largely consider existing climate vulnerabilities such as flooding and stormwater management at individual facilities. However, current county-level transportation standards do not yet consider resilience to *future* climate conditions. This is not unexpected, as generally a locality will first conduct a network-level vulnerability assessment to quantify risks and identify which vulnerable assets, then providing a roadmap for the assessment of transportation standards.

FCDOT does have the option to design stormwater management to either VDOT or FCDOT standards, the latter of which are usually more stringent. One example where more stringent design was used was the in-progress Richmond Highway Bus Rapid Transit Project. Fairfax Connector facilities are also under FCDOT control.

Opportunities:

- There is an opportunity to review and update transportation standards currently used by the county following the completion of the Resilient Fairfax Vulnerability and Risk Assessment (VRA).
- The county should continue to track and collaborate with WMATA and VDOT as they complete their climate resilience plans and related standards.

Key Supporting Resources:

- DPRT Multimodal System Design Guidelines

- Northern Virginia Hazard Mitigation Plan (2017)
- Public Facilities Manual (PFM)
- VDOT Bridge Manual - Chapter 33 - Consideration of Climate Change and Coastal Storms
- VDOT Road Design Manual
- VDOT Statewide Multimodal Plan
- WMATA's Climate Resilience Initiative

IX. Natural & Cultural Resources

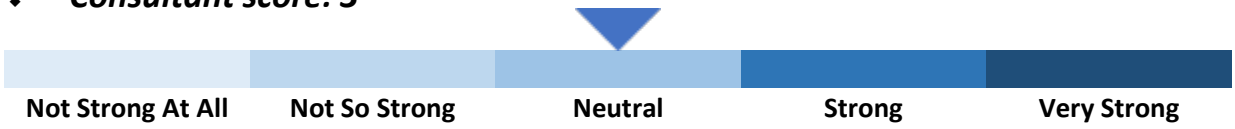
NR-1 Does the land use plan integrate climate change and identify specific ways that climate change will be considered in development regulations?

Relevance:

Land use planning is an important tool to ensure that development occurs in a responsible way consistent with community goals and priorities. Incorporating climate change into land use plans and development regulations can reduce vulnerabilities and support strategies such as nature-based solutions.

Findings:

- ***Consultant score: 3***



The Fairfax County Comprehensive Plan is required by state law to be used as a guide for decision-making on the natural and built environment by the county's Board of Supervisors (BOS), the Planning Commission, the Board of Zoning Appeals, and others. It is also a guide for county staff and the public to use in the planning process. Although (at the time of writing this Audit) the Comprehensive Plan does not explicitly mention climate change, its plan and policies have indirectly helped to reduce the county's vulnerability and build resilience to climate change. For example, the plan is designed to focus development on activity centers, helping to preserve open space, and protect stream valleys and floodplains. The Environmental Policy Element of the Comprehensive Plan establishes the goals and policies for environmental protection and open space that are integrated throughout the area plans.

Early stream valley protection policies and ordinances have minimized the number of homes and buildings within the floodplain in Fairfax County. These stream valley protection policies and ordinances include a Floodplain Ordinance that was first adopted in the 1959 Zoning Ordinance, Environmental Quality Corridors (EQCs) that were first established in the 1970's, and stream valley park acquisition that also started in 1973.

Due to recent statewide amendments to the Chesapeake Bay Preservation Area Designation and Management Regulations, the county will be required to adopt amendments to the Chesapeake Bay Preservation Ordinance (CBPO) within three years of the effective date of the state-level action. These

amendments will require the county to assess the impacts of climate change and sea level rise on any proposed land development in Resource Protection Areas. See related Audit question W-7 above.

Opportunities:

- There is an opportunity to review the county's land use plan and development regulations, such as the Comprehensive Plan and Zoning Ordinance, and identify potential amendments to integrate climate change considerations more explicitly.

Key Supporting Resources:

- Fairfax County Code of Ordinances Chapter 118 – Chesapeake Bay Preservation Ordinance
- Fairfax County Comprehensive Plan, Environment Element of the Policy Plan
- Fairfax County Comprehensive Plan, 2017 Edition Policy Plan Land Use, Amended through 2-23-2021
- Fairfax County Comprehensive Plan, Policy Plan
- Fairfax County Comprehensive Plan, Concept for Future Development
- Fairfax County Park Authority Policy Manual

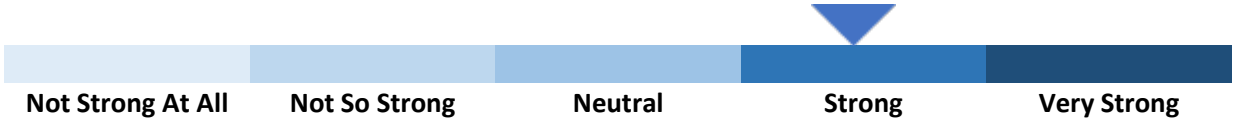
NR-2 Does the community participate in NFIP and CRS? If so, what Class is it in? Does the local government regulate floodplain development beyond NFIP?

Relevance:

Participation in the National Flood Insurance Program (NFIP) requires a community to adopt and enforce floodplain management regulations that help mitigate flooding impacts. Participation in the program enables property owners to access national flood insurance. By taking additional flood mitigation actions through the Community Rating System (CRS), the county enables residents to receive a discount on flood insurance.

Findings:

❖ ***Consultant score: 4***



Fairfax County is a Class 6 NFIP community and participates in CRS to give property owners discounts on flood insurance. Additionally, beyond minimum federal floodplain requirements for a community's participation in the NFIP, the county's Zoning Ordinance Section 5105 and Public Facilities Manual Article 6 include provisions that are more stringent than NFIP minimums. See NR-3 for additional details.

Opportunities:

- While property owners within the designated floodplain often purchase flood insurance (in many cases due to mortgage requirements), owners outside of the designated floodplains are frequently less aware of their flood risk and insurance options. There is an opportunity for the county to play an active role in raising awareness of flood risk outside the designated floodplain and to educate property owners about their ability to get discounted flood insurance to mitigate their financial risk. Efforts to reduce flood risk overall improve the county's rating.
- There is an opportunity for the county to explore how to provide additional support for renters residing in areas of high flood risk.

Key Supporting Resources:

- Floodplain Management Plan Progress Report (2021)
- Public Facilities Manual (PFM)
- Zoning Ordinance

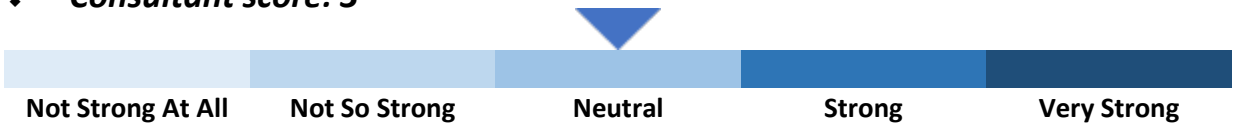
NR-3 Does the local government restrict development in the 100-year floodplain? Does the local government regulate development in the 500-year floodplain?

Relevance:

Floodplains represent areas of the county that are in low-lying areas or near a body of water and are subject to flooding. The 100-year floodplain has a 1% annual risk of being flooded, while the 500-year floodplain has a 0.2% annual risk of being flooded. Properties located in floodplains have a greater risk of flooding than those outside the floodplain, so it is important to restrict or regulate development within them.

Findings:

❖ ***Consultant score: 3***



Fairfax County restricts development in the 100-year floodplain but does not regulate development in the 500-year floodplain. Activity in the floodplain is regulated by the Zoning Ordinance Section 5105, the PFM Sections 6-0700 and 1400, and the Chesapeake Bay Preservation Ordinance or Chapter 118 of the county code. The Comprehensive Plan also includes protective sections. The floodplain regulations include the following:

- County provisions define floodplains as all areas of the county that are designated as floodplain by the FEMA, the United States Geological Survey, or by Fairfax County. "Minor floodplains" are drainage areas between 70 and 360 acres and "major floodplains" are equal to or greater than 360 acres.
- No dwellings or portions of dwellings may be located within a minimum of 15 feet of the edge of a floodplain, even if there is a property line between the floodplain and the dwelling. As detailed in Section 5105, there are certain exceptions, such as for buildings constructed prior to the 1978 ordinance (because they were in compliance when they were built).
- The Floodplain Regulations require a determination from Land Development Services (LDS) whether any use proposed to be built in the floodplain qualifies as a "Permitted Use" or whether the use requires a Special Exception approved by the BOS. The Special Exception process is long, arduous, and strict, resulting in a very low number of approvals for structures in the floodplain.
- "Permitted Uses" within the floodplain are strictly limited to uses such as: small accessory uses such as children's playhouses, recreational uses such as hiking trails, agricultural operations operated in accordance with a conservation plan, off-street parking areas smaller than 5,000 square feet, railroad tracks meeting certain requirements, public and private utility lines, roadway crossings, additional uses that do not require a building permit or major fill, and other such uses specified in Section 5105.
- Any proposed use in the floodplain must not increase the flood elevation on any adjacent property.
- To be fair in circumstances where a building was constructed prior to the 1978 ordinance, certain additions and accessory uses to those buildings are permitted. However, numerous rules must be met, including elevation of the lowest part of the structure (including basements) at least 18 inches above the applicable base 100-year flood elevation, size, and scope restrictions, and a "hold harmless" agreement with the county, among others.

- For accessory storage (i.e. sheds) or parking structures (i.e. carports) only, if the main building was built prior to August 14, 1978, the accessory structure may be built less than 18 inches above the 100-year flood level only when certain conditions are met, including but not limited to: determination that the structure has less than a one percent chance of flooding in any given year, a maximum size of 1,000 square feet, construction with flood-damage resistant materials, anchoring and floodproofing, and elevation of any mechanical, electrical, and utility equipment above the base flood elevation.
- For by-right subdivision projects on lots having an RPA, as stated in PFM Section 6-1702.1, "unless an exception is approved by the Exception Review Committee or the BOS, as provided for in Chapter 118 of the Code, all newly proposed buildable subdivision lots in or adjacent to an RPA must contain sufficient area of land outside the RPA to allow development of the lot without encroachment upon the RPA."

Certain uses that are not permitted may be authorized by the BOS with approval of a Special Exception. However, as aforementioned, the Special Exception process is long, arduous, and strict, resulting in a notably low number of applicants (approximately one per year) for structures in the floodplain.

In addition to Zoning Ordinance and PFM standards, the Environmental Element of the Comprehensive Plan Policy Plan notes that new development should not be exposed to the potential of flood impacts and are prohibited within flood impact hazard areas. New residential structures are to be prohibited within flood impact hazard areas. The Policy Plan also states that the Potomac Estuary and the Chesapeake Bay are to be protected from the avoidable impacts of land use activities in Fairfax County. New development and redevelopment are expected to comply with the county's CBPO related to RPAs. Additionally, the Policy Plan includes an EQC system, which is intended to be "an integrated network of ecologically valuable land and surface waters for present and future residents of Fairfax County." The stream valley component of the EQC system includes 100-year floodplains, areas of 15 percent or greater slopes adjacent to the floodplain, wetlands connected to stream valleys, and land within a corridor as defined by the Comprehensive Plan.

Recent state-level legislation changes to the Chesapeake Bay Preservation Area Designation and Management Regulations will require Fairfax County to amend the CBPO for additional climate-related land development considerations.

Additionally, The FCPA continues to acquire land in undeveloped floodplain areas via fee simple acquisitions, developer dedications, donations, and easements. This results in prevention of development in high-priority flood-prone areas and enhances resiliency.

Opportunities:

- There is an opportunity to review floodplain regulations through the lens of climate change to minimize flood risk.

- Based on future climate projections, there is an opportunity to review the level of flood protection provided by the 18-inch freeboard above the base 100-year flood elevation and 15-foot setback, and whether these standards need to be updated.
- There is also an opportunity to review the potential to regulate development in the 500-year floodplain.

Key Supporting Resources:

- Chesapeake Bay Area Designation and Management Regulations amendment
- Comprehensive Plan, Environment Element of the Policy Plan
- DPWES Flood Information and Floodplain Management Progress Report
- Fairfax County Code of Ordinances Chapter 118 – Chesapeake Bay Preservation Ordinance
- Public Facilities Manual (PFM)
- Zoning Ordinance

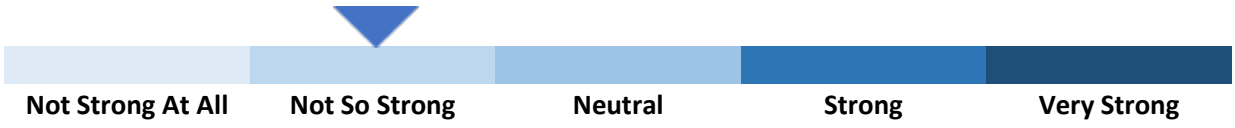
NR-4 Does the local government have a strategy for addressing Repetitive Loss (RL) and Severe Repetitive Loss (SRL) properties?

Relevance:

A Repetitive Loss (RL) is a property that has filed two or more claims of more than $1,000 to the National Flood Insurance Program (NFIP) within any rolling 10-year period. A Severe Repetitive Loss (SRL) is a property that has filed four or more claims of more than $5,000 or at least two claims that cumulatively exceed the building's value. Strategies to address RL and SRL properties, such as purchasing these properties and relocating development, can reduce or eliminate flood risk and protect residents from flood damage.

Findings:

❖ ***Consultant score: 2***



Fairfax County offers a voluntary program administered by the Department of Public Works and Environmental Services (DPWES) that seeks to buyout RL properties within the floodplain. The 2017 Northern Virginia Hazard Mitigation Plan (HMP) notes that there are 135 RL properties and three SRL properties within the Northern Virginia region (i.e., region extending beyond Fairfax County). All

properties are unmitigated with 35 of them also being uninsured. The HMP further sets a goal of completing one buy-out per year. The program is largely FEMA funded, so in cases where FEMA funding is not available, the cost/benefit ratio of buyouts are largely infeasible for Fairfax County government due to high property values in the county. Therefore, the county is currently unable to meet the HMP goal of one buyout per year. RL and SRL properties are federal-level, FEMA-specific terms, so the county's Land Development Services (LDS) does not have authority to include RL or SRL in the review of proposed uses in the floodplain.

Additionally, although not equivalent to RL or SRL, the state and county regulations, including the Zoning Ordinance, include provisions for rebuilding after a natural disaster.

Opportunities

- As part of the Hazard Mitigation Plan process, the county could assess the RL and SRL program strategy and evaluate if the existing program addresses local needs.
- The county could potentially identify alternative funding opportunities for RL and SRL properties, such as state and private grants.
- The county could evaluate whether the existing RL and SRL program strategy includes a multi-disciplinary team that is part of the county's internal process to guide the development of parcels upon acquisition. Such teams should be engaged early on and throughout the buyout process. Oftentimes, multi-disciplinary teams help ensure that the properties provide multiple benefits to the community upon acquisition, as well as in the site development process. For example, provided that any previous structures have been demolished, these properties could function as green stormwater infrastructure during flooding events and as a park or open space during non-storm events.

Key Supporting Resources:

- Northern Virginia Hazard Mitigation Plan (2017)
- Virginia Uniform Statewide Building Code
- Zoning Ordinance

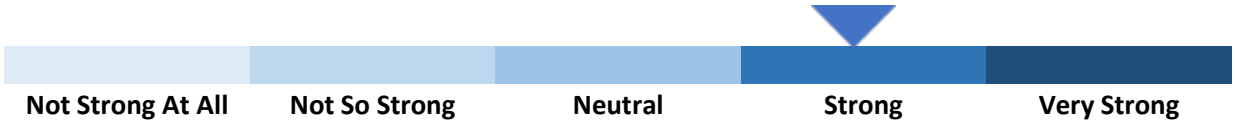
NR-5 Has the local government adopted stream setbacks or stream buffer requirements?

Relevance:

Required stream setbacks or buffers can help keep development out of harm's way while serving as a means of protecting water quality and ecosystem services (including preservation of floodplains).

Findings:

- ***Consultant score: 4***



Fairfax County has had policies in place to identify and protect stream corridors since the 1970s. The Fairfax County Stream Protection Baseline Report (2003) details the history of this effort in Fairfax County: "Since the 1970's, the county has adopted ordinances to implement stormwater management and Best Management Practices (BMPs) to combat the problems associated with the quality of stormwater runoff and flooding." In the late 1970's, Proposed Drainage Plans (Parsons, Brinckerhoff, Quade, and Douglas), consisting of an "Immediate Action Plan" and a "Future Basin Plan," were prepared for all watersheds in the county.

In accordance with state code, Fairfax County also regulates Resource Protection Areas (RPAs), or buffers around bodies of water with perennial flow and contiguous wetlands. In 1993, Fairfax County enacted the Chesapeake Bay Preservation Ordinance (CBPO), and an amendment in 2003 significantly increased the number of RPAs in the county. The CBPO specifies certain uses that are allowed, exempt, or need an exception to be located in RPAs. Most uses in RPAs require approval, including landowners seeking to remove vegetation in these areas. For by-right subdivision projects on lots having an RPA, as stated in the Public Facilities Manual (PFM) Section 6-1702.1, "Unless an exception is approved by the Exception Review Committee or the Board of Supervisors, as provided for in Chapter 118 of the Code, all newly proposed buildable subdivision lots in or adjacent to an RPA must contain sufficient area of land outside the RPA to allow development of the lot without encroachment upon the RPA." The recently adopted amendment to the CBPO Regulations will require the locality to assess the impacts of climate change and sea-level rise on any proposed land development in the RPA during the plan of development or project review process. See NR-1 above.

Fairfax County also requires a 15-foot setback from the edge of the floodplain for all dwellings or a portion of a dwelling. In addition to FEMA floodplains (see NR-3), Fairfax County requires developers to map smaller floodplains as part of the land development process and restricts activities in these areas. The county defines major floodplains as having an area greater than 360 acres and minor floodplains as a drainage area of between than 70 and 360 acres. However, because the county-designated floodplains

are mapped as development is proposed, there currently exist significant gaps in the county floodplain maps, particularly for minor floodplains.

Additionally, the Environment Element of the Comprehensive Plan Policy Plan provides guidance for entitlement applications related to the protection of streams and RPAs. The Policy Plan states that the protection and restoration of the ecological integrity of streams is expected in Fairfax County. To minimize the impacts that new development and redevelopment projects have on county streams, the Comprehensive Plan encourages the protection of stream channels, buffer areas along stream channels, and commitments to the restoration of degraded stream channels and riparian buffer areas. New residential structures are to be prohibited within flood impact hazard areas. The Policy Plan also states the Potomac Estuary and the Chesapeake Bay are to be protected from the avoidable impacts of land use activities in Fairfax County. New development and redevelopment are expected to comply with the county's CBPO related to RPAs.

Additionally, an objective of the Policy Plan is to "[i]dentify, protect and enhance an integrated network of ecologically valuable land and surface waters for present and future residents of Fairfax County," to include an Environmental Quality Corridor (EQC) system. Lands may be included within the EQC system if they can achieve any of the following purposes: habitat quality, connectivity, hydrology/stream buffering/stream protection, and pollution reduction capabilities. "The core of the EQC system will be the county's stream valleys. Additions to the stream valleys should be selected to augment the habitats and buffers provided by the stream valleys, and to add representative elements of the landscapes that are not represented within stream valleys." The stream valley component of the EQC system shall include: 100-year flood plains; areas of 15 percent or greater slopes adjacent to the flood plain; wetlands connected to the stream valleys; and land within a corridor, as defined by the Comprehensive Plan.

Further, Fairfax County streams are protected by the Fairfax County Park Authority (FCPA) through their Stream Valley Parks. The FCPA Policy Manual specifies that Stream Valley Parks "preserve large contiguous natural areas for a riparian habitat, water quality protection, aesthetic values, and genetic corridors within Biodiversity Conservation Zones." The Stream Valley Parks include the EQCs identified for public access in the Comprehensive Plan. Two levels of Stream Valley Parks are identified: Major Environmental Quality Corridors, which include flood plains and contiguous steep slopes of all streams greater than first order, and first order stream valleys. Strict protections apply to these Stream Valley Parks.

Opportunities:

- There is an opportunity for Fairfax County to consider floodplains more explicitly as a managed asset for climate resilience.

Key Supporting Resources:

- Chesapeake Bay Preservation Area Designation and Management Regulations
- Fairfax County Code of Ordinances Chapter 118 – Chesapeake Bay Preservation Ordinance
- Fairfax County Comprehensive Plan Environmental Policy: Environmental Quality Corridor

- Fairfax County Stream Protection Baseline Report (2003)
- Fairfax County Stream Protection Strategy
- Fairfax County Park Authority Policy Manual
- Public Facilities Manual (PFM)
- Zoning Ordinance

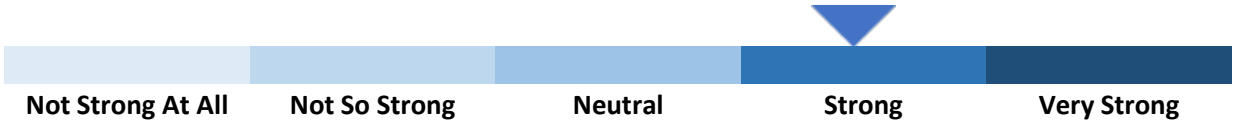
NR-6 Are there policies in place related to resilient coastlines?

Relevance:

Coastlines are at risk of coastal flooding from sea level rise, high tide, and/or storm surge. Policies to limit development and/or ensure new and existing development is ready to withstand projected climate impacts is crucial for resilience.

Findings:

❖ ***Consultant score: 4***



There is a long history of policies and regulations enacted to protect Virginia's coastlines, including the following:

- In 1972, Virginia established protections for tidal wetlands through the Virginia Tidal Wetlands Act of 1972.
- In 2011, Senate Bill 964 amended the Code of Virginia to define "living shorelines" and specify that living shorelines were the *preferred* approach to shoreline erosion protection. The legislation also mandated the development of a living shorelines general permit and guidance for shoreline management.
- In 2020, Senate Bill 776 amended the Code of Virginia established living shorelines as the *default* unless "best available science" indicates the site is not suitable for living shorelines. The legislation

aims to protect shorelines and sensitive coastal habitats from sea level rise and coastal hazards and asked that integrated guidance be developed for permitting.

- In 2021, Virginia Marine Resources Commission released Tidal Wetlands Guidelines to meet the 2020 regulations establishing living shorelines as the default practice.
- In 2021, the adopted state Chesapeake Bay Preservation Act amended regulations include criteria to encourage and promote "coastal resilience and adaptation to sea level rise and climate change."

Accordingly, Fairfax County has adopted guidance on resilient coastlines and living shorelines as a preferred practice in Fairfax County for flooding mitigation, and as of October 2021, is in the process of updating its ordinances and guidelines in accordance with state code.

Further, the Northern Virginia Soil and Water Conservation District (NVSWCD) Virginia Conservation Assistance Program (VCAP) includes living shorelines as an eligible practice for funding and technical assistance. At the state level, the Virginia Marine Resources Commission is responsible for permitting, and the Virginia Department of Conservation and Recreation Shoreline Erosion Advisory Service provides technical support for resilient coastlines projects.

Additionally, Chapter 116 of the county code, the Wetlands Zoning Ordinance, does not explicitly note 'resilient' coastlines, but the document largely supports the intent by limiting development to low impact uses and preserving the storm surge mitigation capacity of coastal wetlands. In 2004, the BOS adopted an amendment to the Comprehensive Plan and undertook and completed a shoreline erosion control inventory to identify areas where erosion is occurring and characterize the rates of erosion along the tidal shorelines, as well as develop policies and implementation strategies for use by the county's Wetlands Board in approving structures designed to prevent shoreline erosion. These guidelines, which support the Fairfax County Wetlands Board in its permitting decisions related to shoreline erosion control practices, emphasize the preference for the use of living shoreline approaches to tidal shoreline erosion control.

Based on recent legislation adopted by the General Assembly, the Department of Planning and Development (DPD) is in the process of amending Chapter 116, the Wetlands Zoning Ordinance, which will encourage the use of living shoreline stabilization methods, unless the best available science shows that such approaches are not suitable, and to ensure that the county's Wetlands Board will ensure protection of shorelines and sensitive coastal habitats from sea level rise and coastal hazards. As part of this update to Chapter 116, DPD is also updating portions of the Comprehensive Plan Environment Policy Plan with information about living shorelines and the recent wealth of resource information and guidance offered by several Commonwealth agencies. Both the Comprehensive Plan amendment and Chapter 116 amendment will be sent to the county's BOS in November 2021 for consideration. These updates will encourage more nature-based shoreline stabilization methods, which will add climate change resiliency and long-term ecological benefits to tidal shorelines.

State resources such as the Virginia Coastal Zone Management (CZM) Program include Community Resilience Grants for:

- Regional planning support and technical assistance for areas most affected by coastal hazards.
- Local and regional evaluations of resilience through the Resilience and Adaptation Feasibility.

- Analyses and community training and evaluations to promote participation in NFIP CRS.
- Creation of a database of potential resilience-building projects to help better position Virginia to receive grant funds.
- Evaluation of cost-effective methodologies for determining first floor elevations of structures.
- A Roadmap to Resilience for the Northern Virginia region.
- An analysis of the impacts of road flooding on affected areas.

Opportunities:

- With impending adoption of the Comprehensive Plan amendment and Chapter 116 amendment, there are opportunities to encourage and support more nature-based shoreline stabilization methods.
- For nature-based living shoreline policies, there is an opportunity to evaluate whether the policies provide direction/guidance on monitoring and maintenance standards to sustain their resiliency to storm surge, extreme weather, and sea level rise. Additionally, monitoring and maintenance practices help ensure that the ecosystem is healthy. Living shorelines require some monitoring and maintenance in order to ensure its efficacy over time.

Key Supporting Resources:

- Chesapeake Bay Preservation Area Designation and Management Regulations Amendment
- Fairfax County Code of Ordinances Chapter 118 - Chesapeake Bay Preservation Ordinance
- Fairfax County Code of Ordinances Chapter 104 – Erosion and Sediment Control
- Fairfax County Code of Ordinances Chapter 116 – Wetlands Zoning Ordinance
- General Assembly of Virginia: SB 776
- General Assembly of Virginia: SB 964
- Virginia Conservation Assistance Program (VCAP)
- Virginia Coastal Zone Management Program

NR-7 Does the local government have a green infrastructure plan?

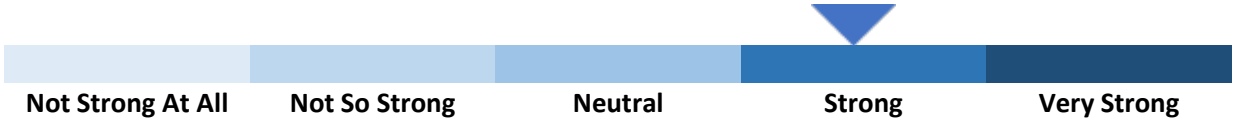
Relevance:

“Green infrastructure” refers to nature-based infrastructure such as green roofs, trees, bioswales, rain gardens, bioretention ponds, pervious pavers, or other such features. Green infrastructure provides multiple climate resilience benefits, including enhanced on-site stormwater management and reduction

of urban heat island effects. Localities with green infrastructure plans may be better prepared for systematic considerations and implementation of green infrastructure.

Findings:

- ***Consultant score: 4***



Regional level: The Northern Virginia Regional Commission (NVRC) produced a Conservation Corridors Planning Project and Assessment Report in 2012. This report included maps of the region's green infrastructure assets, planning opportunities, and recommendations. The report also included explanations of the ecological, recreational, economic, and regulatory benefits provided by green infrastructure. NVRC also leads a Conservation Corridors Workgroup. Additionally, the 2020 "Regional Collaboration to Build Community Resilience in Northern Virginia" continued the work of NVRC's resiliency team that was formed during the creation of "Resilient Critical Infrastructure: A Roadmap for Northern Virginia." Through this work, the Roadmap was revised to include two new objectives, including maximization of green infrastructure. Additionally, at the regional level, the Metropolitan Washington Council of Governments (MWCOG) Tree Conservation Cookbook provides guidance on tree canopy preservation and enhancement.

County level: At the county level, while Fairfax County does not have a single comprehensive green infrastructure plan, it does offer numerous initiatives, pilots, and policies that touch on the goals of green infrastructure. There are currently discussions underway that incorporates a broader approach to green infrastructure framed as "nature-based solutions."

The Fairfax County Park Authority (FCPA) maintains a robust portfolio of 427 parks on approximately 23,359 acres of park land to "preserve large contiguous natural areas for riparian habitat, water quality protection, aesthetic values…biodiversity conservation…recreation, aesthetic values, and non-motorized transportation routes," and to provide multiple layers of environmental protections, including stormwater management.

Additionally, the Fairfax County Tree Action Plan (2019) explicitly links trees (i.e., urban forest) as green infrastructure, defining the latter as "living materials within the built and unbuilt landscape. In an urban context, this includes streetscapes, green roofs, stormwater facilities, residential yards and common areas, school and commercial grounds, and natural areas such as stream valley parks – areas that conserve ecosystem values and functions and provide associated benefits to human populations." However, the Tree Action Plan appears to focus on urban-trees only and does not account for climate change projections. The Urban Forest Management Division's 2019 Climate Change Adaptation Plan focuses on trees, forests, and related natural resources. The Plan evaluates how to make better tree

planting and preservation recommendations and decisions, and identifies climate change impacts, vulnerabilities, and adaptation tactics. The county is taking climate change projections on individual tree species into account, using research funded by the USDA Forest Service (Butler-Leopold et al.).

One of the Fairfax County Urban Forest Management Division's aspirational goals is to protect and improve the tree canopy in residential communities by planting 5,000 trees on residential properties per year. The Urban Forest Management Division is also partnering with Casey Trees on a residential tree planting pilot program in neighborhoods surrounding the Richmond Highway Commercial Revitalization District. The pilot program runs from Fall 2021 to April of 2022 and will allow Fairfax County to better understand the needs, costs, and challenges of replicating this effort at a wider scale.

The Public Facilities Manual (PFM) includes sections on green infrastructure such as Permeable Pavement, Vegetated Roofs, Vegetated Swales, but does not account specifically for future climate impacts, such as extreme precipitation events including cloudbursts. It is noted that the State Stormwater Management Regulations (9VAC25-870-65) preclude the county from adopting any BMP (including the design standards and specifications) that is not specifically approved by the state and listed on the BMP Clearinghouse.

The Policy Plan Amendment 2018-CW-2CP (Adopted Amendment 2017 P-09: Natural Landscaping at county Facilities) includes language for facilities and sites to be designed, retrofitted, and maintained in an environmentally-sensitive manner with a focus on 'natural landscaping,' which may be constituted as green infrastructure: "Apply low impact development (LID) practices and natural landscaping methods with the goal of minimizing resource consumption, reducing stormwater runoff, decreasing life-cycle maintenance requirements, increasing the habitat value of each site, and increasing soil and plant health."

The county supports the National Green Infrastructure Certification Program that sets national certification standards for the construction, inspection, and maintenance of green infrastructure (i.e., bioretention, permeable pavement, rainwater harvesting, rooftop stormwater management, dry wells, and wetlands).

Additionally, the Northern Virginia Soil and Water Conservation District (NVSWCD) has a number of guides available to support residents, landscape professionals, and local jurisdictions adopting green infrastructure. Sample publications include the Northern Virginia Homeowner's Guide to Rain Garden Design and Construction. NVSWCD also organizes periodic workshops to support residents in designing and installing rain gardens and rain barrels.

Opportunities:

- There is an opportunity for the multiple county entities and partners currently involved in green infrastructure (i.e., FCPA, DPWES, DPD, NVSWCD, OEEC) to develop a consolidated natural resource management plan that includes consideration of future climate conditions, manages natural resources as assets, and identifies opportunities for green infrastructure implementation countywide.

Key Supporting Resources:

- Butler-Leopold et al. (in review). Mid-Atlantic Forest ecosystem vulnerability assessment and synthesis: a report from the Mid-Atlantic Climate Change Response Framework, Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station.
- Conservation Corridor Planning by the Northern Virginia Regional Commission (2012)
- Fairfax County Code of Ordinances Chapter 122 – Tree Conservation Ordinance
- Fairfax County Comprehensive Plan, Environment Element of the Policy Plan
- Fairfax County Park Authority Policy Manual
- Fairfax County Tree Action Plan (2019)
- MWCOG Tree Conservation Cookbook
- Northern Virginia Homeowner's Guide to Rain Garden Design and Construction
- Policy Plan Amendment 2018-CW-2CP; Adopted Amendment 2017 P-09: NATURAL LANDSCAPING AT COUNTY FACILITIES
- Public Facilities Manual (PFM)
- Urban Forest Management Division Climate Adaptation Training Review (2019)
- Urban Forest Management Division Climate Change Adaptation Plan (2019)

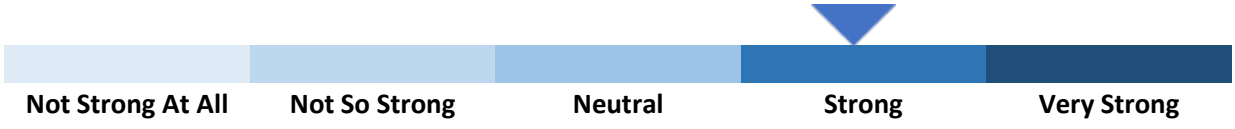
NR-8 Does local government implement green infrastructure on publicly owned properties?

Relevance:

Green infrastructure on publicly owned properties helps surrounding properties better adapt to flooding and extreme heat and builds overall county resilience, while leading by example.

Findings:

❖ ***Consultant score: 4***



Fairfax County implements green infrastructure on publicly owned properties. The Department of Public Works and Environmental Services (DPWES) looks for partnership opportunities with DPWES Capital Facilities, Fairfax County Park Authority (FCPA), Fairfax County Public Schools (FCPS) and Fairfax County Department of Transportation (FCDOT) to include green infrastructure above the minimum stormwater

requirements on capital projects. Low Impact Development (LID_ techniques are embraced by DPWES' Building Design and Construction Division (BDCD) designs for all Capital Improvement Program (CIP) projects. Green features such as rain gardens, bio-retention areas, pervious pavers, rainwater harvesting. and green roofs are included in DPWES' plans.

Policy Plan Amendment 2018-CW-2CP; Adopted Amendment 2017 P-09: Natural Landscaping at County Facilities includes language for facilities and sites to be designed, retrofitted, and maintained in an environmentally sensitive manner with a focus on 'natural landscaping', which may be constituted as green infrastructure:

- "Apply low impact development (LID) practices and natural landscaping methods with the goal of minimizing resource consumption, reducing stormwater runoff, decreasing life-cycle maintenance requirements, increasing the habitat value of each site, and increasing soil and plant health."
- "...protecting and restoring natural ecosystem components; maximizing the use of native plants; controlling invasive plant species; reducing areas of unnecessary mowing; reducing or eliminating synthetic fertilizers; protecting, creating, and maintaining healthy soils; and retaining rainwater on-site through low impact development practices."

Specific examples of green infrastructure on publicly owned properties are listed below. Additional projects are included on the Stormwater Improvement Projects and Green Buildings websites.

- **Dolley Madison Library:** includes a green roof, bioretention, stormwater outfall improvement and stream restoration.
- **George C. Marshal High School:** includes installation of a 314,00-gallon cistern to collect and harvest 16.2 acres of onsite drainage with 10.1 acres of impervious surface.
- **Herrity Building**: includes a rain garden, native plants, bioretention planters, permeable pavers, and underground cistern
- **Langston Hughes Middle School:** includes infiltration practices with underground chambers.
- **Noman M. Cole Jr Pollution Control Plant:** includes rain gardens.
- **Oakton Library:** includes bioretention and infiltration practices.
- **Public Safety Headquarters**: includes green roofs, permeable pavements, a 25,000 gallon rainwater harvesting system, a wet pond, regenerative stormwater conveyance, a bioretention basin or raingarden, and vegetated swales.
- **Stringfellow Road Park & Ride:** includes an enhanced extended detention facility, porous concrete parking area and reforestation.

Additionally, the Northern Virginia Soil and Water Conservation District (NVSWCD) assists with implementation and evaluation of effectiveness of green infrastructure on public property through the bioretention assessment programs.

Opportunities:

- There is an opportunity to build on green building policy including revisions to the 2021 Operation Energy Strategy to better integrate green infrastructure.
- There is an opportunity to systematically implement green infrastructure on all publicly owned properties such as schools, public housing, community centers, park-and-ride facilities, trails, etc.
- There may be an opportunity to improve the implementation of green infrastructure for publicly owned lands that are leased to third parties, such as 99-year leases and public-private partnerships.
- There may be an opportunity to integrate educational signage as part of the county's green infrastructure implementation standards on publicly owned properties. Educational signage can increase community and stakeholder understanding of these practices.
- There is an opportunity to include monitoring and maintenance standards to ensure that green infrastructure implementation is successful and to increase the county's ability to learn from projects and improve designs.

Key Supporting Resources:

- Capital Improvement Program (CIP)
- DPWES Stormwater Improvement Projects Webpage
- Fairfax County Comprehensive Plan, Environment Element of the Policy Plan
- Fairfax County Sustainability Initiatives Report FY 2020
- Operational Energy Strategy 2021
- Policy Plan Amendment 2018-CW-2CP; Adopted Amendment 2017 P-09: NATURAL LANDSCAPING AT COUNTY FACILITIES
- Sustainable Development Policy for Capital Projects

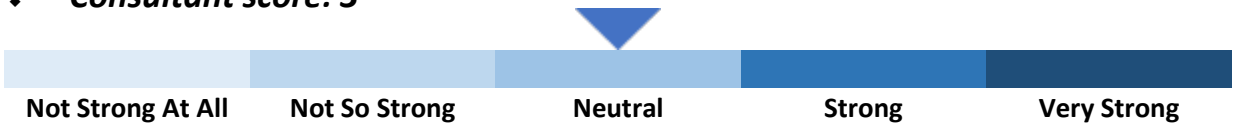
NR-9 Does the local government offer incentives to property owners to implement green infrastructure?

Relevance:

Incentives to encourage residential-level green infrastructure helps residents cope with both flooding and extreme heat and helps to build overall county resilience.

Findings:

❖ ***Consultant score: 3***



Fairfax County offers technical assistance, financial assistance, and some policy incentives to property owners to implement green infrastructure and/or Low Impact Development (LID) techniques.

The Virginia Conservation Assistance Program (VCAP) and the local Conservation Assistance Program (CAP), administered through Northern Virginia Soil and Water Conservation District (NVSWCD) currently offer technical assistance, training, and financial incentives in form of cost sharing to homeowners in Fairfax County for environmental Best Management Practices (BMPs), including pavement removal and/or replacement with pervious surfaces, conservation landscaping, rain gardens or bioretention activities, bioswales, green roofs, and cisterns. In 2021, the Department of Public Works and Environmental Services (DPWES) helped to fortify the existing CAP and VCAP programs through a local stormwater management grant. In addition to the VCAP and CAP programs, NVSWCD provides general technical assistance, outreach, and education to property owners relating to green infrastructure.

The Comprehensive Plan provides guidance to encourage green infrastructure, including "application of low impact development practices including minimization of impervious cover," "use of innovative BMPs and infiltration techniques of stormwater management where site conditions are appropriate," "the use of pervious parking surfaces in low-use parking areas," and "the use of infiltration landscaping within streetscapes consistent with county and state requirements," among other provisions.

The Tysons Urban Design Guidelines include guidance for LID stormwater management and green infrastructure. These guidelines encourage the use of green roofs, porous pavers, pervious paving techniques, rain gardens, bioswales, planted spaces, bioretention planters, and other green infrastructure techniques.

The Public Facilities Manual (PFM), which sets guidelines for the design of all public facilities constructed to serve new development, specifies the standards and specifications for the design, construction, and maintenance of stormwater BMPs. (These are requirements and restrictions related to green infrastructure, not incentives). The PFM includes guidance for a range of techniques that could be considered "green infrastructure," including permeable pavement, vegetated roofs, vegetated swales, reforestation, and rainwater harvesting, among others. In consideration of the significant perpetual maintenance efforts and costs, the county does not allow permeable pavement systems to be located in single-family attached or detached residential developments for the purpose of satisfying the detention, water quantity, or water quality control BMP requirements of the Stormwater Management Ordinance, except by Board review and exemption. Permeable pavement is permitted in other circumstances, as described in 6-1304 of the PFM.

Opportunities:

- There is a continued opportunity to support and expand the technical support and education programs through CAP and VCAP and gather feedback to ensure the success of the new local stormwater management grant.
- There is an opportunity to link incentives, guidance documents and technical support to target high priority neighborhoods expected to experience increased inland flooding.
- There is an opportunity to develop additional design guidelines for common development types within the county.

Key Supporting Resources:

- Fairfax County Comprehensive Plan
- Local Stormwater Management Grant Program Memorandum
- Public Facilities Manual (PFM)
- Tysons Urban Design Guidelines
- Virginia Coastal Zone Management Program
- Virginia Conservation Assistance Program (VCAP)

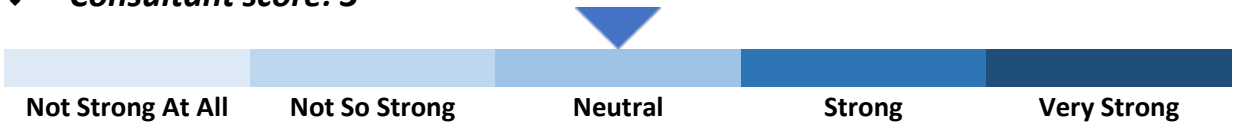
NR-10 Does the local government encourage or incentivize reducing impervious cover?

Relevance:

Impervious surfaces are areas covered in impermeable material that does not allow water to soak into the ground (e.g., roofs, parking lots, roads). Water runs off more quickly on impervious surfaces therefore creating concerns for stormwater management and flooding. Impervious surfaces are typically made of heat retaining material (e.g., asphalt, concrete, etc.) and therefore also contribute to the urban heat island effect. Replacing impervious surfaces with permeable material can have stormwater and heat mitigation benefits.

Findings:

❖ ***Consultant score: 3***



Fairfax County ordinances include multiple provisions relating to the reduction of impervious surfaces.

The Zoning Ordinance has the effect of regulating impervious cover in multiple ways, including through setback requirements, minimum open space regulations, and maximum coverage limitations. The maximum coverage limitations apply to the front and rear yards for certain properties developed with residential dwellings. For properties 36,000 square feet in size or less that are developed with single-family detached dwellings in the R-1 and R-2 Districts, driveways or areas used for parking may cover no more than 25% of the front yard; for those zoned R-3 and R-4, these areas may cover no more than 30% of the front yard. In the rear setback, all lots developed with single-family detached dwellings are limited to maximum coverage percentages that vary per lot size.

The Stormwater Management Ordinance provisions exempt single-family homes from the quality and quantity control requirements if the construction of the separately built dwelling disturbs less than 1 acre and results in impervious area less than 18% of the lot or 2500 square feet (whichever is greater), providing an incentive to have the impervious area below the threshold.

The Chesapeake Bay Preservation Ordinance (CBPO) Section 118-3-2 requires “unless an exception is granted…any use, development or redevelopment of land in CBPAs must meet the following performance criteria: (a) No more land is disturbed than is necessary to provide for the proposed use, development or redevelopment; (b) indigenous vegetation shall be preserved to the maximum extent practicable consistent with the use, development, or redevelopment proposed; and (c) impervious cover shall be minimized consistent with the use, development, or redevelopment proposed.”

The Public Facilities Manual (PFM) includes impervious surface in numerous sections including 6-0200 Policy and Requirements for Adequate Drainage, 6-0300 Policy on Detention of Stormwaters, 6-0400 Stormwater Runoff Quality Control Criteria, 6-0500 Policy on Off-Site Drainage Improvements, 6-0600 Policy on Proportionate Cost of Off-Site Drainage Improvements, 6-0800 Hydrologic Design, 6-1300 Retention, Detention, and Best Management Practices Facilities, and 6-1600 Design and Construction of Dams and Impoundments, among others. These PFM sections go into detail on practices such as permeable pavement, bioretention, vegetated swales, vegetated roofs, reforestation, sheet flow to vegetated filters, rainwater harvesting, and other relevant practices.

For government facilities, the Fairfax County Sustainable Development Policy for Capital Projects links to LEED Sustainable Site Design SSc6.1 which limits disruption of natural water hydrology by reducing impervious cover, increasing on-site infiltration, reducing, or eliminating pollution from stormwater runoff, and eliminating contaminants.

Additionally, the Environment Element of the Policy Plan states in Objective 2 that new development and redevelopment should “prevent and reduce pollution of surface and groundwater resources. Policy K within this Objective states that site designs should: minimize the amount of impervious surface created as it relates to overall development, convey drainage from impervious areas into pervious areas, encourage cluster development, commit to tree preservation thresholds that exceed the minimum

Zoning Ordinance requirements, encourage shared parking, use pervious parking surfaces, and use low impact development (LID) techniques as a way to achieve these goals."

Further, the Northern Virginia Soil and Water Conservation District incentivizes impervious surface removal through the Virginia Conservation Assistance Program (VCAP). The program covers a portion (and sometimes all) of the cost associated with the removal of impervious surfaces.

Other indirect policies and initiative contribute to the reduction of impervious surface cover, such as the Tree Conservation, the Erosion and Sedimentation Control Ordinance, the Tree Action Plan.

Opportunities:

- The Fairfax County Flood Mitigation Program Summary acknowledges the need to (re)assess infill development stormwater management standards and overland relief evaluation. It notes that the county currently lacks the ability to mitigate the cumulative effects of increases in impervious area created by residential infill redevelopment (i.e., a larger home built on an existing lot and its related increased impervious area). See related opportunities under stormwater management items W-6 and W-7.
- There may be an opportunity to further incentivize reductions in impervious cover, such as through grants to retrofit existing sites, an awards or recognition program, or other financing options.

Key Supporting Resources:

- Fairfax County Code of Ordinances Chapter 104 – Erosion and Sedimentation Control
- Fairfax County Code of Ordinances Chapter 118 – Chesapeake Bay Preservation Ordinance
- Fairfax County Code of Ordinances Chapter 122 – Tree Conservation Ordinance
- Fairfax County Code of Ordinances Chapter 124 – Stormwater Management Ordinance
- Fairfax County Comprehensive Plan, Environment Element of the Policy Plan
- Fairfax County Flood Mitigation Program Summary
- Fairfax County Tree Action Plan
- Fairfax County Virginia Sustainable Development Policy for Capital Projects
- Public Facilities Manual (PFM)
- Virginia Conservation Assistance Program (VCAP)
- Zoning Ordinance

X. Citations Matrix

The table below cites the sources used in this assessment. A blue dot indicates the source was used in the respective sector.

Sectors: ***P*** *– Population* **|** ***G*** *– Governance* **|** ***I*** *– Interdisciplinary/Other* **|** ***B*** *– Buildings & Sites* **|** ***W*** *– Water Infrastructure* **|** ***T*** *– Transportation* **|** ***E*** *– Energy* **|** ***NR*** *– Natural & Cultural Resources*

Source	P	G	I	B	W	T	E	NR
ActiveFairfax Transportation Plan. *https://www.fairfaxcounty.gov/transportation/bike-walk/activefairfax*	●							
AdaptVA (2020). Adapt VA Interactive Map Viewer. https://cmap2.vims.edu/AdaptVA/adaptVA_viewer.html			●					
Ahmed, S.N., H.L.N. Moltz, C.L. Schultz, and A. Seck (2020). 2020 Washington Metropolitan Area Water Supply Reliability Study: Demand and Resource Availability Forecast for the Year 2050. https://www.potomacriver.org/publications/2020-washington-metropolitan-area-water-supply-reliability-study-demand-and-resource-availability-forecast-for-the-year-2050/					●			
Butler-Leopold et al. (in review). Mid- Atlantic Forest ecosystem vulnerability assessment and synthesis: a report from the Mid-Atlantic Climate Change Response Framework, Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station.								●
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Chesapeake Bay Program Science and Technical Advisory Committee (2008). Climate Change and the Chesapeake Bay: State of the Science Review and Recommendations. http://www.chesapeake.org/stac/Pubs/climchangereport.pdf			●					
Climate Change Response Framework (2020). Fairfax County Urban Forest Management Division: Climate Change Adaptation Plan. https://forestadaptation.org/adapt/demonstration-projects/fairfax-county-urban-forest-management-division-climate-change								●

Source	P	G	I	B	W	T	E	NR
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