METROPOLITAN WASHINGTON 2030 CLIMATE AND ENERGY ACTION PLAN

November 2020

Metropolitan Washington
Council of Governments

METROPOLITAN WASHINGTON CLIMATE ACTION PLAN
Prepared by the Climate, Energy and Environment Policy Committee (CEEPC)
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The Metropolitan Washington Council of Governments (COG) is an independent, nonprofit association that brings area leaders together to address major regional issues in the District of Columbia, suburban Maryland, and Northern Virginia. COG's membership is comprised of 300 elected officials from 24 local governments, the Maryland and Virginia state legislatures, and U.S. Congress.

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CLIMATE RISKS AND VULNERABILITIES

Assessment Overview

In 2018, The Intergovernmental Panel on Climate Change (IPCC) released the *Global Warming of 1.5 °C*, an IPCC special report, highlighting that the world is already experiencing the impacts of 1 degree Celsius warming above pre-industrial levels but more severe climate impacts could be avoided if global warming is limited to 1.5 degrees Celsius. If the rate of warming continues, 1.5 degrees Celsius warming is likely to occur between 2030 and 2052 with more frequent and severe extreme weather events becoming even more prevalent.[cix]

As the IPCC noted internationally, metropolitan Washington is also experiencing the impacts of a changing climate. Observations in metropolitan Washington show that temperatures and the water surface level in the Potomac River have been rising and will continue to rise. Extreme weather events and increases in the number of extreme heat and cold days will increase risks to health, energy usage patterns, plant and animal habitats, and infrastructure. These changes are also affecting stormwater, drinking water, and wastewater. Implementing regional adaptation strategies are necessary to reduce the impacts of climate change.[cx]

A climate risk and vulnerability assessment (CRVA) was conducted for metropolitan Washington with the goal of understanding the climate hazards that face the region and assessing the likelihood and impact of current and future hazards on the region. Climate change may increase the frequency or severity of climate hazards in metropolitan Washington, including extreme heat (high day and night temperatures), drought, flooding (flash, riverine, and coastal), lightning and thunderstorms, and extreme winter conditions.

METHODOLOGY

The regional CRVA methodology is based on the Global Covenant of Mayors for Climate and Energy (GCoM) framework. GCOM is a global alliance of cities and local governments that support voluntary action to address climate change and ensure a low emission, climate resilient future.[cxi] The CRVA identifies and describes current and anticipated climate hazards metropolitan Washington faces. As shown in Table 3, each hazard is assigned a risk level, based on probability and level of consequence (probability x consequence). After the hazard risks are identified, an assessment is conducted to determine the future change in intensity and frequency, and the timeframe over which this will occur: Immediately, Short Term (by 2025), Medium Term (by 2050), and Long Term (after 2050).

Table 3: Climate Risk Sourcing Matrix

		Probability		
Consequence		Low (1)	Moderate (2)	High (3)
	High (3)	3	6	9
	Moderate (2)	2	4	6
	Low (1)	1	2	3

Next, vulnerabilities were assessed to determine the degree in which the people, systems, and sectors are susceptible to current and future climate impacts. The impacts assessed include, but are not limited to: services lost, environmental impact, property damages, public health threats, economic loses, and other disruptions to day-to-day operations. For each hazard, relevant population groups in the region were identified that are most vulnerable to future climate hazards and impacts. Finally, for each hazard, factors were assessed that may impact the region's adaptive capability.

To conduct the CRVA relevant climate studies and reports were leveraged followed by stakeholder engagement in climate planning work sessions. Both the research and stakeholder engagement informed the final CRVA results to determine the adaptive capability of the region. The findings of the CRVA provides guidance to the priority collaborative resilience actions identified in this plan.

SUMMARY RESULTS

As shown in Table 4, the most prominent climate hazards facing metropolitan Washington include extreme heat and flash and riverine flooding. More frequent extreme heat days will lead to public health concerns, increase energy demand, travel disruptions, and maintenance and infrastructure damages. With more frequent and intense storms, flash and riverine flooding will increase disruptions and damages to infrastructure and emergency services, and further threaten vulnerable populations.

Table 4: Risk Level of Hazards in Metropolitan Washington

Hazard	Probability	Consequence	Risk
Extreme Heat	3	3	9
Drought	2	3	6
Flooding (Flash and Riverine)	3	3	9
Coastal Flooding	3	2	6
Lightning/Thunderstorm	3	2	6
Extreme Winter Conditions	2	3	6

The region must adapt to climate change. Adaptive capacity is defined as "the ability of systems, institutions, humans and other organisms to adjust to potential damage, to take advantage of opportunities or to respond to consequences."[cxii] Table 5 shows the degree of challenge identified for each sector evaluated in the CRVA. Infrastructure conditions pose the highest degree of challenge due to the impacts on maintenance costs, aging facilities, interoperability, and increased demand. Resilient critical infrastructure is essential to the well-being, health, and safety of the people in metropolitan Washington. Implementing resilient measures for all critical infrastructure by 2050 is necessary to respond to a changing climate.

Table 5: Metropolitan Washington Adaptive Capacity Degree of Challenge

Factor	Degree of Challenge
Infrastructure Conditions/Maintenance	High
Access to Basic Services	Moderate
Access to Healthcare	Moderate
Public Health	Moderate
Housing	Moderate
Poverty	Moderate
Community Engagement	Moderate
Environmental Conditions	Moderate
Economic Health	Low

VULNERABLE POPULATIONS

Climate change will impact people and communities differently. Potentially vulnerable populations may include low-income, minority, 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 overlays the Equity Emphasis Areas (EEAs) developed originally for transportation planning and evaluation of communities with more health challenges with climate risks as a starting point to identify potentially vulnerable populations. Metropolitan Washington EEAs, identified by COG and its members, include communities that have a higher than average concentration of low-income, minority populations, or both. As vulnerable populations face greater risks, their consideration and inclusion in climate change planning is essential to ensure equitable distribution of benefits. Creating resilient communities is only possible when inclusion of vulnerable populations' needs are met. [cxiii]

Climate Hazards, Risks and Impacts

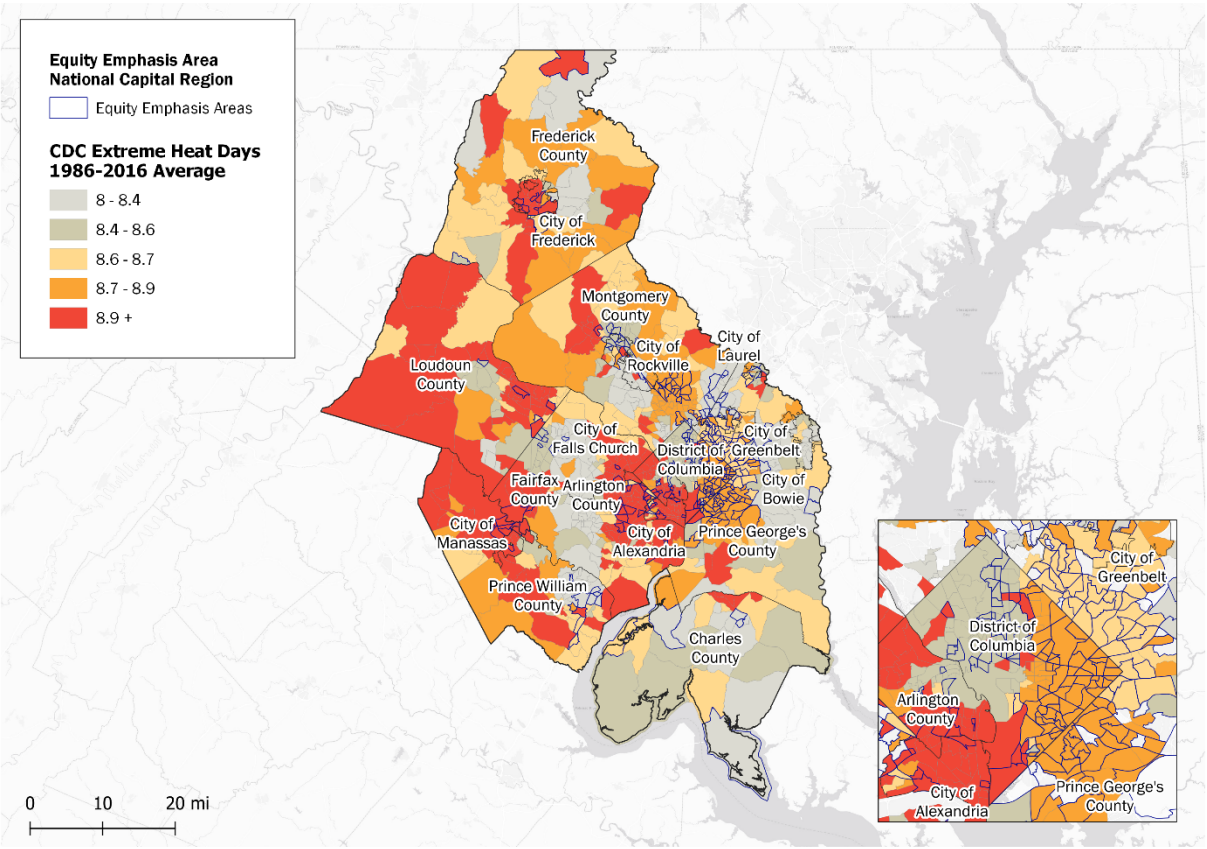
EXTREME HEAT

Probability	Consequence	Risk
3	3	9

Extreme heat occurs when temperatures that occur in the summertime are significantly higher or more humid than the average temperature the area typically experiences. Extreme heat has a high probability of occurring in metropolitan Washington and poses a high threat to human life. [cxiv]

Heat is the number one cause of weather-related injuries and fatalities in the region. In 2019, 53 days at or above 90°F and 13 days at or above 95°F were recorded at Dulles International Airport. Across the region, Figure 10 shows the average number of extreme heat days from 1986- 2016 overlaid with EEA's in the region. EEAs are more heavily burdened by extreme heat. The median number of extreme heat days a year in the region is 8.61 days, the median in EEAs is 8.75 days. Potentially vulnerable populations may face barriers such as access to air conditioning, housing, and cooling centers. Populations that rely on electronic medical devices and refrigerated medication face a greater risk during power outages from extreme heat days. Populations that reside in urban areas, are more at risk due to urban heat island effects. [cxv]

Figure 10: Extreme Heat Days and Equity Emphasis Areas

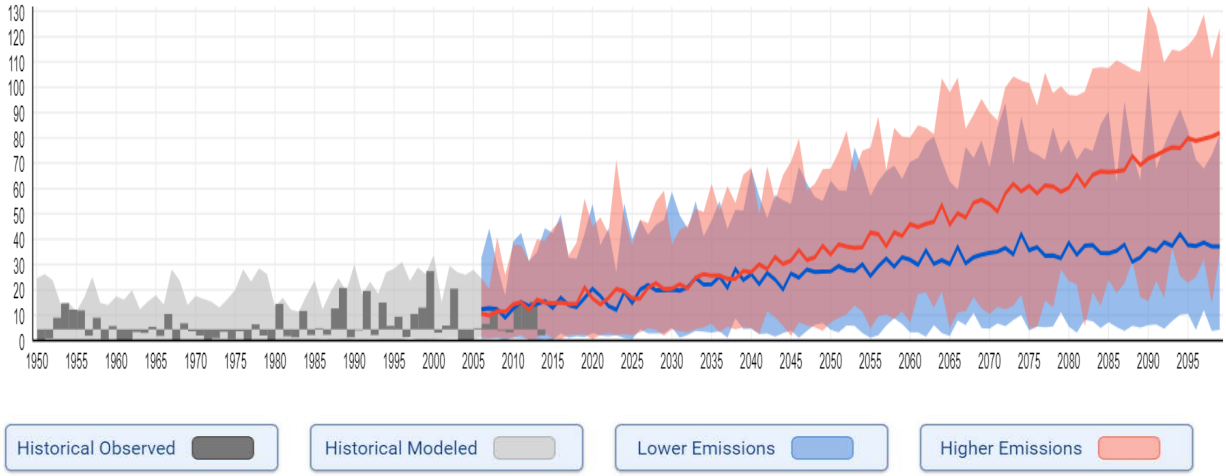


Source: Centers for Disease Control and Prevention (CDC) National Environmental Public Health Tracking Network Analysis Data Explorer and COG Equity Emphasis Areas

The number of extreme heat days will increase by 2025, with both extreme heat days and heat waves occurring more frequently. As seen in Figure 11, the National Oceanic and Atmospheric Administration (NOAA) Climate Explorer shows the number of days per year with temperatures greater than 95°F from 1950 to 2095, the red and blue fill indicates the range of future projected temperatures under high and low emissions scenarios, respectively. The data indicates a significant increase in the projected number of heat days; that the number of days per year with temperatures above 95°F may reach more than 50 to 100 days by 2065 under the high emissions scenario. [cxvi]

Similarly, the Climate Ready DC Plan projects that the District of Columbia would experience 40 to 75 days with temperatures above 95°F by 2080 under a high emission scenario.[cxvii]

Figure 11: Number of Projected Days Over 95 °F from 1950 until 2095



Source: NOAA Climate Explorer

Extreme heat presents challenges to infrastructure. Extreme heat can lead to more frequent travel disruptions, increased road surface damage and pavement softening, increase in rail infrastructure deterioration from buckling and expansion, impact aviation runways and plane takeoff, and impact electrical infrastructure (i.e. sagging lines). An increase in the number of extreme heat days may accelerate deterioration of other assets such as buildings, bridges, and vegetation, and increase cost of maintenance. Higher temperatures will result in increased cooling costs and energy demands and disruptions and damages to utility infrastructure.

Increased days of extreme heat can also lead to higher ozone pollution levels and could make it more difficult for the region to attain or maintain attainment with National Ambient Air Quality Standards (NAAQS) for ozone. High heat, unhealthy air days can trigger heat stroke, respiratory problems, heat exhaustion, hyperthermia, and death. The elderly, small children, persons with chronic diseases, persons with allergies, low-income populations, and outdoor workers are especially vulnerable to heat-related illnesses. An increase and prolonged number of extreme heat days will increase the transmission of diseases, making a longer tick and mosquito season common and increase the likelihood of vector-borne diseases. By the 2060s, the season could begin three weeks earlier in Virginia than it did from 1992 to 2007.[cxviii]

DROUGHT

Probability	Consequence	Risk
3	2	6

Drought is affected by the number of precipitation-free days and warmer temperatures, causing greater evaporation and evapotranspiration. Drought can cause dry weather patterns, low water supply, and can affect agricultural crops. While upstream reservoirs provide some protection from drought for metropolitan Washington, the region is particularly at risk due to the heavy reliance on the Potomac River as the primary source of potable water. Some jurisdictions are 100 percent reliant on water withdrawals from the Potomac River. Conditions in the Potomac River Basin frequently differ between the upper and lower portions of the Basin. Drought has a moderate probability of occurring but has a high consequence of impact in the region on the water supply and agricultural systems.[cxix]

Although droughts account for a small percentage of hazards in the region, impacts can be severe. In September 2010, due to unusually dry conditions, COG's Drought Coordination Committee (DCC) declared a drought 'WATCH"; The WATCH ended when Tropical Storm Nicole hit the region. Since 2000, several smaller community water systems have briefly declared WARNING or EMERGENCY stages due to limited rainfall and less resilient water supply systems. In October 2019, The October 1, 2019 U.S. Drought Monitor for the Potomac Watershed indicated that abnormal dryness (D0) and moderate drought (D1) exist throughout the region due to an unusually hot and dry September.[cxx]

By 2050, droughts may occur more frequently and be prolonged, with an increased intensity. As most of the region's drinking water comes from the free-flowing Potomac River, more frequent and intense droughts may increase the demand of water, lower base flows in the Potomac River watershed, and degrade water quality. The food and agriculture sector may face reduced crop yield and crop losses. Vulnerable populations are at a high risk, due to the indirect impacts of the disruptions of agriculture and water systems.[cxxi]

FLASH AND RIVERINE FLOODING

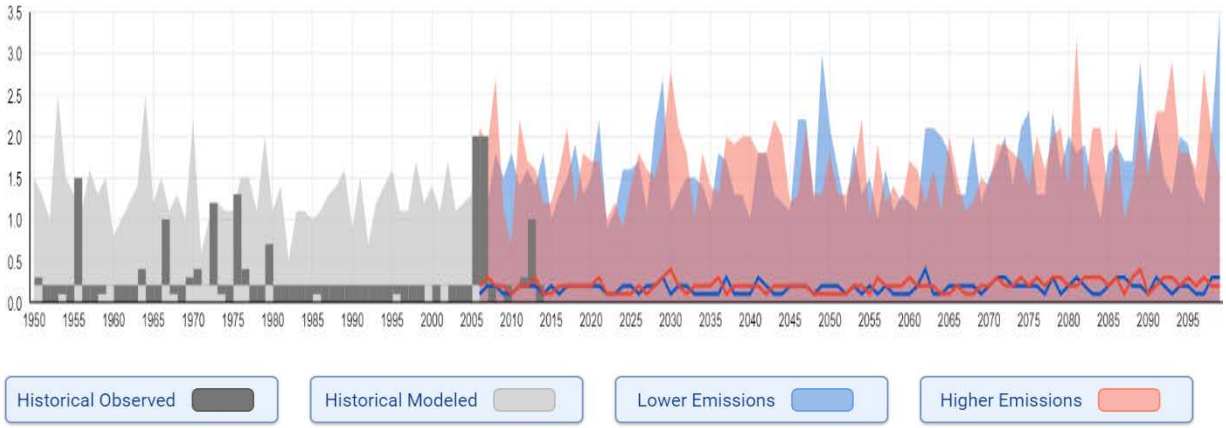
Probability	Consequence	Risk
3	3	9

Flash flooding occurs when the ground exceeds the ability to absorb heavy or excessive rainfall. Riverine flooding occurs when excessive rainfall causes high flow rates and water levels to rise over the top of riverbanks. This may occur due to thunderstorms, combined rainfall and snowmelt, ice jam, or heavy rain from tropical storms. Flash and riverine flooding have a high probability and high consequence of impact, posing a high risk to public health, transportation, water supply and sanitation, and properties. Coastal storm surge has a lower probability and medium consequence in metropolitan Washington.[cxxii]

The region has experienced many flash and riverine flooding events. In 2006, Washington D.C., experienced several days of intense rainfall, equivalent to a 200-year storm. The precipitation overwhelmed the storm sewer system. Several Federal agencies, Smithsonian museums including the National Gallery, and the Washington Metropolitan Area Transportation Authority (WMATA) had severe impacts to their operations, buildings, and infrastructure. In addition to damages to infrastructure and businesses, the event caused disruptions to critical services. A couple other notable examples of flash and riverine include May 2018 flash flooding in Frederick and July 2019 flash flooding in Northern Virginia.[cxxiii]

The frequency and intensity of heavy precipitation events are likely to increase. Figure 12**,** shows precipitation projections will occur at a higher range than historical records, demonstrating the possibility of more frequent heavy precipitation events. A 100-year precipitation event could become a one in 25-year event by mid-century, and a one in 15-year event by the 2080's.[cxxiv]

Figure 12: Projected Number of Days per Year with Over 3 Inches of Precipitation

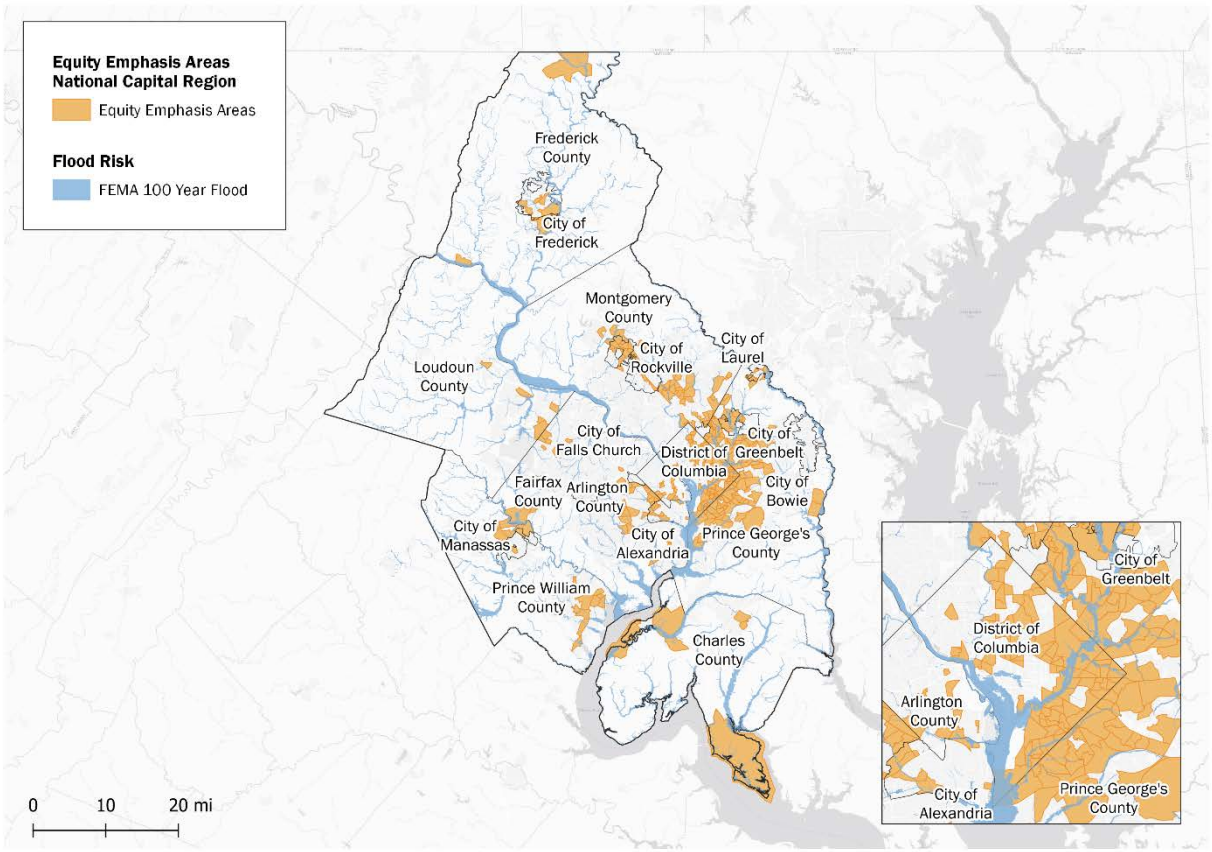


Source: NOAA Climate Explorer

An increase in the number and intensity of flash and riverine flooding may cause disruptions to the transportation and energy sector including flooding roadways, physical damages, loss and disruption to critical and emergency services, and wide-scale power outages. Sewer systems may be damaged due to the overwhelming level of water and pollution from storm water runoff may increase a degradation of water quality and shoreline loss.

Individuals with lower socioeconomic status, such as low-income households, persons in sub-standard housing, and unemployed persons are more likely to have limited resources that may hinder their ability to prepare for flooding and evacuate before and during an event. Persons with disabilities, the elderly, persons with chronic conditions, and language barriers are also at risk during flood events. Persons residing in flood zones are at risk for loss of property and injuries. As seen in Figure 13, Federal Emergency Management Agency's (FEMA) 100-year floodplains run through more than 60 percent of Equity Emphasis Areas (EEAs), where currently approximately 1 million people reside. Also notable, is that more than half of the region's EEAs are within the Anacostia watershed (mainly in the District of Columbia and western border of Prince George's County). These areas can serve as a starting point for local jurisdiction to work with these communities to further identify potentially vulnerable populations, how they will be impacted by riverine flooding, and how to address their needs.[cxxv]

Figure 13: Equity Emphasis Areas and FEMA's 100-Year Floodplains



Source: FEMA and COG Equity Emphasis Areas

COASTAL FLOODING

Probability	Consequence	Risk
3	2	6

Coastal flooding can occur in the form of nuisance or tidal flooding during extreme high tides and during coastal storms that produce intense rain, storm surges and high waves. Coastal flooding poses a risk to human health including injuries, death, and illnesses associated with contaminated water including diarrhea and stomach illnesses.[cxxvi] Coastal flooding poses risks to transportation services, infrastructure, residential housing, businesses, and the economy.

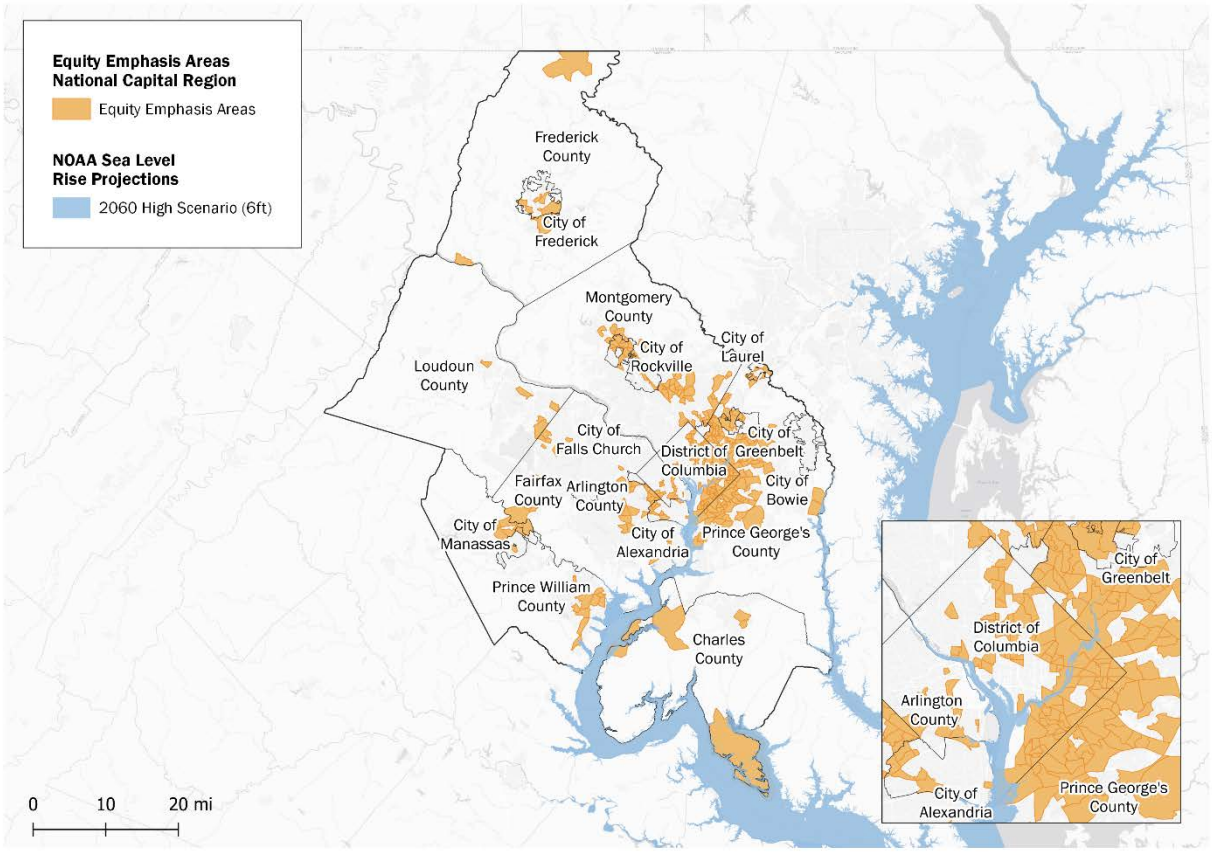
In the past 90 years, the Potomac and Anacostia River, both tidal rivers have experienced 11 inches of sea level rise. Nuisance flooding has increased over 300 percent along the riverfront. Effects of sea level rise are observable, including shoreline erosion and deterioration of tidal wetlands. Recent examples of coastal flood events include impacts of Hurricane Isaac (2003), the 2006 Mid-Atlantic Storm and Tropical Storm Lee (2011).[cxxvii]

The region may experience more intense and more frequent coastal flooding impacts. The District of Columbia could experience 2 to 6 feet of additional sea level rise towards the end of the century. Increases in sea level rise will cause tidal and nuisance floods with more severe impacts and a reduction of time in between floods. Storm surge floods will be more threatening in the long term with added sea level rise.[cxxviii]

Coastal areas in metropolitan Washington contain a critical convergence of infrastructure (water, energy, and communication utilities, transportation hubs, facilities and buildings) that the region's local governments, businesses, institutions, and communities depend upon. The region is also home to many federal buildings, military installations, national security facilities, and significant national monuments and cultural treasures. As sea level rises, the coastline may change and critical infrastructure that was previously not at risk may face a greater risk of flooding from storm surges. More frequent and intense coastal flooding may impact these infrastructure and facilities potentially causing damage, disruptions, and economic losses.

Coastal flooding puts vulnerable populations that live and work near the coast at a higher risk. Populations with socioeconomic barriers, including low-income households, the elderly, persons in sub-standard housing, and individuals with language barriers face greater challenges to prepare and respond to flood events. Figure 14 demonstrates the number of EEAs that fall within NOAA's high sea level rise projections (6ft). More than 10 percent of EEAs will be affected by a 6-foot sea level rise. More than 100,000 people currently live in these EEAs. These areas can serve as a starting point for local jurisdictions to work with these communities to further identify potentially vulnerable populations, how they will be impacted by coastal flooding, and how to address their needs.[cxxix]

Figure 14: Equity Emphasis Areas and NOAA Sea Level Rise Projections High Scenario (2080 6ft)



Source: NOAA and COG Equity Emphasis Areas

SEVERE THUNDERSTORMS/LIGHTNING

Probability	Consequence	Risk
3	2	6

A thunderstorm is a combination of precipitation, thunder, and lightning. A severe thunderstorm may additionally include hail, wind gusts of 50 knots or more or may even form into a tornado. Severe thunderstorms may also cause flooding. Severe thunderstorms and lightning have a high probability of occurring with a moderate level of impact.

The June 2012 Derecho that hit the region was a violent thunderstorm with winds recorded at upwards of 85 mph. The storm demonstrated the consequences of climate impacts on infrastructure failures. Millions of people experienced power outages for several days during a heatwave. The Washington Suburban Sanitary Commission (WSSC) experienced power loss at Potomac and Patuxent filtration plants and at more than 50 of its facilities. Transportation routes were blocked due to downed trees and power lines. The Derecho event resulted in communication infrastructure damages and 9-1-1 outages affected more than 1.5 million people in Northern Virginia and 68,000 people in the District of Columbia.[cxxx]

In October 2012, the region experienced sustained winds and heavy rain during Superstorm Sandy. Impacts were lessened due to the region not being directly hit, pre-landfall preparedness, and coordination during response and recovery operations. During Sandy, the region experienced flooding, power outages, downed power lines and trees. The Potomac and Patuxent Water Filtration Plants maintained full power; however, other water utilities experienced short power outages, flooding, or sewer overflows. Washington Metropolitan Area Transit Authority (WMATA) suspended Metrorail and bus services for two days.[cxxxi]

With rising temperatures, severe thunderstorms and lightning have a high probability to occur more frequently by 2025. Future projections show the frequency and intensity of extreme precipitation events are projected to increase from 10 days per year with 1 inch of rain in a 24-hour period, to 11 days in the 2020s and 12 days by 2050. The number of days per year with more than 2 inches of rainfall per 24-hour period is expected to increase from 1 day to 3 days by the 2020s and 3.5 days by the 2050s.[cxxxii]

More frequent and intense severe storms will cause additional impacts to energy, transportation, water, and communication services and assets. Power outages and transportation disruptions will occur due to extreme rainfall events and downed trees. Severe thunderstorms and lightning pose a public health challenge, as power outages can disrupt medical services and emergency response. More intense rainfall can damage and overwhelm water infrastructure. More frequent lightning will increase fire risk. Additionally, an increasing electric fleet may be impacted by power outages.

Long-term power outages particularly pose challenges to potentially vulnerable populations including the elderly, persons with chronic conditions, persons who rely on electric medical equipment, homeless, and those reliant on refrigerated medication. Prolonged power outages pose public health challenges and can become life threatening during heat waves and extreme cold events.

EXTREME WINTER CONDITIONS

Probability	Consequence	Risk
2	3	6

Extreme winter conditions are a combination of heavy snow, blowing snow or dangerous wind chills. Extreme winter storms can create blizzards which causes low visibility due to blowing snow and wind. Ice storms occur when at least

0.25 inches of ice accumulates on an exposed surface.[cxxxiii] The region may see increases risk of ice storms as winter temperatures rise and more storms will occur near 32°F in temperature. Extreme winter conditions have a moderate probability and a high consequence, as these events pose a life-threatening risk to human health and life.

The region has experienced extreme winter conditions resulting in loss of life, significant economic impacts, and infrastructure damages. Recent winter storms events affecting metropolitan Washington include: Snowzilla (2016), Carmageddon (2011), Snowmageddon (2010), and Snowpocalypse (2009). As seen in Figure 15**,** the February 2010 severe winter storm named Snowmageddon impacted the Atlantic coastline, dropping several feet of snow in metropolitan Washington. Washington's Dulles Airport recorded 32.4 inches of snow. A State of Emergency was declared in Washington D.C, Virginia, and Maryland. Widespread power outages occurred with hundreds of thousands without power. The Federal government and schools in the region were closed for several days. Infrastructure damages and disruptions to transportation routes occurred due to excessive snow on roadways, downed trees, abandoned vehicles and vehicle accidents. It took several days to clear roads and pedestrian paths after the storm.[cxxxiv]

Figure 15: Satellite Image of Snowmageddon

Source: National Aeronautics and Space Administration (NASA) Terra Satellite

Extreme winter conditions will occur more frequently and increase in intensity by 2025. While average annual temperatures are increasing, extreme winter events and cold snaps may continue to occur. Extreme winter conditions cause impacts to both infrastructure and people. Infrastructure can experience road surface damages and closures resulting in travel disruptions and higher maintenance costs. Roadway accidents, injuries, and fatalities are likely to coincide with winter conditions. Energy infrastructure may experience transmission structure failures resulting in power outages for many customers. Extreme cold temperatures pose a public health risk especially to persons facing homelessness, low-income households, the elderly, and persons with chronic conditions who rely on daily access to services.

REGIONAL CLIMATE RESILIENCE STRATEGY

Moving Toward Resilience

The Regional Climate Resilience Strategy includes collaborative actions to support the region in achieving the climate resilience goals of becoming a Climate Ready Region and making significant progress to be a Climate Resilient Region by 2030. To move the region toward becoming more resilient, the region needs to ensure that all populations are included and prioritize resilience of the region's most vulnerable populations.

CLIMATE READY REGION BY 2030

Recognizing everything cannot be implemented at once due to the significant capital outlay required for resilience, the region first needs to be climate ready. To be Climate Ready by 2030, all local governments must assess current and future climate risks, and be actively integrating climate planning across government plans, operations, and communications. More specifically, Climate Ready involves metropolitan Washington undertaking five key components:

1. Local climate risks have been assessed and climate planning is incorporated into all government plans.
2. Climate risks are being communicated across governmental offices and to the public, with a particular emphasis on empowering diverse populations.
3. Climate planning is actively being incorporated into government operations.
4. All communities are implementing actions to reduce climate risks.
5. Establish the necessary plans, networks, funding, and other actions to ensure implementation of full resilience.

CLIMATE RESILIENT REGION

To fully be a Climate Resilient Region, the region must have the ability to adapt and absorb against disturbances caused by current and future, acute and chronic climate impacts and successfully maintain essential functions. This will be realized when:

1. The region is a network of resilient and socially connected people, governments, and institutions that have constructed resilient communities. (Resilient people = resilient communities).
2. Measures have been implemented across the region to mitigate against current and future climate impacts.
   - All critical infrastructure and functions are climate resilient.
   - Resilient solutions to protect public health and safety, particularly of potentially vulnerable populations, have been deployed.
3. The region is monitoring measures to address current and future climate risks and vulnerabilities.

PRIORITY COLLABORATIVE RESILIENCE ACTIONS

The climate action areas included in this Regional Climate Resilience Strategy address: Planning, Equity, and Resilient Infrastructure. Within these action areas are high-level priority actions for COG and its members to focus on through 2030. All actions are voluntary. Actions have a 1-page description that includes:

- An action overview with example policies, programs, or projects;
- How the action supports regional resilience goals;
- Identifies what level of implementation is needed to meet by 2030 and beyond;
- Examples of how COG and local jurisdiction efforts that can support implementation (it's not an exhaustive list); and
- How the action benefits other *Region Forward* goals.

Table 6 is a summary of the climate action areas and priority collaborative actions described in this strategy. The actions are based on the needs identified in the regional climate risk and vulnerabilities assessment described in the previous section of this plan. While these actions focus on what COG and its members can do together to move the region towards becoming Climate Ready and Climate Resilient, significant action will be needed across all sectors and all levels of government in order to meet these goals.

Table 6: Metropolitan Washington Priority Collaborative Resilience Actions

Climate Action Area	Action ID	Priority Collaborative Action
Planning	PL - 2	Support Capacity Building for Climate Resilience Planning
	PL - 3	Develop Integrated Approach to Climate Resilience Planning
	PL - 4	Update Local and Regional Plans to Address Climate Risks
Equity	EQ - 3	Support Engagement of the Public on Climate Risks, with a Particular Emphasis on Potentially Vulnerable Populations
	EQ - 4	Support Equitable Secure Energy Access
Resilient Infrastructure	RI - 1	Support Establishment of Resilience Hubs
	RI - 2	Improve the Resilience of Critical Infrastructure
	RI - 3	Implement Measures to Equitably Address Urban Heat Island
	RI - 4	Enhance Green Infrastructure Networks
	RI - 5	Implement Measures to Reduce Flood Risk