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Resilience and Adaptation Memo –

Developed to inform the Sustainability and Climate Action Plan

CITY OF TAKOMA PARK

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Purpose and Background

The purpose of this document is to provide an overview of the historical and projected climate stressors for the City of Takoma Park, Maryland, select climate vulnerability considerations, and strategies for adapting to those stressors. This memo serves as a supplement to the Sustainability and Climate Action Plan – Opportunities for Action Report and is based on desk research (primarily from state, county, and municipal-level resources along with reports from the Metropolitan Washington Council of Governments (MWCOG)) combined with key stakeholder interviews. Interview participants were identified in consultation with the City of Takoma Park staff and include the following:

- Maia Davis: Sr. Environmental Planner, Metropolitan Washington Council of Governments
- Amanda Campbell: Climate Resiliency Lead, Metropolitan Washington Council of Governments
- Jeff King: Chief of Energy & Climate Programs, Metropolitan Washington Council of Governments
- Grayce Wiggins: Housing and Community Development Manager, City of Takoma Park
- Laura Barclay: Director, Old Takoma Business Association
- Pamela Sparr: Environmental and Climate Justice Consultant
- Ron Hardy: Emergency Manager, City of Takoma Park Office of Emergency Management

Takoma Park Climate Stressors

The primary climate stressors facing Takoma Park include extreme heat, flooding, and storms, with drought arising as a secondary concern.[1] These are largely similar to the stressors and associated risks across Montgomery Country and the MWCOG region. The following section explores both historical observations and future projections for each of these stressors.

Extreme Heat

Historical Observations

On average, Takoma Park has historically experienced around 15 days over 90 degrees Fahrenheit, and around 2.5 days over 95 degrees Fahrenheit each year[i]. Across the State of Maryland, summertime extreme heat events have more than doubled between 1980-2000 when compared to 1960-1970[ii]. Exact thresholds vary across the state and Montgomery County, but Heat Advisories are generally issued when the heat index is equal to or greater than 100 degrees Fahrenheit, while Excessive Heat Warnings are issued when temperatures exceed 105.[iii]

[1] While winter storms are a key concern for Takoma Park and the region, they are not included in this memo given that climate change projections for the region indicate increased likelihood of mild winters and reduced winter weather impacts (Maryland Commission on Climate Change 2018 and MWCOG 2013). Considerations around projections for increased overall precipitation in the winter can be addressed through the storm and flooding risks discussed below. The 2018 Montgomery County Hazard Mitigation Plan includes valuable information on mitigating current winter storm risks.

The Urban Heat Island Effect and Neighborhood-level Extreme Heat Events

Some neighborhoods experience heatwaves more acutely than others due in part to the urban heat island effect (UHIE), which **may increase temperatures by 2-10 degrees Fahrenheit relative to more vegetative areas**. UHIE is the result of heat absorption by dark rooftops and pavement, heat emitted by buildings and vehicles, reduced airflow and low vegetation cover (i.e., limited shading), all of which can be exacerbated by surrounding urban areas.[iv] For example, upstream UHI-generated hot air was carried by wind from DC and Columbia, Maryland to Baltimore during a 2007 heatwave, increasing temperatures by approximately two-degrees Fahrenheit.[v]

As of 2018, approximately 58 percent (772 acres) of Takoma Park was covered by tree canopy. This is in contrast to adjacent jurisdictions, which have tree canopy coverage of approximately 40 percent. Additionally, ten percent (138 acres) of the land has been identified as impervious surface suitable to be replaced by tree canopy. While the tree canopy has been relatively stable since first measured in 2014, the greatest average loss of tree canopy occurred within medium-density residential land use.[vi]

Future Projections

Temperatures across the State of Maryland are rising and projected to increase by two (2) degrees Fahrenheit from the 1998 baseline by 2025, irrespective of changes in greenhouse gas (GHG) emissions levels. By the end of the century, under a low-emissions scenario, temperatures are projected to increase nearly five (5) degrees Fahrenheit, and the number of 90-degree days (i.e., extreme heat days) are projected to double or triple.[vii] The frequency, intensity, and duration of extreme heat events is expected to increase across the State.[viii] If population growth or increasing development in Takoma Park result in additional pavement and/or vehicles, the heat island effect across the city could intensify and expand in spatial extent.

Flooding

Historical Observations

The City of Takoma Park has been impacted by numerous flood events, mostly due to flash flooding from sudden and brief extreme precipitation and stormwater management issues.[ix] While these have been disruptive, none have been identified as major flood events according to the City.[x] While a storm of around 3 inches of rain over 24 hours occurs on average every 5 years, a 100-year intense precipitation event brings over half a foot of rain over 24 hours.[xi] Across Montgomery County, the region has been impacted by 234 flood events between 1964 and 2018. The area as a whole experienced a slight increase in average annual precipitation between 1950 and 2008, and high-intensity precipitation events have been growing in intensity.[xii]

Future Projections

Flood risks are expected to increase throughout the MWCOG area, particularly if precipitation continues to fall with greater intensity and duration, regardless of changes in high-precipitation event frequency. There are projections for average less during the summer and more during the autumn months by 2080.[xiii]

While there are not projected to be significant positive or negative changes in total annual precipitation, intensity of high-intensity rainfall events is projected to increase.

The two main types of flood risk for Takoma Park are **overbank flooding**, caused by the volume of water exceeding a river's capacity (particularly along Sligo Creek), and **urban drainage flooding**, caused by water exceeding a storm sewer's capacity. The latter concern could become more problematic if new development increases impervious surface area and requires greater drainage capacity.[xiv] Regardless of the extent of expected new development, projected increases in rainfall event intensity and duration could heighten the risk for urban drainage flooding. While flooding in existing flood hazard areas of Montgomery County remains highly likely, smaller floods generated by heavy rains, increased runoff, and ~~inadequate~~ overwhelmed drainage capacity are anticipated to become more frequent—impacting residences, businesses, and critical facilities[2] outside of flood plains.[xv]

Storms

Historical Observations

High wind speeds can impact infrastructure, particularly communications and utilities. Mass power outages seriously affect the operation of government facilities and utility companies, and interruptions in services and impaired transportation network from downed power lines can lead to lost services and access in and out of neighborhoods for extended periods.[xvi, xvii] Damages from thunderstorms, hurricanes, lightning, hail, wind, and tornados combined cost the Metropolitan Washington region overall an average of $14 million annually.[xviii]

Thunderstorms and Derechos

On 29 June 2012, Takoma Park faced two concurrent emergency events: a derecho storm and a record-breaking heatwave (104 degrees Fahrenheit). The June derecho, a fastmoving (i.e., 60 mph) and severe thunderstorm, uprooted trees, downed powerlines, and generated tons of debris.[xix] The damage resulted in the loss of power to 238,000 (77 percent) of Montgomery County's Pepco customers for an extended period of time, including public and private critical facilities (e.g., hospitals, nursing homes) serving vulnerable populations.[xx, xxi] While the 2012 event was the most significant derecho in recent years, other heavy storms and lightening events have caused more recent damage, including a May 14, 2018 storm in which lightning strikes set fire to two Takoma Park houses in separate incidents.[xxii]

Tropical Storms

In 1979, Montgomery County was impacted by Tropical Storm David, which resulted in over $2 million in property damage. In 1999, Hurricane Floyd caused $200 million in damage across the state of Maryland. Hurricane Isabel struck Montgomery County in 2003, causing power outages that impacted hospitals and nursing homes, and flooding that led to numerous road closures. While Montgomery County is not within

[2] Critical facilities include fire and police stations, water and wastewater treatment facilities, community health care, schools, public shelters, water filtration and pump stations (2018 Montgomery County Hazard Mitigation Plan).

a high coastal hazard area, it is still at risk of impacts from coastal storms. The American Society of Civil Engineers does rate the County as being in a Zone II wind hazard area, which indicates it can experience wind speeds of up to 160 miles per hour.[xxiii]

Future Projections

Montgomery County is anticipated to continue to regularly experience thunderstorms between early spring and late autumn, the intensity of which is expected to increase due climate change.[xxiv] These storms can be associated with flash floods, tornadoes, downbursts and derechos and can generate debris, causing damage and requiring cleanup with costs in the millions. While the frequency of high-wind events is not generally expected to increase, the intensity of associated rainfall is projected to increase in a warming climate.[xxv]

Drought

Drought has not historically been a significant stressor for Takoma Park with respect to either observed climatological conditions or social and economic impact. However, drought conditions can negatively impact the city's residential and community gardens~~city's numerous community gardens~~ and also require increased watering to sustain municipally-managed trees. The latter issue could divert staff time and resources from the Public Works Department.[xxvi] Projected increases in temperatures, particularly during summer months, combined with changing rainfall patterns are likely to increase drought intensity and/or during across the region.[xxvii]

Climate Vulnerability Considerations

In seeking to understand and address climate risks across Takoma Park, it is critical to consider the role of equity in shaping vulnerability and resilience to climate stressors. In particular, the City is encouraged to pay special attention to the following communities: elders/senior citizens, children, those with fragile health, homeless individuals, renters, low- to moderate-income individuals, and those with limited English proficiency.[xxviii] These frontline communities are likely to be affected first and worst by climate change, and many are less able to prepare for, adapt to, and bounce back from climate impacts. The sections below include further exploration of specific considerations based on the issues prioritized in consultation with the City of Takoma Park's Sustainability Manager and informed by desk research along with key stakeholder interviews.

Housing

The **median rent in Takoma Park is 22 percent lower than the surrounding area and approximately 50 percent lower than Montgomery County**, indicating a higher degree of affordability when compared to neighboring jurisdictions.[xxix] In 2016, Takoma Park had 3,044 units subject to stabilization ordinances and 303 units that were subject to area median income (AMI) rent control ordinances; AMI is determined by the US Department of Housing and Urban Development (HUD) and based on the average income of Montgomery County households, which was $109,200 in 2016. [xxx]

While AMI-indexed rents require that a certain number of units in a building do not exceed 40-80 percent of AMI, **approximately 32 percent of all Takoma Park households earn less than the minimum annual income** (approximately $44,000) **required to afford a rent stabilized apartment**.[xxxi] Additionally, HUD defines affordable housing as costing less than 30 percent of a households income[3] and low income is defined as making less than 80 percent of AMI (approximately $22,000). Around 14 percent of Takoma Park households earning below 80 percent AMI spend more than 30 percent of their income on housing costs.[xxxii]

While approximately 50 percent of Takoma Park residents are renters, affordable housing is not equally distributed through the City; the greatest clusters of rent-stabilized and subsidized properties are in the Long Branch/Sligo Creek (Ward 5) area and along Maple Avenue (Ward 4).[xxxiii] That said, given that renters often live side-by-side with homeowners and there is a lack of public housing in Takoma Park, equity disparities are often hidden across the city.[xxxiv]

Climate change threatens to increase housing costs for many Takoma Park households, disproportionately impacting those households earning below 80 percent AMI and spending 30 percent or more of their income on housing costs. Higher summer temperatures are expected to increase peak energy demands due to greater use of air conditioning units, potentially requiring an **increase in 10-20 percent in electric generating capacity across Maryland**.[xxxv] Increased energy use at the household level would likely result in increased home operating costs for Takoma Park residents, which could disproportionately impact low- to moderate-income (LMI) communities. There are no regulations within Montgomery County requiring landlords to provide air conditioning to tenants. While many landlords in Takoma Park do supply A/C or convection units, the are often challenges in operating and maintaining the units, which can increase renter-landlord conflict.[xxxvi]

Many residential properties across Takoma Park experience some degree of flooding or other climate-related impact. While not confirmed, it is estimated that a large proportion of the ~13,000 annual; Montgomery County records for Takoma Park inspection or re-inspection are the result of climate-related concerns (e.g., flooding, heat, and storms).[xxxvii] The largest condo building in the city, Takoma Overlook, experiences significant flooding that has displaced some residences and caused costly damage. Condos are highly unregulated and perceived by some as receiving relatively little attention with respect to services, including for managing climate-related events.[xxxviii]

The City Council adopted a new Housing and Economic Development Strategic Plan in October 2019.[xxxix] While the Housing and Community Development Department is not mandated with addressing climate stressors, the plan includes numerous references to climate change impacts and recommendations for ensuring linkages with the Sustainability and Climate Action Plan under development. **It will be critical to ensure that the objectives and implementation of the Housing and Economic Development Strategic**

[3] Housing costs include rent/mortgage, utilities, food, clothing, transportation, and medical care.

Plan and the Sustainability and Climate Action Plan are aligned, including increased collaboration between implementing departments.

Business Continuity

During the kickoff for the Sustainability and Climate Action Plan project, participants flagged the critical role of the small business community, which is perceived as crucial to the vibrancy of Takoma Park. In particular, there are concerns around disaster preparedness and recovery. Discussion with the Director of the Old Takoma Business Association (OTBA) indicated that **the primary climate-related stressor affecting the small businesses within the OTBA is power loss associated with storms**.[xl] This can result in business closure and food spoilage. While heat waves could impact business patronage and result in increased energy costs, the businesses with OTBA have not flagged these are critical concerns. Additionally, flooding in the immediate area around the location represented by OTBA was reported to minimal. The more significant flooding of Sligo Creek Parkway, which sometimes results in a road closure, could affect business patronage, but has not historically been a critical concern. **The small businesses in the OTBA are perceived as generally focusing more on day-to-day survival rather than preparedness for potential climate-related hazards, given an expectation that the City government will manage the climate risks and a general lack of experienced climate hazard impacts.**[xli]

Public Health

Extreme heat is **the leading cause of weather-related illnesses and fatalities** within the Metropolitan Washington Council of Governments (MWCOG) area, which includes Takoma Park.[xlii] Between 2000 and 2012, extreme summer heat events increased the risk of hospitalization for heart attacks by 11 percent across the State of Maryland and by as much as 43 percent in some local jurisdictions;[xliii] the **risk was considerably higher among non-Hispanic blacks compared to non-Hispanic whites**.[xliv] Montgomery County has experienced 13 extreme heat events between 1983 and 2018, resulting in 13 fatalities.[xlv] Populations at great risk from extreme heat events include those who rely on public transportation (particularly given the lack of covered structures), children and others with underlying health concerns and sensitivity to heat, and homeless individuals.[xlvi]

Senior citizens (those aged 65 and up) are more susceptible to extreme heat events than other age groups, facing increased risks for heat-related illnesses and mortality. This segment of the population grew 24.7 percent between 2000 and 2015 in Takoma Park.[xlvii] A study in Baltimore found that senior citizens' **ambient body temperature increased by 0.15 degrees Fahrenheit for every 1-degree increase in ambient air temperature**. To adapt to increasing temperatures, seniors in the study undertook a range of strategies, including increased use of air conditioning.[xlviii] While not historically an identified priority concern among seniors in the three agree-segregated rental buildings or over-housed seniors who are aging in place and facing significant economic challenges, heat and other climate-related stressors could become a more significant threat in the future.[xlix]

Recommended Adaptation and Resilience Strategies

The suite of strategies listed below are intended to provide a menu of recommended options based on the critical climate-related risks identified for Takoma Park. These strategies were selected in consideration of the existing policy context in the city and informed by interviews, stakeholder recommendations, and a database of successful strategies implemented by municipal across the United States. Prioritization, selection, and implementation staging from among these strategies requires additional stakeholder engagement and input from Takoma Park staff.

Extreme Heat

1. **Continue to expand the tree canopy to mitigate the UHIE,** targeting medium-density residential areas and prioritizing those areas identified as impervious in the Takoma Park 2018 Tree Canopy Report.[I]
2. **Work with first responders and health institutions to track Takoma Park heat-related illnesses and fatalities**. Collecting zip code, ambulance, and emergency room data during extreme heat events will enable evidence-based decision making in the development of extreme heat management strategies.
3. **Develop a heat risk outreach and services strategy,** for example surveying the community regarding use and needs for cooling centers and public cooling infrastructure, with particular focus on communities most vulnerable to heat; education campaigns on recognizing the signs of heat stress; neighbor-to-neighbor and/or Be A Buddy programs to check on elderly community members during extreme heat events.
4. **Increase public access to water,** for example by ensuring that there are working water fountains and/or water refill stations in all public facilities, including parks and bus shelters, where possible.
5. **Improve shade and other bus shelter amenities** (e.g., real-time arrival information) to reduce negative health impacts from sun and heat and also incentivize usage of public transportation.
6. **Implement a cool and/or green roof retrofit program to reduce cooling costs and mitigate the UHIE**. The City of Bowie in Montgomery County, Maryland, has leveraged Community Development Block Grant (CDBG) funds to implement its Green Housing Rehabilitation program and rehabilitate the roofs of 200 low- to moderate-income (LMI) senior citizen owned single-family homes, **lowering energy bills by an average of 9-10 percent**; the program has recently been expanded to all LMI single-family homes in Bowie.[4] Note that rehabilitated roofs were not replaced with cool or green roofs, but CDBG funds could be used to implement innovative roofing technologies. Washington D.C. also incentivizes stormwater infrastructure and green roofs.[5] Other more basic, affordable weatherization measures aside from cool/green roof options can also reduce cooling energy needs and associated costs.

[4] See https://www.cityofbowie.org/970/Senior-Housing-Rehab-Program

[5] See https://doee.dc.gov/greenroofs and https://doee.dc.gov/riversmart

Flooding

7. **Increase awareness of existing flood insurance coverage for residential and commercial properties for all vulnerable residents**, particularly those in flood prone areas—regardless or being located in a 100- or 500-year floodplain (based exclusively on historical conditions); promote increased flood insurance uptake where appropriate.
8. **Update the Department of Public Work's 2009 Flood Mitigation Plan**, including explicit consideration of projected future changes in climate and flood conditions, including from changing runoff patterns, and equity considerations.
9. **Improve outreach to targeted communities and business around flood preparedness and recovery,** including promotion of activities under the Stormwater Management Program and increased community partnerships around flood protection.[6]
10. **Establish a flood impacts reporting and monitoring program** to identify current and changing vulnerability, including changing runoff patterns, and help target investments in preparedness and recovery. Ensure the program is accessible to all, including those with limited English proficiency.

Storms (see also recommendations above for flood-based impacts from storms)

11. **Retrofit critical facilities and infrastructures with distributed energy resources (DERs- e.g., rooftop solar) to improve their resilience**. The power outages experienced during the June 2012 derecho highlighted a need to retrofit critical facilities (e.g., health care facilities and cooling center, where applicable) with resilient backup power systems (e.g., rooftop solar paired with storage).

Drought

12. **Consider participation in the MWCOG Drought Coordination Technical Committee** (DCTC), a regional water supply and drought management program for the National Capitol region that assists in the implementation of the Metropolitan Washington Water Supply and Drought Awareness Response Plan.[7]
13. **Monitor climate stress and increases in water demand**; increases in annual temperatures or extreme heat events may put excessive stress on available water resources for community gardens and tree watering over short or long periods of time.
14. **Support provision of rain barrels and similar water-capture devices,** particularly for community gardens and areas supporting trees.
15. **Encourage garden practices that promote drought resilience** through educational and training opportunities and pilot demonstrations.

[6] See https://takomaparkmd.gov/government/public-works/stormwater-management-program/

[7] See https://www.mwcog.org/committees/dcc-technical-committee/

16. **Promote xeriscaping, rainwater capture, grey water and water-efficient appliances and fixtures**, reducing water demand and the potential for excessive demand due to temperature increases or heat events.

Overall

17. **Ensure equity considerations are prioritized in the identification, development, and adaptation of all adaptation and resilience measures.** This includes increased focus on the broader context of issues shaping vulnerability and the means of addressing those issues, including efforts to improve collective control over resources and democratic engagement. While some strategies will provide targeted benefit to specific communities and groups, the City should seek to ensure equitable benefits to all communities. The NAACP's action toolkit for *Advancing Resistance and Resilience in Climate Change Adaptation* is a valuable resource for recommendations and guidance.[8] Stakeholder groups to include in outreach could include churches (many of which are working on issues of environment/climate and equity) as well as schools (e.g., Montgomery Blair as well as Don Bosco Cristo Rey).[li]
18. **Actively leverage the resources and tools from the City's participation in the Government Alliance on Race and Equity** to continue working towards racial equity and the advancement opportunities for all Takoma Park residents, building resilience to societal and climate stressors.[9] This aligns with and builds upon the City's resolution on racial equity (No. 2017-28).[10]
19. **Improve individual and community climate preparedness through community outreach tools.** The Takoma Park Office of Emergency Management leverages a "card game" to teach youth about preparedness, which could be adapted to include climate change adaptation. Additionally, the Urban Sustainability Directors Network (USDN) has developed the USDN Game of Floods, Game of Heat, and Game of Extremes, all of which could be applied in Takoma Park.[11]
20. **Integrate adaption language on climate stressors into policies, plans, and programs**, ensuring that resilience is built across sectors and neighborhoods. One example of successful integration is within Takoma Park's recently-passed Housing and Economic Development Strategic Plan. Importantly, the language within plans must be accompanied by increased collaboration between departments to ensure adaptation and resilience are effectively integrated into actual implementation.

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[8] See the NAACP action toolkit here: https://live-naacp-site.pantheonsite.io/wp-content/uploads/2019/04/Our-Communities-Our-Power-TOOLKIT-FINAL.pdf

[9] See the Government Alliance on Race and Equity here: https://www.racialequityalliance.org/

[10] See https://documents.takomaparkmd.gov/government/city-council/resolutions/2017/resolution-2017-28.pdf

[11] See the USDN Game of Floods at https://www.usdn.org/public/page/18/Climate-Change-Resilience#ClimateTraining and search for heat and extremes games at https://www.usdn.org/products-climate.html

Co-Benefits Across Recommended Greenhouse Gas Mitigation Strategies

Climate preparedness and resilience co-benefits were one of the principal criteria used in prioritization of the greenhouse gas mitigation strategies outlined in the Sustainability and Climate Action Plan – Opportunities for Action Report[12] provided to the City of Takoma Park. The table below captures the co-benefits across all initial proposed strategies.

Table 1. Climate Preparedness and Resilience Co-Benefits Across Strategies

Strategy	Climate Preparedness and Resilience Co-Benefits
Promote EmPOWER Maryland Offerings	This strategy could have notable benefits to climate preparedness and resilience by supporting energy efficiency measures that enable buildings to maintain more habitable temperatures during extreme weather events or power outages.
Energy Disclosure Ordinance	This strategy could be somewhat beneficial to climate preparedness and resilience by indirectly helping improve the durability of residences and their ability to withstand extreme weather (particularly extreme heat events) more efficiently. Programs like LEED, a high-performance building standard, are exploring ways to use energy efficiency to encourage passive survivability, a term which means that a building can maintain a habitable temperature for occupants in the event of a power outage.
Building Performance Requirements	This strategy could be somewhat beneficial to climate preparedness and resilience by indirectly helping improve the durability of residences and their ability to withstand extreme weather (particularly extreme heat events) more efficiently. These benefits could be strengthened if the requirements have a more direct impact on improvements, including if the standards are paired with targeted improvement incentives.
Residential Energy Assessment	This strategy could be somewhat beneficial to climate preparedness and resilience by indirectly helping improve the durability of residences and their ability to withstand extreme weather (particularly extreme heat events) more efficiently. It is possible that residential energy assessments could be combined with resiliency audits, which identify pathways for homes to adapt to flooding. Washington D.C. is exploring this through their multifamily energy and resilience audit tool.

[12] See the Sustainability and Climate Action Plan – Opportunities for Action Report for additional details on the strategies.

Strategy	Climate Preparedness and Resilience Co-Benefits
Promote Cogeneration	This strategy may have limited benefit to climate preparedness and resilience through reducing electrical grid demand and potentially lowering household utility costs. CHP can also be a back-up power source, if it is enabled to operate independently from the grid in the event of a power outage or emergency. This capability is called islanding. Montgomery County's Public Safety Headquarters Microgrid demonstrates this capability.
Renewable Thermal Community Outreach Campaigns	This strategy could be somewhat beneficial to climate preparedness and resilience, particularly in cases where heat pumps are added to buildings with no central A/C or limited cooling capability; the heat pumps can help offset the impacts of extreme heat events. Any heat pumps must have access to back-up power to provide support during a power outage.
Natural Gas Elimination - New Residential Construction	This strategy has the potential to provide benefits for climate preparedness and resilience. If homes pursue on-site distributed energy and battery back-up storage as part of new construction projects, this may improve individual home resilience to extreme events. However, the elimination of natural gas also has tradeoffs as all power for homes will come from the electric sector as opposed to having a diversity of fuel sources.
EV Charger-Ready Parking Requirements	This strategy may have limited indirect benefit to climate resilience by improving air quality due to decreased emissions of GHGs and other pollutants; this could reduce the impact of extreme heat events on individuals with lung diseases and other health concerns.
EV Charging Station Expansion	This strategy may have limited indirect benefit to climate preparedness and resilience by improving air quality due to decreased emissions of GHGs and other pollutants; this could reduce the impact of extreme heat events on individuals with lung diseases and other health concerns.
Montgomery County Green Bank Electrification Programs	This strategy may have limited indirect benefit to climate preparedness and resilience by improving air quality due to decreased emissions of GHGs and other pollutants; this could reduce the impact of extreme heat events on individuals with lung diseases and other health concerns.
Solar-Ready Construction Requirements	This strategy may have limited benefit to climate preparedness and resilience through reducing electrical grid demand and potentially lowering household utility costs.
Virtual Power Purchase Agreement (PPA) Opportunities	This strategy may have limited benefit to climate preparedness and resilience through reducing electrical grid demand and potentially lowering household utility costs.
Community Choice Aggregation	This strategy may have limited benefit to climate preparedness and resilience through reducing electrical grid demand and potentially lowering household utility costs.
Carbon Impact Statements	This strategy has limited direct benefit to climate preparedness and resilience, but could be extended to also consider resiliency or climate preparedness impacts of city policy decisions. For example, the City of Boston provides a climate resilience checklist alongside green building and sustainability projects, for all new development within the City. While this is not for internal projects,

Strategy	Climate Preparedness and Resilience Co-Benefits
	the process is still valuable for keeping climate change in discussions and conversations.
Green Roof/Green Space Requirements	This strategy could have benefits to climate preparedness and resilience by improving stormwater management and reducing the impacts of extreme heat in targeted areas. While individual buildings introduce relatively small benefits, broad implementation is a viable way to manage flood impacts in communities.
Install Protected Bike Lanes	This strategy may have limited indirect benefit to climate preparedness and resilience by improving air quality due to decreased emissions of GHGs and other pollutants, if increased bike usage were to result in decreased car usage; this could reduce the impact of extreme heat events on individuals with lung diseases and other health concerns.
Targeted Tree Planting	This strategy could have benefits to climate preparedness and resilience by improving stormwater management, mitigating extreme heat impacts, and increasing green space.
Transit Accessibility and Outreach	This strategy may have limited indirect benefit to climate preparedness and resilience by improving air quality due to decreased emissions of GHGs and other pollutants, if increased transit usage were to result in decreased car usage; this could reduce the impact of extreme heat events on individuals with lung diseases and other health concerns. Transit accessibility actions can also be paired with improvements (e.g., shaded bus stations) that reduce climate vulnerability. Note that increased transit traffic in some areas could decrease overall air quality.

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