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# Overview of Regional Resilience Activities

Presentation to Baltimore City Commission on Sustainability  
July 19, 2023



# Agenda

- Overview of BMC
- Overview of Climate Resilience Work
  - Electric Vehicle Infrastructure
  - Climate Resilience Documents
  - Reservoir Protection
  - Regional Proposals

# Overview of Baltimore Metropolitan Council

- Private nonprofit organization committed to **identifying regional interests** and **developing collaborative strategies** through plans and programs, which will **improve the quality of life and economic vitality** throughout the region.
- Board of Directors:
  - Mayor of Baltimore City
  - Executives of Anne Arundel, Baltimore, Harford and Howard counties, a Carroll County Commissioner, a Queen Anne's County Commissioner
  - Delegate and Senator from the State of Maryland, and a gubernatorial appointee



# Overview of Baltimore Metropolitan Council

- Work of BMC staff includes:
  - Transportation Planning
  - Economic and Demographic Research
  - Computer Mapping and Geographic Analysis
  - Air and Water Quality Programs
  - Cooperative Purchasing
  - Workforce Development
  - Housing
  - Rideshare Coordination
  - Emergency Preparedness

[www.baltometro.org](http://www.baltometro.org)



# Overview of Baltimore Metropolitan Council

- Transportation Planning committees:
  - Baltimore Regional Transportation Board
  - Baltimore Region GIS Committee
  - Baltimore Regional Safety Subcommittee
  - Bicycle and Pedestrian Advisory Group
  - Congestion Management Process Committee
  - Cooperative Forecasting Group
  - Freight Movement Task Force
  - Interagency Consultation Group
  - Public Advisory Committee
  - Technical Committee
  - Traffic Incident Management Committee
  - Traffic Signal Subcommittee
  - Transportation & Public Works Committee
- Other BMC committees:
  - BMC Board of Directors
  - Baltimore Regional Cooperative Purchasing Committee
  - Energy Board
  - Executive Committee
  - Housing Affordability Preservation Task Force
  - Housing Committee
  - Regional Fair Housing Group
  - Reservoir Technical Group
  - Watershed Protection Committee
  - Food and Water Security

# About BRTB



The Baltimore Regional Transportation Board (BRTB) is the federally designated metropolitan planning organization (MPO) for the Baltimore region. The BRTB works with local, state, regional, and federal partners to coordinate plans and planning activities, provide data and analysis to decision makers, and coordinate regional programs to advance transportation, safety, freight movement, budgeting for future transportation projects and programs. The BRTB's efforts are based on a continuing, cooperative and comprehensive (3-C) planning process. All transportation projects and programs that receive federal surface transportation funding in our region go through this planning process. The BRTB is housed at and staffed by the Baltimore Metropolitan Council (BMC).

# Regional Transportation Planning

- BMC staff provides technical support to the Baltimore Regional Transportation Board (BRTB).
- BRTB is the designated Metropolitan Planning Organization (MPO) for the Baltimore region.
- BRTB members include representatives from:
  - Baltimore City, City of Annapolis, Anne Arundel County, Baltimore County, Carroll County, Harford County, Howard County, and Queen Anne's County
  - Maryland Department of Transportation, Maryland Department of the Environment, Maryland Department of Planning, MDOT Maryland Transit Administration, and Central Maryland RTA.

# Regional Transportation Planning Storymap

- Overview of
  - *Resilience 2050*: Long Range Transportation Plan
  - 2024-2027 Transportation Improvement Program
  - Air Quality Conformity analysis
    - Emission Reduction Strategies
- BRTB will vote on these 3 documents on July 25<sup>th</sup>



<https://storymaps.arcgis.com/stories/aa7dcd845cf84b2c9ac6b26f6bbb5260>



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# Overview of Climate Resilience Work

- Electric Vehicle Infrastructure
- Climate Resilience Documents
- Reservoir Protection
- Regional Proposals

# Electric Vehicle Infrastructure

- Staff Contact:
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[amarshall@baltometro.org](mailto:amarshall@baltometro.org)
- Project funded through BMC
- RFP to be issued soon
- View description in Unified Planning Work Program  
[https://www.baltometro.org/sites/default/files/bmc\\_documents/general/transportation/upwp/UPWP\\_FY2023\\_Addendum\\_to\\_FY2022-2023\\_UPWP.pdf.pdf](https://www.baltometro.org/sites/default/files/bmc_documents/general/transportation/upwp/UPWP_FY2023_Addendum_to_FY2022-2023_UPWP.pdf.pdf)

BALTIMORE REGION UPWP  
ADDENDUM TO FY 2022-2023 UNIFIED PLANNING WORK

**PROJECT: SUPPORT FOR EXPANDING ELECTRIC VEHICLE CHARGING STATION INFRASTRUCTURE**

**PURPOSE:** To support regional and equitable expansion of public light duty electric vehicle (EV) charging station infrastructure in the Baltimore region. To take non-duplicative actions that will aid jurisdictions and municipalities implementing EV charging infrastructure investments.

The transportation sector is the largest source of greenhouse gas (GHG) emissions in Maryland. Most of these emissions come from light-duty passenger cars and trucks. Maryland has a goal of reducing GHG emissions by 45% from the year 2005 levels by the year 2030. A major measure to achieve this goal is widespread adoption of electric vehicles (EV). EV charging stations are being installed across the Baltimore region, including sites in Annapolis and Baltimore City, as well as Baltimore, Carroll, Harford, and Howard Counties. However, more public light duty EV charging stations will be needed to meet anticipated growth in EV purchases and encourage EV adoption.

Guidance specific to siting EV charging stations does not yet exist for the Baltimore region. To best support BRTB members in siting and establishing new public EV charging stations, the development of a vehicle charging infrastructure siting guide is proposed. Topics to be addressed in the guide include types of EVs and charging stations, existing EV charging station guidance, and public EV charging stations siting needs.

A major goal of this guide is to lay a foundation which could support future development of an interactive EV charging station siting tool for the Baltimore region, to provide similar functionality to the Santa Clara County, California, [Electric Vehicle Charging Demand Siting Analysis](#).



# Climate Resilience Documents

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## Climate Change Resilience

A significant aspect of managing and operating the transportation system is the ability for agencies to anticipate, prepare for, and continue operating in the event of a disruption, which could be short-term (such as traffic incidents, flooding, severe storms, terrorist act) or long term (such as impacts from increasingly stronger storms, warming climate, and rising sea levels), this is referred to as resilience. Resilience is defined by [FHWA Order 5520](#) as, "... the ability to anticipate, prepare for and adapt to changing conditions and withstand, respond to and recover rapidly from disruptions." BMC works with our partners to identify potential disruptions as well as actions that can be employed to increase the resilience of agencies and the transportation system components that they plan, operate, and maintain.

In May 2016, BMC hosted an Extreme Weather Forum that included presentations on trends of extreme weather in Maryland as well as related activities by local, state, and federal agencies. Presentations and resources from the event have been posted [online](#).

## Resilience Planning Activities:

After development of the Climate Change Resource Guide, the region undertook the next step to develop more detailed guidance and develop recommendations to institutionalize ongoing inter-jurisdictional coordination on climate resilience. The following documents were developed in February 2022:

CLIMATE RESILIENCE GUIDANCE FOR LOCAL JURISDICTIONS

RECOMMENDATIONS FOR INTERJURISDICTIONAL COORDINATION ON CLIMATE RESILIENCE

In October 2021, the **Climate Change Resource Guide** was completed to provide a resource to local jurisdictions on adaptation options to consider as they plan, design, operate, and maintain their local infrastructure. The Guide includes an overview of projected changes to the climate, documentation of how the changing climate has already impacted them, adaptation options, and a **Toolkit** that makes the content of each chapter actionable for users. The project also included a summary **presentation** that can be used by any agency to inform them about the Guide.



CLIMATE CHANGE ADAPTATION TOOLKIT



CLIMATE CHANGE RESOURCE GUIDE

FINAL PRESENTATION FOR CLIMATE CHANGE RESOURCE GUIDE



<https://www.baltometro.org/environment/planning-areas/climate-change-resilience>

# Introduction - Climate Change Resource Guide

- Climate Change Resource Guide and Toolkit support local DPWs and DOTs efforts to prepare for climate change
  - Climate Change Resource Guide
    - Includes toolkit questions
  - Toolkit:
    - Writable PDF
- Covers 6 infrastructure service areas



## KEY TERMS

There are two ways to take action on climate change:

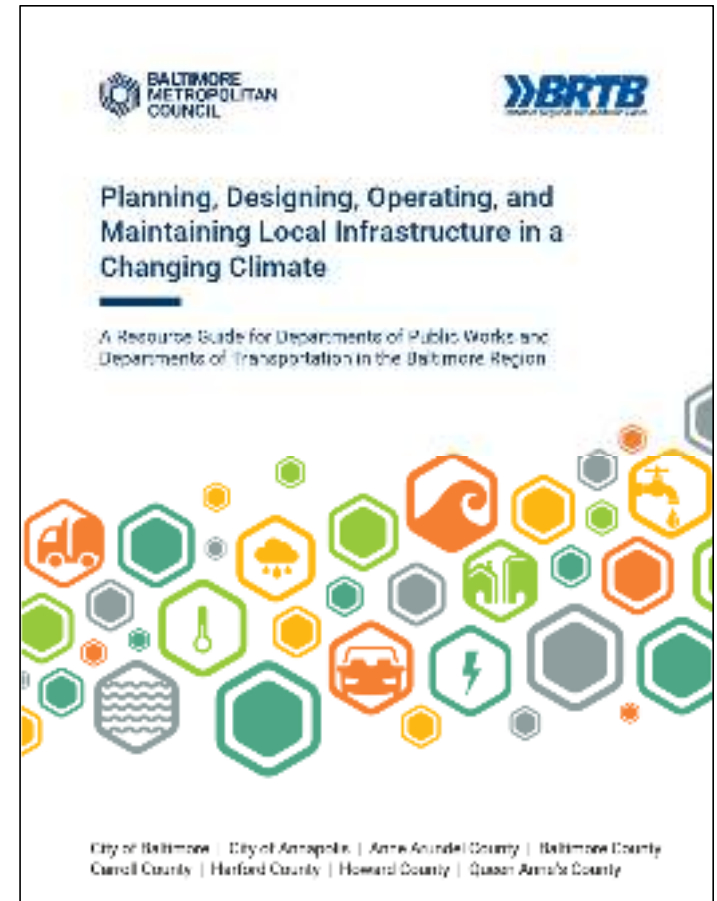
- **Adaptation:** Measures to proactively adjust to a changing environment.  
Examples include ensuring sufficient building cooling systems given rising temperatures or siting assets outside future flood zones.
- **Mitigation:** Measures to reduce greenhouse gas emissions to slow or stop the impacts of climate change.  
Examples include transition to clean energy sources or electrification of building heating systems.

**This Resource Guide and Toolkit focus on adaptation.**

# Resource Guide Overview

- The Resource Guide consists of six chapters to support climate resilience planning:
  - Ch1: Introduction and Toolkit
  - Ch2: The Changing Climate
  - Ch3: Climate Change Impacts
  - Ch4: Policies
  - Ch5: Adaptation Options
  - Ch6: Funding and Financing

[https://www.baltometro.org/sites/default/files/bmc\\_documents/general/transportation/climate-change/Climate%20Change%20Resource%20Guide.pdf](https://www.baltometro.org/sites/default/files/bmc_documents/general/transportation/climate-change/Climate%20Change%20Resource%20Guide.pdf)



# Toolkit Overview

- The Toolkit, within the Resource Guide, is a worksheet that **makes the content from each chapter actionable** for users, by including questions to consider


Consider questions	Enter Your Responses
<p><b>Climate context: Chapter 2 and Appendix A</b></p> <p>1. What climate hazards are relevant to your work or project? Use the information about current and future climate change in Chapter 2 (regional summary) and Appendix A (jurisdictional data) to determine relevant climate hazards.</p> <p> Hazard identification is better addressed by the high-level regional climate context (e.g., summary of impacts from 2027) in the overview table. Focusing on specific hazards for location, time, and day of the transportation system, if that of climate-related elements, is better done by the variables particularly relevant to your work.</p>	<p><b>Climate hazards</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/>  Temperature</li> <li><input type="checkbox"/>  Precipitation</li> <li><input type="checkbox"/>  Sea level rise and storm surge</li> <li><input type="checkbox"/>  Wildfire</li> </ul> <p><b>Climate variables</b></p>
<p>2. For each of the climate hazards, what are the historical climate conditions? How are the climate conditions changing in your jurisdiction? Use the information about current and future climate change in Chapter 2 (regional summary) and Appendix A (jurisdictional data) to evaluate how the climate conditions are changing.</p> <p> The data provided in the tables are intended to be used for the general overview of the regional climate conditions. To complete details on a specific hazard or variable, use the information about current and future climate change in the jurisdictional summary and Appendix A (jurisdictional data) to evaluate how the climate conditions are changing in your jurisdiction.</p>	<p><b>Historical climate conditions</b>      <b>Projected climate conditions</b></p>

Consider questions	Enter Your Responses
<p><b>Climate Impacts: Chapter 3</b></p> <p>3. Does the timing of climate hazards, when combined with long and short-term actions or projects, have potential impacts that you can be sure or project has reasonably quantifiable, and use the climate projections from Chapter 2 along with the information and examples from Chapter 3 to determine projected climate impacts.</p> <p> Potential climate impacts are better addressed by the high-level regional context based on potential damage, impacts of public services, and cost of impacts.</p> <p>4. Have climate impacts to your jurisdiction or project disproportionately affected vulnerable populations? Use the information from Chapter 3 (regional summary) and Appendix A (jurisdictional data) to evaluate how the climate conditions are changing in your jurisdiction. Use the information and examples from Chapter 3 to consider the areas in the most vulnerable populations and the most vulnerable populations.</p> <p> The information about climate conditions and climate projections from Chapter 2 to consider the areas in the most vulnerable populations and the most vulnerable populations.</p>	<p><b>Projected climate impacts</b></p>
<p><b>Policy: Chapter 4</b></p> <p>5. How does climate-related policy or climate impacts that affect your work or project? Use the information from Chapter 4 to consider relevant climate policy.</p> <p> The information about climate conditions and climate projections from Chapter 2 to consider the areas in the most vulnerable populations and the most vulnerable populations.</p>	
<p><b>Adaptation options: Chapter 5</b></p> <p>6. Given the projected climate impacts, what are potential adaptation options? How are you or your jurisdiction currently addressing the hazards (e.g., road grade improvements)? Use the information and examples from Chapter 5 to evaluate how the climate conditions are changing in your jurisdiction.</p> <p> When adaptation options are developed, the general design guidelines of the climate and road design should be used in the design of the adaptation options (e.g., road design).</p>	
<p><b>Planning and financing: Chapter 6</b></p> <p>7. What funding and financing sources are available to help implement the adaptation options and how the information and examples from Chapter 6 to evaluate how the climate conditions are changing in your jurisdiction.</p>	
<p><b>Monitoring</b></p> <p>8. What are your next steps to address these climate impacts and plan for their potential risks?</p> <p> The information about climate conditions and climate projections from Chapter 2 to consider the areas in the most vulnerable populations and the most vulnerable populations.</p>	




## Toolkit Questions: The Changing Climate

### 1) What climate hazards are relevant to your work or project?

 For each climate hazard, certain variables may be highly relevant to your service area or project (e.g., number of days above 90°F for worker safety; heating/cooling degree days for facilities; freeze/thaw days for transportation).


### 2) For each of the climate hazards: What are the historical climate conditions? How are the climate conditions changing in your jurisdiction?

 Consider your planning timeframe or asset's useful life when reviewing the projected climate conditions (e.g., maintenance decisions or replacement of facility mechanical components should consider medium-term projections (centered around 2050); construction of new long-lived infrastructure should consider long-term projections (end of century and beyond)).




## Toolkit Questions: Climate Change Impacts

3) Given changing climate conditions, what are anticipated impacts to your service area or project? Consider impacts that your service area or project has recently experienced.


 Which anticipated impacts are priorities to address? Consider prioritizing impacts based on potential damage, disruption of public services, and cost of repair.

4) Have climate impacts to your service area or project disproportionately affected vulnerable populations? Review the [BMC Vulnerable Populations Index](#).

 Are there areas where infrastructure investments could both reduce climate impacts and enhance social equity?

## Toolkit Questions: Policies

5) Are there state and local policies on climate impacts that affect your work or project?

 Are there policies that would help facilitate climate adaptation measures if approached from a climate perspective (e.g., environmental justice policies may help show progress or build support when addressing climate)? On the flipside, are there policy or planning barriers that limit your ability to address climate impacts?

# Ch5: Climate Adaptation Options

- Menu of climate adaptation options by hazard and across service areas




- A multi-faceted approach to adaptation spans functions:
  - Planning
  - Design/Construction
  - Maintenance/Operations/Worker Safety

Changes in Temperature Strategies			
Adaptation Strategy	Service Areas	Function	Examples
Adjust and expand worker safety plans	TRANSPORTATION, WATER, FACILITIES, STORMWATER, WASTEWATER, SOLID WASTE	<ul style="list-style-type: none"> <li>Planning</li> <li>Design/Construction</li> <li>✓ Maintenance/Operations/Worker Safety</li> </ul>	In Austin, TX, the <a href="#">Climate Resilience Action Plan</a> suggested expanding staff safety plans to adjust work schedules and safety policies for fieldworkers during extreme heat days, poor air quality days, and other climate-related health risk days.
Plant more trees and vegetation to provide shading and lower ambient temperatures	TRANSPORTATION, WATER, FACILITIES, STORMWATER, WASTEWATER, SOLID WASTE	<ul style="list-style-type: none"> <li>✓ Planning</li> <li>✓ Design/Construction</li> <li>Maintenance/Operations/Worker Safety</li> </ul>	<a href="#">Baltimore County's Climate Action Plan</a> calls to increase the urban tree canopy, targeting areas with urban heat island impacts. In <a href="#">Madison, TN</a> , is developing an <a href="#">Urban Forest Strategy Plan</a> , prioritizing equity and environmental justice in service delivery, so that the most vulnerable and underserved communities can benefit from healthy tree canopy.
Incorporate shading into street and building code standards	TRANSPORTATION, WATER, FACILITIES, STORMWATER, WASTEWATER, SOLID WASTE	<ul style="list-style-type: none"> <li>✓ Planning</li> <li>✓ Design/Construction</li> <li>Maintenance/Operations/Worker Safety</li> </ul>	Phoenix, AZ, incorporated shade standards, such as requiring a minimum of 75% of public sidewalks be shaded, into the <a href="#">municipal code</a> .
Incorporate bus shelters, shading, and seating for transit riders and workers	TRANSPORTATION, WATER, FACILITIES, STORMWATER, WASTEWATER, SOLID WASTE	<ul style="list-style-type: none"> <li>✓ Planning</li> <li>✓ Design/Construction</li> <li>✓ Maintenance/Operations/Worker Safety</li> </ul>	Rockville Park, MD, committed by resolution to develop a bus shelter revitalization plan and identified the need to make improvements to bus stops as a means of enhancing alternative transportation options. In Los Angeles, CA, <a href="#">Streetsix</a> is expanding street furniture and administering a program to install new bus shelters to thousands of bus stops in the region to protect riders from heat and maintain reliability.
Use cooler pavement mixes (e.g., light-colored aggregate) to reduce surface temperatures	TRANSPORTATION, WATER, FACILITIES, STORMWATER, WASTEWATER, SOLID WASTE	<ul style="list-style-type: none"> <li>Planning</li> <li>✓ Design/Construction</li> <li>Maintenance/Operations/Worker Safety</li> </ul>	Chicago, IL's <a href="#">Green Alley</a> program is repaving of alleys in the city with permeable, high-albedo pavement, a lighter-colored surface that reflects sunlight instead of absorbing it. <a href="#">Chula Vista, CA's Climate Action Plan</a> <a href="#">adaptation strategies</a> include installation of cooler paving products, intended to incorporate reflective paving into all municipal projects (paving bike and streets).

## Toolkit Questions: Climate Adaptation Options

6) Given the projected climate impacts, what are potential adaptation strategies within your service areas or for your project, across relevant functions (e.g., design, maintenance)?

 What adaptation options are no-regrets (i.e., generate benefits regardless of future climate) and/or could be implemented in the near-term? What adaptation options are no or low cost?


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## **Toolkit Questions: Funding and Financing Sources**

7) What funding and financing sources are available to help implement the adaptation options?

## Toolkit Questions: Next Steps

8) What are your next steps to address these climate impacts and plan for these adaptation options?

 For the selected adaptation strategies, would there be implications to other service areas? Are there other agencies or departments (inside or outside your jurisdiction) your DPW or DOT should coordinate with?

## Resilience Planning Activities:

After development of the Climate Change Resource Guide, the region undertook the next step to develop more detailed guidance and develop recommendations to institutionalize ongoing inter-jurisdictional coordination on climate resilience. The following documents were developed in February 2022:



CLIMATE RESILIENCE GUIDANCE FOR LOCAL JURISDICTIONS

RECOMMENDATIONS FOR INTERJURISDICTIONAL COORDINATION ON CLIMATE RESILIENCE

In October 2021, the **Climate Change Resource Guide** was completed to provide a resource to local jurisdictions on adaptation options to consider as they plan, design, operate, and maintain their local infrastructure. The Guide includes an overview of projected changes to the climate, documentation of how the changing climate has already impacted them, adaptation options, and a **Toolkit** that makes the content of each chapter actionable for users. The project also included a summary **presentation** that can be used by any agency to inform them about the Guide.

CLIMATE CHANGE ADAPTATION TOOLKIT

CLIMATE CHANGE RESOURCE GUIDE

FINAL PRESENTATION FOR CLIMATE CHANGE RESOURCE GUIDE

# Climate Resilience Guidance For Local Jurisdictions

- Document developed to further assist DOTs/DPWs to incorporate climate resilience strategies
  - Follow up to *Climate Change Resource Guide*

[https://baltometro.org/sites/default/files/bmc\\_documents/general/transportation/climate-change/Climate-Resilience-Guidance.pdf](https://baltometro.org/sites/default/files/bmc_documents/general/transportation/climate-change/Climate-Resilience-Guidance.pdf)



## Background and Purpose

BMC's [Climate Change Resource Guide](#) assists local departments of public works (DPWs) and departments of transportation (DOTs) to prepare for climate change impacts by providing historical and projected climate data; expected impacts on infrastructure service areas;<sup>1</sup> and information on relevant regulations, funding/financing opportunities, and potential adaptation strategies. The associated Toolkit is a worksheet that helps users navigate each chapter of the Climate Change Resource Guide.

The purpose of this Climate Resilience Guidance is to further assist DPWs and DOTs in implementing climate change resilience activities. The guidance is intended for any DPW or DOT in the Baltimore metropolitan region, recognizing that processes are different across jurisdictions, although comparable at a high level. While this guidance is geared towards the needs and processes of local government DPWs and DOTs, any department or agency may use it as it applies to their work.

Throughout this document, the icons shown in the table to the right indicate when a recommended action or resource is tailored to a specific service area. Most recommendations and resources are meant to be applicable across service areas and are represented by the "all" icon. However, the Steering Committee and workshop participants who helped develop this Guidance provided some suggestions and resources that are service-area specific, which are tagged with the appropriate icon in the margin.

Icon	Service Area
	Transportation
	Stormwater
	Water
	All



## Checklist

### Navigating Use of Regional Resilience Resources

BMC has developed three key resources to support regional resilience efforts: (1) [Climate Change Resource Guide](#) and accompanying Toolkit, (2) [Climate Resilience Guidance for Local Jurisdictions](#) (this document), and (3) [Recommendations for Interjurisdictional Coordination](#).

This checklist is a high-level guide to navigate these three regional resilience resources, providing steps for how local governments and associated departments can use these resources to understand and assess an agency's or jurisdiction's resilience efforts and areas other jurisdictions. Each checklist item addresses different aspects of the process. You can refer back to the checklist regularly to track progress and identify next steps.

Step	Who?
<p>✓ <b>Get the Big Picture</b></p> <p>Read the <a href="#">Climate Change Resource Guide</a> (or read this presentation providing an overview)</p> <p>Answer the <b>Toolkit</b> questions</p>	<p>Staff involved in DPW/DOT planning and design</p> <p>Point person(s) coordinating across DPW/DOT planners and designers</p>
<p>✓ <b>Take Action</b></p> <p>Read this document, <a href="#">Climate Guidance for Local Jurisdictions</a></p> <p>Create an approach to documenting climate risk and identifying recommended projects, policies, and programs to address climate risk  <small>DPW/DOT has jurisdiction</small></p> <ul style="list-style-type: none"> <li>Your local Climate Action Plan should address climate risk and identify what strategies are needed to address climate risk and identify projects or policies</li> </ul> <p>Identify key to most agencies from the Climate Guidance for Local Jurisdictions to pursue</p> <p>Identify relevant jurisdictions for each project strategy and associated recommendations (such as state or strategic plans)</p> <p>Identify a strategy for implementation</p> <p>Identify relevant contacts for implementation</p> <p>Identify relevant contacts for implementation</p> <p>Identify relevant contacts for implementation</p> <p>Identify relevant contacts for implementation</p>	<p>Staff involved in DPW/DOT planning, design, project management, and maintenance</p> <p>Point person(s) coordinating across DPW/DOT planning, design, project management, and maintenance staff</p> <p>Legislative and supporting (planning, project management, maintenance) planning teams</p> <p>Project teams</p> <p>Legislative and supporting (planning and staff support)</p>
<p>✓ <b>Coordinate Regionally</b></p> <p>Read the <a href="#">Recommendations for Interjurisdictional Coordination</a> document</p> <p>Identify the most relevant actions for implementation</p> <p>Participate in regional coordination discussions</p> <p>Maintain regular communication with other jurisdictions to share information and lessons learned, and build regional resilience</p> <p>Work with others to create regional dashboard and achievable, meaningful performance measures to track progress on climate initiatives</p>	<p>Staff involved in DPW/DOT climate-related efforts</p> <p>Staff involved in DPW/DOT climate-related efforts</p> <p>Point person(s) for DPW/DOT staff involved in climate-related efforts</p> <p>Point person(s) for DPW/DOT staff involved in climate-related efforts</p> <p>Point person(s) for DPW/DOT staff involved in climate-related efforts</p>



## Introduction

This Climate Resilience Guidance focuses on implementation of priority resilience strategies identified during meetings with the project Steering Committee and workshops with transportation, water, and stormwater practitioners across the region (though note there are other adaptation strategies in the [Climate Change Resource Guide](#) that may also be considered). Specifically, this Guidance provides information on the following recommended resilience strategies:

1. Develop and adopt climate change resilience design standards and codes, updating existing or creating new standards and codes as needed
2. Screen new and existing capital projects for climate change risk and opportunities
3. Identify and obtain dedicated funding and financing for resilience infrastructure and activities
4. Monitor, maintain, inspect, and repair assets to promote resilience and prevent damage

Each strategy includes a description of what it is, why it is relevant for local DOTs and/or DPWs, how a department might implement the strategy, and resources to help with implementation.

Additionally, the following apply to all four strategies:

- The timeline for implementing these recommendations is largely context-specific to the local jurisdictions, and is dependent on interjurisdictional coordination and other factors, including staff capacity, funding, and political will.
- Relevant stakeholders for implementing these recommendations include but are not limited to state and local DOTs and planning departments, local DPWs and sustainability offices, Maryland Department of the Environment, elected officials, FHWA, EPA, FEMA, community-based organizations, nonprofits, contractors, and engineering consulting firms. Note that project considerations for resilience will likely involve a more varied group of stakeholders than traditional DPW/DOT projects.



# Priority Regional Climate Resilience Strategies

1. **Develop and adopt climate change resilience design standards and codes, updating existing or creating new standards and codes as needed**
  - Recommended Action #1: Review example climate resilience design standards
  - Recommended Action #2: Identify which design standards and codes can and should be updated, and if new standards and codes need to be developed and adopted to help ensure new infrastructure is designed to be resilient to climate change
  - Recommended Action #3: Identify relevant design inputs for your jurisdiction
2. **Screen new and existing capital projects for climate change risk and opportunities**
  - Recommended Action #1: Incorporate climate considerations into the project development and selection process
  - Recommended Action #2: Improve documentation of internal discussions and knowledge of risks
  - Recommended Action #3: Identify climate resilience projects outside the traditional CIP development process based on vulnerability of infrastructure and communities as well as available funding
3. **Identify and obtain dedicated funding and financing for resilience infrastructure and activities**
  - Recommended Action #1: Identify relevant opportunities to fund and finance resilience
  - Recommended Action #2: Develop strategies to overcome barriers of technical and staffing capacity in seeking resilience financing and funding
  - Recommended Action #3: Evaluate and communicate lifecycle costs and benefits of resilience to help with financing
4. **Monitor, maintain, harden, and retrofit assets to promote resilience and prevent damage**
  - Recommended Action #1: Include climate change in maintenance prioritization frameworks
  - Recommended Action #2: Increase frequency of monitoring of infrastructure for potential damage
  - Recommended Action #3: Prioritize retrofits, repairs, and hardening based on level of risk and criticality

## Resilience Planning Activities:

After development of the Climate Change Resource Guide, the region undertook the next step to develop more detailed guidance and develop recommendations to institutionalize ongoing inter-jurisdictional coordination on climate resilience. The following documents were developed in February 2022:

CLIMATE RESILIENCE GUIDANCE FOR LOCAL JURISDICTIONS



RECOMMENDATIONS FOR INTERJURISDICTIONAL COORDINATION ON CLIMATE RESILIENCE

In October 2021, the **Climate Change Resource Guide** was completed to provide a resource to local jurisdictions on adaptation options to consider as they plan, design, operate, and maintain their local infrastructure. The Guide includes an overview of projected changes to the climate, documentation of how the changing climate has already impacted them, adaptation options, and a **Toolkit** that makes the content of each chapter actionable for users. The project also included a summary **presentation** that can be used by any agency to inform them about the Guide.

CLIMATE CHANGE ADAPTATION TOOLKIT

CLIMATE CHANGE RESOURCE GUIDE

FINAL PRESENTATION FOR CLIMATE CHANGE RESOURCE GUIDE

# Recommendations for Interjurisdictional Coordination on Climate Resilience

- Developed to enhance interjurisdictional resilience coordination

## Recommendations for Interjurisdictional Coordination on Climate Resilience

Climate impacts are not constrained by jurisdictional boundaries, and so resilience measures are sometimes most effective at mitigating those impacts when implemented collaboratively across the region. In addition, one jurisdiction's decisions to enhance resilience could have cascading effects on other priorities or decisions made in the region. As the climate continues to change and the local and regional climate resilience initiatives in the Baltimore Region continue building momentum, it will be important to put in place strategies for engaging interjurisdictional coordination.

# Recommendations for Interjurisdictional Coordination on Climate Resilience

## Institutionalize regional coordination for ongoing consideration and support of resilience solutions

1. Develop a resilience strategy to be implemented collaboratively
2. Consider opportunities to build on ongoing efforts of interjurisdictional collaboration
3. Create a new and cohesive group specific to climate efforts, such as an internal technical group or regional compact
4. Create information-sharing databases on climate impacts and resilience efforts at the state, regional, and local levels

## Funding

1. Identify opportunities for sharing state/Federal grants and funding

## Role for the State and BMC



# Reservoir Protection

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The screenshot shows the Baltimore Metropolitan Council website. The header includes the BMC logo, navigation links for Transportation, Community, Environment (highlighted), Purchasing, and About Us, along with a search icon. The main content area features a large image of a reservoir with the title "Reservoir Protection". Below the image, the text reads: "The Region's Reservoirs" and "One of the region's most valuable natural assets is our reservoir system. The Loch Raven, Prettyboy and Liberty Reservoirs together provide high-quality water for approximately 1.8 million people in Baltimore City and the five surrounding counties. In addition, more than half the homes and several communities in the 457 square mile reservoir watershed area depend on wells that draw from the watersheds' groundwater." It continues with: "The majority of the reservoir watershed area (200 square miles) is in Baltimore County. Another 165 square miles are in Carroll County. Very small portions are in Harford County and southern Pennsylvania. Only six percent of the watershed is owned by Baltimore City, which owns the three reservoirs and operates the central regional water system." The final paragraph states: "In addition to being the principal water supply source for the region, the reservoirs and their tributary streams offer water-use recreational opportunities and provide extensive and diverse habitats for fish and other wildlife. The reservoirs and their tributaries are aesthetic and recreational treasures." On the right side, there are sections for "Planning Area", "Air Quality", "Environmental Cooperation", "Reservoir Protection", and "Related Documents". The "Related Documents" section lists: "Baltimore Watershed Action Strategy 2015", "The Water Quality Monitoring Program for the Baltimore Reservoir System Overview Monitoring", and "The Water Quality Monitoring Program for the Baltimore Reservoir System Cover All Staff".



## Regional Proposal: EPA Climate Pollution Reduction Grant

- Baltimore-Towson-Columbia MSA Planning grant application
- BMC leading the program working closely with the City
- Support of 7 jurisdictions including City of Baltimore – geographic coverage
- Schedule to begin late summer



# Regional Proposal: EPA Climate Pollution Reduction Grant

- 3 Key Products:
  - Priority Climate Action Plan, due March 31, 2024;
  - Comprehensive Climate Action Plan, due two years from the date of the award; and,
  - Status Report, due at the close of the 4-year grant period.
- Effects on low income disadvantaged communities to be assessed.

# Regional Proposal: PROTECT Program Proposal for a Regional Resilience Improvement Plan

- USDOT Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation (PROTECT) Program has four subgrants:
  - Planning Grants (\$140 million)
  - Resilience Improvement Grants (\$980 million)
  - Community Resilience and Evacuation Route Grants (\$140 million)
  - At-Risk Coastal Infrastructure Grants (\$140 million)
- Proposing Regional Resilience Improvement Plan
  - Under “Planning Grants”
  - Proposals due August 18<sup>th</sup>

## For More Information

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Pluvial flooding in Baltimore, MD on 6 August 2019. Photo by Sarah Balt.

# BURIED STREAM AND URBAN FLOODING IN BALTIMORE

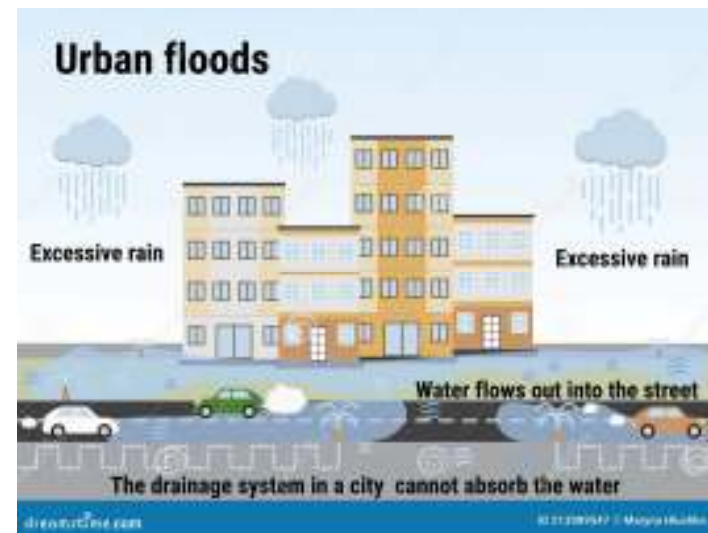


## Background

Pluvial Flooding, or urban flooding, is when flooding occurs **independent** of an overflowing water body.

This type of flooding can occur as flash flooding or when the stormwater drainage system can't handle volume or speed of the rainfall from a storm.

The nature of pluvial flooding can make it difficult to predict but the city has some data to help support areas of the city more likely to experience pluvial flooding.



## City Resources & Proactive Steps

- GIS data for historic streams
- Repetitive Loss Data - maintained by FEMA, properties with multiple flood insurance claims regardless of floodplain boundaries.
  - This data is used to generate areas of multiple properties that could be susceptible to the same flooding as specific RL addresses.
- Historic flooding information - comes from a variety of sources:
  - internally maintained documentation,
  - NOAA storm events database,
  - 311 customer service requests
  - My Coast app data
- Communications
  - Annual mailings to all properties contained within the Special Flood Hazard Area (SFHA)
  - Annual mailings to properties located in Repetitive Loss Areas



## Our Streets are our streams... but not our floodplains



Filter the text at right. The filters build on one another. Reset them to start over. Turn layers on and off to view the various flood layers. Use the actions icon at the top right of the table below to export the table or zoom to a selection. Due to a limitation in the software, you can't export the filtered table, but you can select rows individually

Map of Baltimore showing flood layers and property markers. The map includes a legend on the right with the following filters:

- Is vacant:
- Within 100 ft of 1% or .2% flood plains:
- In repetitive loss area:
- In historic stream buffer:
- In tax lien dataset:
- Is city owned:

Selected features: 0

City of Baltimore, Baltimore County Government, VITA, Esri, HERE, Garmin, USGS, EPA, NPS | Esri, HERE, NPS Powered by Esri

- Repetitive Loss Areas
- Properties
- Flood Plains
- 1%, .2% Flood Plain

Repetitive Loss Areas

Properties

Full Address of P...	Vacant Indicator	Tree Canopy Pct	RLA Indicator	1% .2% Flood Pl...	HistoricStream
1704 WESTWOOD AVE	N	31.813484608236962	N	N	Y
1708 WESTWOOD AVE	N	43.91707756893148	N	N	Y
1712 WESTWOOD AVE	N	46.09104643463921	N	N	Y
	N	48.42904046375153	N	N	Y



## Future Steps

- Include properties that have been impacted by pluvial flooding in annual mailings
- Expand upon available GIS data to the public
- Flag properties within the Repetitive Loss areas for floodplain permit review during the permitting process
- Complete hydraulic and hydrologic (H & H) modeling the City's storm drain system
- Continue applying for grants and loans to:
  - Assess and implement remedial actions (green and gray)
  - Develop policies related related to pluvial flooding
  - Acquire properties especially hazardous to maintain as open space.



Questions / ideas

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