Baltimore Climate Resilience:

Collaboration around an All Hazard Mitigation and Climate Adaptation Process

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Overview

• Background
• Hazards
• Plan Development
• Collaboration
• Lessons Learned
Baltimore City Intro

• Most heavily developed area in Maryland - population 622,000
• Port and waterfront remain extremely important assets
• Home to many Universities and Health Institutions
• Known as the City of Neighborhoods
• 64% African American, 4% Hispanic or Latino, 31% White
# Quick Review of Hazards

<table>
<thead>
<tr>
<th>Hazard</th>
<th>Description</th>
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<tbody>
<tr>
<td>Coastal Storms</td>
<td>more severe</td>
</tr>
<tr>
<td>Floods</td>
<td>more extensive</td>
</tr>
<tr>
<td>Severe Thunderstorms</td>
<td>more severe</td>
</tr>
<tr>
<td>Wind</td>
<td>increase intensity</td>
</tr>
<tr>
<td>Winter Storms</td>
<td>less snow, more flooding</td>
</tr>
<tr>
<td>Extreme Heat/Drought</td>
<td>more severe and intense</td>
</tr>
<tr>
<td>Sea Level Rise</td>
<td>increased threat</td>
</tr>
<tr>
<td>Air Quality</td>
<td>lower quality and increase risk</td>
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</table>
Baltimore’s Unique Approach

All Hazard Mitigation Plan
(Current and Historical Hazards)

+ = Resilience

Climate Adaptation Plan
(Adapt to new and predicted climate conditions)
Risk Assessment

Hazard Identification
- Hazard Identification
- Review Historical Impacts
- Conduct an Asset Inventory

Vulnerability Assessment
- Determine likelihood
- Determine economic, social, legal & environmental consequence

Impacts Assessment
- HAZUS Modeling
- Integrate projected climate conditions
- Identify weaknesses

Plan Development
- Vision, Goals, Strategies, Actions
- Prioritization
- Integration
- Plan for implementation & monitoring
Disaster Preparedness Plan

Adopted unanimously in October, 2013

STORMWATER

IN-16 Enhance and expand stormwater infrastructure and systems

Future changes in precipitation frequency and intensity may require reconsideration of the design of existing stormwater infrastructure systems. Increase resiliency and disaster prevention measures related to stormwater systems by enhancing drainage systems in stream corridors and improving and repairing stormwater conveyance pipes and outfalls.

1. Implement the requirements of Baltimore’s MS4 (separate stormwater and sewer system) permit (5).
   The City of Baltimore operates under a Municipal Separate Stormwater and Sewer System (MS4) permit, which protects water quality and requires that Baltimore prevents pollution as much as possible. It is critical that the requirements of these permits are fully met.

2. Prioritize storm drain upgrades and replacement in areas with recurring flooding (5).
   Prioritize storm drain upgrades and replacement in areas with recurring flooding (5). While proximity to a floodplain or floodway can increase vulnerability to flooding, certain measures can reduce this vulnerability. Inadequate or older pipes, which cannot accommodate the excessive amounts of stormwater, should be upgraded so as to handle extreme rainfall and storm surge events.

3. Install backflow-prevention devices or other appropriate technology along waterfront to reduce flood risk (M-1).
   Backflow-prevention devices are used to ensure that water does not flow back through drainage infrastructure. Through the installation of backflow-prevention devices, the City can improve the performance of the drainage network and prevent risk of flooding impact along the waterfront.

4. Preserve and protect natural drainage corridors (5).
   It is important to utilize natural drainage corridors and green infrastructure to capture more stormwater runoff and enhance the ability of the existing infrastructure to cope with environmental changes.

5. Review and revise storm drain design on a continuous basis, to accommodate projected changes in intensity (5).
   The City’s storm drains will require continual revision to incorporate new and projected changes in intense rainfall. This will ensure that the storm drains maintain adequate capacity.

IMPLEMENTATION GUIDELINES

<table>
<thead>
<tr>
<th>Lead Agency</th>
<th>DFW</th>
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<tbody>
<tr>
<td>Stakeholders</td>
<td>DOW, DWP, Water and Wastewater Utilities</td>
</tr>
<tr>
<td>Alignment w/ Goals</td>
<td>Goal 3</td>
</tr>
<tr>
<td>Connection w/ Existing Efforts</td>
<td>GPR, DOW, MD DWR, ESP-3, ESP-4</td>
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<tr>
<td>Timeframe</td>
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</tbody>
</table>
• Identify overlaps with existing planning efforts
• Prioritize Strategies and Actions with lead stakeholders
Federal and State

FEMA

US Army Corps of Engineers®

NOAA

A more Sustainable and Resilient Baltimore City

Floodplain
Community Rating System (CRS)
Modeling and HAZUS
Engineering Studies
DP3

Pre-Disaster Mitigation
Floodplain Modeling
Coastal Adaptation
Community Preparedness
Regional Collaboration

**Surrounding Counties:**
- Dams
- Stormwater Management
- Emergency Management
- Critical Facilities
- Energy and Transportation

**Regional Partnerships:**
- Other Cities (DC, Philly, NYC)
- Baltimore Wilderness Coalition
- Baltimore Urban Waters Partnership
- USDN Preparedness Group
Inter-Agency Collaboration

**Outcome Budgeting**
- 10 year budget and strategy guide
- Measurable goals and outcomes
- Determine amount needed in the “rainy day fund”

**Capital Improvement Process**
- Resiliency checklist for projects (Risk)
- Projects must take into account anticipated impacts from climate change
- Build resiliency into new projects/plans

**CitiStat**
- Integrate climate adaptation into metrics
- Connect resiliency to other agencies work
Make a Plan, Build a Kit, Help Each Other
Benefits

- Develop a comprehensive system for addressing existing and future impacts
- Capitalize on hazard mitigation requirements to gain support from agency directors for adaptation
- Model both historic and predicted hazard scenarios
- Helps ensure adaptation strategies are incorporated into budgeting and CIP processes
- Stronger implementation phase if collaborate extensively in the planning phase
- Overlaps with all stakeholders, plans, projects and partnerships identified and enhanced
Lessons Learned

- Being well organized is essential
- In-person meetings and information sessions are extremely beneficial – gain greater support
- Identifying overlaps with existing plans or projects helps with gaining support
- Identifying funding opportunities or ways to enhance existing projects also helps with gaining support
- You will have a stronger implementation phase if collaborate extensively in the planning phase
THANK YOU!

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