

# Chapter 6

## Implementation, Maintenance and Evaluation

The City of Baltimore is committed to reaching the goals of the DP3 Plan, and completing, to the maximum degree possible, the strategies and actions presented in Chapter 5. To start this process, steps to implement the strategies are outlined in this chapter, and include information on adoption, maintenance, and revision of the plan. As the strategies and actions were developed, members of the Advisory Committee also considered how each action would be implemented, monitored, and evaluated. Agencies and organizations responsible for implementation, as well as possible funding or financing sources have been identified for each strategy. The DP3 Plan is the product of a collaborative effort including City agencies and stakeholders from all sectors, and collaboration moving the plan forward is a vital priority in order to achieve success.



Charles Village Rowhouses

Source: [Planning.org](http://Planning.org)



The Fitzgerald Building on Mount Royal

Source: The Baltimore Sun

## Plan Adoption

The City of Baltimore DP3 Plan was officially endorsed by the DP3 Advisory Committee on August 19, 2013. The Plan was then presented and adopted by Sustainability Commission on September 24, 2013. On October 3, 2013, the Baltimore City Planning Commission also adopted the Plan.

Following formal adoption of this plan by both The City of Baltimore Planning Commission and Sustainability Commission, this Plan will be presented to the Federal Emergency Management Agency (FEMA), the Maryland Emergency Management Agency (MEMA), and the Maryland Department of Natural Resources (MDNR) for approval. Once approved, this Plan will act as a guide to making hazard mitigation and climate adaptation management decisions and will allow city agencies to integrate the strategies and actions into ongoing and new projects and assist in guiding policy decisions.

Accomplishing the strategies and actions proposed in this plan will require cooperation from City officials and staff and an ongoing long-term commitment to the Plan's vision and goals. It will also require collaboration with the FEMA, MEMA, and MDNR. Lead agencies, stakeholders, and timelines are identified in the spreadsheet within this chapter.

## Implementation Guidance

The City of Baltimore must act now and prepare for the future by proactively mitigating natural hazards and adapting to climate change. Recognizing that the City is already exposed to natural hazards and that many of those hazards are difficult to predict, it is crucial that the strategies outlined within this plan are implemented swiftly and efficiently. The DP3 Plan provides a series of guidelines to ensure the successful implementation of the proposed actions.

DP3 is a living document which has proposed a series of actions that shall persist well into the future. As Baltimore grows and develops, or as conditions change and new information becomes available, some adjustments may need to be made to the plan. The implementation framework will guide the processes through which DP3 may be applied, monitored, evaluated, updated, and sustained so as to ensure that the plan remains both effective and relevant.

### Implementation

The Baltimore Office of Sustainability is responsible for general oversight, maintenance, and progress reporting of the DP3 plan. The execution of each strategy and action, however, will primarily lie within the responsibilities of lead agencies that were identified for their capacity for overseeing implementation of individual actions.

A key to creating a viable mitigation and adaptation plan is identifying and capitalizing upon existing efforts and programs. Therefore, additional guidance is provided in this chapter that will assist other agencies with implementing DP3 strategies and actions. It urges a process by which government agencies may incorporate DP3 requirements into planning tools, such as comprehensive or capital improvement plans, where appropriate.

The implementation guidance segment below calls attention to key details which will guide and manage the implementation of the strategies and actions recommended in this plan. It identifies the relationship each strategy may share with existing efforts, policies, and plans so as to highlight the potential to coordinate ongoing efforts. These existing initiatives may include other plans, such as the Climate Action Plan (CAP); the Baltimore Sustainability Plan; Emergency Support Functions (ESF); and the Community Rating System (CRS) among others, or may generally refer to entire agencies or organizations.

Just as the list of strategies in Chapter 5 had noted key stakeholders, the list below identifies lead agencies that are likely to oversee the progress of that individual strategy (for a glossary of acronyms, please refer to the list in Appendix B). An estimated timeframe is also noted for each strategy. The period of implementation may be ongoing, short, medium, or long. Again, varying timeframes may be indicated for individual actions by the letters O, S, M, and L. Financial support for the implementation of these strategies had also been considered, and possible sources are suggested for each. Some metrics and performance measures have been identified, but this is not an exhaustive list, and additional indicators will be added as the implementation process begins.

DP3 is an ongoing process, and continued public involvement is critical. A number of strategies and their actions rely heavily on the establishment and use of comprehensive education and outreach efforts. In addition to creating a process for public input and community involvement, outreach efforts ensure that residents are provided with adequate information and resources for responding to hazard warnings.

## **DP3 Monitoring and Evaluation, Maintenance and Revision**

In order to evaluate the successes and limits of DP3, there must be a process for monitoring the implementation of strategies and actions. Monitoring is best conducted through an organized and routine process that will measure and assess the progress of strategy implementation, evaluating the effectiveness of those recommendations. The Baltimore Office of Sustainability in collaboration with the Sustainability Commission's Climate Committee will be in charge of maintenance, monitoring, and reporting of the DP3 Plan. If necessary, these monitoring bodies may call a meeting of the DP3 Advisory Committee or its subcommittees to propose, consider, and adopt revisions as formal amendments to the plan.

The monitoring body, in its review process, will examine DP3's implementation efforts and continued viability with respect to changing circumstances or strategies, implementation progress, plan modification, the need for any additional information or elements. Should the implementation of any one strategy or action prove exceedingly difficult, the Climate Committee will investigate possible restrictions (e.g. outside circumstances) and consider various solutions for overcoming those barriers—either by removing a particular constraint or reconsidering the action

Steps taken to monitor progress may include:

- Determine how strategies and actions will be monitored; establishing a collection of indicators to measure success.
- Coordinate, compile, and disseminate hazard mitigation funding information.
- Review of annual reports produced by lead agencies tasked with the implementation of adaptation and mitigation projects or activities as identified in Chapter 5 of this Plan.
- Review progress and completion of strategies.
- Maintain and revise the strategy and action list as needed.
- Research and identify changing or new natural hazards which may affect Baltimore City.



Annual Tree Meeting

The plan monitoring and refinement strategy should include a post-disaster component to identify a framework for reviewing the plan after a future major hazard event. This component will facilitate revisions, as needed, based on new experiences or circumstances. This process will require continued coordination with Baltimore's Mayor's Office of Emergency Management (MOEM) and the Baltimore City Health Department (BCHD). Should this process indicate a need for any revisions, they will be incorporated into the routine plan update noted above. Additionally, following a hazard event, this plan should also be reviewed in order to assess its continued applicability or any needs for revisions.

Following an evaluation and revision schedule, DP3 will be continuously updated as new information becomes available. In compliance with FEMA requirements, the Plan will also be updated every five years and presented to FEMA to reflect any new findings.

## Integrating DP3 with the CAP

Building off of the successful education, outreach and behavior change model of the Baltimore Energy Challenge, the Office of Sustainability is in the process of creating a comprehensive climate engagement program. This program will utilize neighborhood, resident and business ambassadors to assist in communicating and educating members of the community on how to prepare for, mitigate, and respond to natural hazard events due to climate change. The communications strategy will effectively deliver valuable information, engage residents, motivate behavior change, recognize leaders and will most importantly build stronger more resilient communities.

Portions of the DP3 Plan will be routinely reviewed. Comments and recommendations offered by lead agencies in charge of implementation, DP3 Advisory committee members, City and State Hazard Mitigation Officers, and public comment will be considered and incorporated into plan updates. Reevaluation, updating, and revision will be ongoing. For each major FEMA update, the climate science will be reviewed and strategies updated to reflect new concerns or vulnerabilities. The public will also be given an opportunity to provide feedback about implementation to date and updates to the plan.

DP3 progress and activities will continue to engage diverse audiences across Baltimore, including the general public. When appropriate, news and information will be shared on the Baltimore Office of Sustainability website and the City's natural hazards site.





Storm over the Harbor

Source: Kristin Baja

## Funding Sources

A number of financing options are available for the development, operation, and maintenance of hazard mitigation and climate adaptation measures. Identification of these potential funding resources is an essential element to achieving the City's resilience goals. Funding opportunities and sources are constantly changing. For instance, the City of Baltimore currently remains eligible for Hazard Mitigation Grant Program (HMGP) funding as a result of Hurricane Sandy. HMGP provides funding to implement long-term hazard mitigation measures after a major disaster declaration in order to reduce the loss of life and property due to natural disasters. Since Hurricane Sandy occurred in late 2012, this funding for numerous projects, such as generators, draining/flooding reduction efforts, acquisition and demolition, and wind retrofitting is currently available, but for a limited time. The list below is a quick look at potential funding sources at the time this plan was developed. Often, opportunities for funding will need to be explored in greater detail by the lead agency and stakeholders.

**[The Federal Emergency Management Agency](#)** | The Federal Emergency Management Agency (FEMA) funds several programs, coordinated through the Maryland Emergency Management Agency (see below), which assist with preparedness, mitigation, and response efforts.

**[Hazard Mitigation Grant Program](#)** | FEMA's Hazard Mitigation Grant Program (HMGP) provides grants to States, local governments, and Indian tribes for long-term hazard mitigation projects following a major disaster declaration. The purpose of the program is to reduce the loss of life and property in future disasters by funding mitigation measures during the recovery phase of a natural disaster. In the case of flood mitigation, projects can include the flood proofing or acquisition and relocation of flood prone properties, the elevation of structures in compliance with National Flood Insurance Program (NFIP) standards, and other flood control measures, including structural projects, where identified as cost-effective. FEMA conducts a

final eligibility review to ensure compliance with Federal regulations. HMGP projects must comply with Federal environmental laws and regulations, be cost-effective, and be technically feasible. Although State and local units of government are eligible applicants, HMGP funds can be used on private property for eligible projects. The HMGP gives priority to properties identified by FEMA as repetitive-loss properties.

**Flood Mitigation Assistance Program** | The Flood Mitigation Assistance (FMA) program can provide funds to assist States and communities implement measures that reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other structures insured under NFIP. Three types of FEMA grants are available to States and communities: (1) Planning, (2) Project, and (3) Management Cost. The funds are coordinated through Maryland's Hazard Mitigation Officer. In addition to participating in the NFIP, eligible program applicants must meet cost-benefit criteria established by FEMA. Mitigation of repetitive-loss properties is given a high priority under this program. Increased cost of compliance (ICC) coverage under the NFIP may provide a funding source for bringing noncompliant structures into compliance after a flood loss.

**Public Assistance Program** | FEMA's Public Assistance Program provides supplemental financial assistance to State, local governments and certain private, non-profit organizations for response and recovery activities as a result of a Presidentially-declared disaster. The Public Assistance Program provides Federal grant assistance for the repair, replacement or restoration of disaster-damaged, publicly owned and uninsured facilities. This grant funding is provided at a 75% Federal/25% applicant grant share formula. The Public Assistance Program may pay for mitigation measures under Section 406 of the Stafford Act.

**Pre-Disaster Mitigation Program** | FEMA's Pre-Disaster Mitigation (PDM) program provides funds to states, territories, Indian tribal governments, communities, and universities for hazard mitigation planning and the implementation of mitigation projects prior to a disaster event. Funding these plans and projects reduces overall risks to the population and structures, while also reducing reliance on funding from actual disaster declarations. PDM grants are to be awarded on a competitive basis and without reference to state allocations, quotas, or other formula-based allocation of funds.

Examples of eligible projects include property acquisition, structure acquisition and demolition or relocation, structure elevation, safe room construction, dry flood proofing of nonresidential structures and historic residential structures, and minor localized flood reduction projects. Individual homeowners and businesses may not apply directly to the program; however an eligible Applicant or Sub-applicant may apply on their behalf.

**Repetitive Flood Claims Grants** | FEMA's Repetitive Flood Claims Program (RFC) provides funds on an annual basis to reduce the risk of flood damage to individual properties insured under the NFIP that have had one or more claim payments for flood damages. The Repetitive Flood Claims (RFC) grant program was authorized by the Bunning-Bereuter-Blumenauer Flood Insurance Reform Act of 2004, which amended the National Flood Insurance Act of 1968. RFC provides funding to reduce or eliminate the long-term risk of flood damage to structures insured under the National Flood Insurance Program (NFIP) that have had one or more claim payments for flood damages.

**Severe Repetitive Loss Grants** | FEMA's Severe Repetitive Loss (SRL) grant program was authorized by the Bunning-Bereuter-Blumenauer Flood Insurance Reform Act of 2004, which amended the National Flood Insurance Act of 1968 to provide funding to reduce or eliminate the long-term risk of flood damage to severe repetitive loss structures insured under the National Flood Insurance Program. An SRL property is defined as a residential property that is covered under an NFIP flood insurance policy and:

- That has at least four NFIP claim payments (including building and contents) over \$5,000 each, and the cumulative amount of such claims payments exceeds \$20,000; or
- For which at least two separate claims payments (building payments only) have been made with the cumulative amount of the building portion of such claims exceeding the market value of the building.
- For both (a) and (b) above, at least two of the referenced claims must have occurred within any ten-year period, and must be greater than 10 days apart.
- Examples of eligible projects include property acquisition, structure removal or relocations, structure elevation, dry flood proofing of residential structures, mitigation reconstruction, and minor localized flood reduction projects.

### **National Training and Education Division** |

In addition to financial resources, FEMA offers a National Training Program. At the time of print, the National Training and Education Division had been offering more than 125 courses to help build critical skills that responders need to function effectively in mass consequence events.

U.S. Department of Housing and Urban Development (HUD) **Community Development Block Grant Program** | Community Development Block Grant (CDBG) programs, funded by the U.S. Department of Housing and Urban Development (HUD), provide communities with resources to address a wide range of unique community development needs, including disaster recovery and neighborhood stabilization. Over a one-, two-, or three-year period, as selected by the grantee, not less than 70 percent of CDBG funds must be used for activities that benefit low- and moderate-income persons. In addition, each activity must meet one of the following national objectives for the program: benefit low- and moderate-income persons, prevention or elimination of slums or blight, or address community development needs having a particular urgency because existing conditions pose a serious and immediate threat to the health or welfare of the community for which other funding is not available. Depending on the nature of the hazard event, possible use of this assistance may support repair to damaged housing; acquisition and demolition of significantly damaged dwellings; construction of new housing; or repairs to publicly-owned utility systems, streets, sidewalks, or other infrastructure.

### **U.S. Small Business Administration Loan Programs** |

The U.S. Small Business Administration (SBA) provides low-interest disaster loans to homeowners, renters, businesses of all sizes, and most private nonprofit organizations. SBA disaster loans can be used to repair or replace the following items damaged or destroyed in a declared disaster: real estate, personal property, machinery and equipment, and inventory and business assets. Types of disaster loans include Home and Personal Property Loans, Business Physical Disaster Loans, and Military Reservists Economic Injury Loans. Additionally, Drought Disaster Assistance may be available through Economic Injury Disaster Loans.

**U.S. Army Corps of Engineers** | The U.S. Army Corps of Engineers programs are potential sources of funding, particularly for implementing flood adaptation and mitigation recommendations of this plan.

**U.S. Fire Administration** | The mission of the U.S. Fire Administration (USFA), an entity of FEMA, is to provide national leadership to foster a solid foundation for our fire and emergency services stakeholders in prevention, preparedness, and response. USFA's National Fire Academy provides tuition-free training in firefighting, fire prevention, emergency medical services, and related areas to persons with substantial involvement in the fire control and prevention, emergency medical services, fire-related emergency management activities, and related professions.

Additionally, USFA administers several grant programs that are designed to assist local fire departments and other organizations in protecting citizens and firefighters against the effects of fire and fire-related incidents. These programs include the [Assistance to Firefighters Grant program](#), the [Fire Prevention and Safety Grant programs](#), and the [Staffing for Adequate Fire and Emergency Response \(SAFER\) Grant program](#).

### **Chemical Emergency Preparedness and Prevention (CEPP) Technical Assistance Grants Program** |

CEPP programs provide financial assistance for chemical accident prevention, for chemical emergency planning, and for community right-to-know programs which are established to prevent or eliminate unreasonable risk to the health and environment of communities within the State. The Innovative Technical Assistance Grants are offered to improve the ability to protect public health and safety and involve the development of technical assistance or similar materials that could be used directly or adapted by other States/Tribes or Local Emergency Planning Committees (LEPCs). Projects which address implementing the Risk Management Program under the Clean Air Act Section 112(r) are especially of interest.

### **National Institute of Environmental Health Sciences (NIEHS) Hazardous Waste Worker Health and Safety Training** |

The Hazardous Waste Worker Education and Training Program (WTEP) is sponsored by the National Institutes of Health, Department of Health and Human Services to provide assistance for Superfund Site worker training. The program has compiled a number of resources related to emergency preparedness and response, [offering these resources](#) to address issues in government preparedness and public preparedness. Sample resources offered include [Emergency Responders Health Monitoring and Surveillance \(ERHMS\) Document and Guide for Key Decision Makers](#), the [Guidance for Managing Worker Fatigue During Disaster Operations](#), a report on [DISASTER PREPAREDNESS: Better Planning Would Improve OSHA](#), and [Talking About Disasters: Guide for Standard Messages - 2004 Edition](#).

**[Maryland Emergency Management Agency](#)** | The Maryland Emergency Management Agency (MEMA) was created by the Maryland legislature to ensure that our state is prepared to deal with large-scale emergencies. MEMA is responsible for coordinating the state's response in any major emergency or disaster. This includes supporting local governments as needed or requested, and coordinating assistance with the Federal Emergency Management Agency (FEMA) and other federal partners. MEMA provides resources to communities through various grant programs, including the Public Assistance Program and the Hazard Mitigation Grant Program (both are described above).

**[Maryland Department of Natural Resources](#)** | The Maryland Department of Natural Resources (MDNR) states its mission in securing a sustainable future for our environment, society, and economy by preserving, protecting, restoring, and enhancing the State's natural resources. Through a number of programs, MDNR offers tools, resources, and financial assistance to other state agencies, businesses, and communities pursuing efforts that further this mission. This includes initiatives to build community resilience through strengthening key natural systems. Many of the financial programs will be valuable for actions that address the health and resiliency of the urban forest, goals for habitat restoration and conservation, as well as for actions that intend to strengthen coastal and other hydrological systems. The list below is only a sample of the programs MDNR has to offer.

**[Coastal Zone Management Program](#)** | The Chesapeake and Coastal Service program is an umbrella program for other coastal and watershed initiatives. It includes funding resources such as the [Chesapeake & Atlantic Coastal Bays Trust Fund](#), to address pollution and water quality, the [CoastSmart Communities](#) initiative, which aims to assist businesses, communities and local governments with access to available products and services that address the current risks associated with coastal hazards and the potential increased impacts of those hazards in the future due to climate change.

It also establishes the [Watershed Assistance Collaborative](#), a partnership that provides services and technical assistance to communities to advance restoration activities and projects. By leveraging resources of existing programs, the Watershed Assistance Collaborative exists to provide coordinated capacity building opportunities to local implementers. Communities interested in undertaking comprehensive watershed protection and restoration activities are encouraged to take advantage of the services offered through this partnership. The Collaborative offers the tools, resources and outreach needed to work toward large nonpoint source pollution implementation and restoration efforts.

**Additional MDNR Programs** | Additional programs, support restoration efforts through the development of new technologies, can benefit private landowners with major projects, and even offer financial assistance to actions that can provide resources and education to the public about natural resources and efforts to strengthen and restore these features. An extensive list of MDNR's financial resources may be found online, at their [Grants and Loans Center](#) webpage.

**[Maryland Energy Administration](#)** | The Maryland Energy Administration (MEA) offers a number of [State and Local Government Incentives](#) for energy improvements, including programs that support fuel efficiency.

Together with the resources noted above, supplementary funding should be explored through local or regional resources, or may be available for more targeted or specific projects. In the Implementation Guidance segment below, potential financing programs have been identified for each strategy. These sources have not been secured, nor are they guaranteed. Furthermore, the limited size of each list does not suggest that additional funding opportunities don't exist. Again, new funding sources may later develop, or the availability of currently known resources may change in the future.



Storm over the Harbor



ACTION	LEAD AGENCY	STAKEHOLDERS	ESTIMATED TIMEFRAME (short 1-2yrs, med 3-5yrs, long 6+)	FINANCING OPTIONS	PERFORMANCE METRICS	OVERLAP WITH CAP	EOP, ESF, COOP
IN-1	(MOEM)	Protect and enhance the resiliency and redundancy of electricity system					
Work with the Maryland Public Service Commission (PSC) to minimize power outages from the local electric utility during extreme weather events by identifying and protecting critical energy facilities and located within the City	MOEM MEMA	BCRP (Forestry), BGE, Building Owners, DGS, DOT, DPW, Exelon, PSC, Utility customers, Veolia, Wheelabrator	Short	<ul style="list-style-type: none"> <li>Baltimore City CIP</li> <li>Federal Sources</li> <li>BGE's existing funds allocated through the Smart Grid Investment Grant</li> </ul>	<ul style="list-style-type: none"> <li>Evaluation or development of an alternative energy plan</li> <li>Percentage of electricity generated within the 500-year floodplain able to remain online after a 500-year flood event</li> <li>Percentage of assets at or above their loading limits during peak demand periods (e.g., during heat waves)</li> <li>Resiliency investment in the power supply system</li> <li>Successful creation and employment of a maintenance and training program</li> </ul>	Yes	ESF-12
Evaluate the City of Baltimore utility distribution system, and identify "underground utility districts" using BGE's May 2013 short term reliability improvement plan	PSC DPW- city	BCRP (Forestry), BGE, Building Owners, DGS, DOT, DPW, Exelon, PSC, Utility customers, Veolia, Wheelabrator	Short	<ul style="list-style-type: none"> <li>Baltimore City CIP</li> <li>Federal Sources</li> <li>BGE's existing funds allocated through the Smart Grid Investment Grant</li> </ul>	To Be Determined with Future Data	Yes	ESF-12
Support BGE's collaboration with the Maryland Public Service Commission to implement various smart grid solutions that will provide the City with real-time access to data during events	DPW	BCRP (Forestry), BGE, Building Owners, DGS, DOT, DPW, Exelon, PSC, Utility customers, Veolia, Wheelabrator	Short	<ul style="list-style-type: none"> <li>Baltimore City CIP</li> <li>Federal Sources</li> <li>BGE's existing funds allocated through the Smart Grid Investment Grant</li> </ul>	To Be Determined with Future Data	Yes	ESF-12
Identify, harden, and water seal critical infrastructure relative to electrical, heating, and ventilation hardware within the flood plain	MOEM	BCRP (Forestry), BGE, Building Owners, DGS, DOT, DPW, Exelon, PSC, Utility customers, Veolia, Wheelabrator	Short-Medium	<ul style="list-style-type: none"> <li>Baltimore City CIP</li> <li>Federal Sources</li> <li>BGE's existing funds allocated through the Smart Grid Investment Grant</li> </ul>	To Be Determined with Future Data	Yes	ESF-12: COOP
Increase resiliency in our energy generation system by encouraging the development of decentralized power generation and developing fuel flexibility capabilities	MOEM	BCRP (Forestry), BGE, Building Owners, DGS, DOT, DPW, Exelon, PSC, Utility customers, Veolia, Wheelabrator	Short-Medium	<ul style="list-style-type: none"> <li>Baltimore City CIP</li> <li>Federal Sources</li> <li>BGE's existing funds allocated through the Smart Grid Investment Grant</li> </ul>	To Be Determined with Future Data	Yes	COOP
Develop a comprehensive maintenance and training program for City employees at facilities with backup generators to ensure proper placement, hook-up and function during hazard events.	MOEM	BCRP (Forestry), BGE, Building Owners, DGS, DOT, DPW, Exelon, PSC, Utility customers, Veolia, Wheelabrator	Short-Medium	<ul style="list-style-type: none"> <li>Baltimore City CIP</li> <li>Federal Sources</li> <li>BGE's existing funds allocated through the Smart Grid Investment Grant</li> </ul>			
Install external generator hookups for critical City facilities that depend on mobile generators for backup power	MOEM	BCRP (Forestry), BGE, Building Owners, DGS, DOT, DPW, Exelon, PSC, Utility customers, Veolia, Wheelabrator	Short-Medium	<ul style="list-style-type: none"> <li>Baltimore City CIP</li> <li>Federal Sources</li> <li>BGE's existing funds allocated through the Smart Grid Investment Grant</li> </ul>	To Be Determined with Future Data		COOP
Partner with utility to evaluate protecting power and utility lines from all hazards.	MOEM	BCRP (Forestry), BGE, Building Owners, DGS, DOT, DPW, Exelon, PSC, Utility customers, Veolia, Wheelabrator	Short-Medium	<ul style="list-style-type: none"> <li>Baltimore City CIP</li> <li>Federal Sources</li> <li>BGE's existing funds allocated through the Smart Grid Investment Grant</li> </ul>	To Be Determined with Future Data	Yes	
Determine low-laying substation vulnerability and outline options for adaptation and mitigation.	PSC DPW- city	BCRP (Forestry), BGE, Building Owners, DGS, DOT, DPW, Exelon, PSC, Utility customers, Veolia, Wheelabrator	Short	<ul style="list-style-type: none"> <li>Baltimore City CIP</li> <li>Federal Sources</li> <li>BGE's existing funds allocated through the Smart Grid Investment Grant</li> </ul>		Yes	ESF-12
Evaluate and protect low laying infrastructure - switching vaults, conduit and transformers	MOEM PSC	BCRP (Forestry), BGE, Building Owners, DGS, DOT, DPW, Exelon, PSC, Utility customers, Veolia, Wheelabrator	Short-Medium	<ul style="list-style-type: none"> <li>BGE</li> <li>Federal Funds</li> <li>Local Funds</li> </ul>		Yes	

ACTION	LEAD AGENCY	STAKEHOLDERS	ESTIMATED TIMEFRAME (short 1-2yrs, med 3-5yrs, long 6+)	FINANCING OPTIONS	PERFORMANCE METRICS	OVERLAP WITH CAP	EOP, ESF, COOP
IN-2	(BoS)	Increase energy conservation efforts					
Increase energy efficiency across all sectors through education, efficiency retrofits, and building management systems	BoS	BGE, Building owners, City Delegates, DOP, DPW, Energy Office, PSC	Medium	• MEA	<ul style="list-style-type: none"> <li>• Overall energy consumption and use</li> <li>• Number of permits for energy efficiency retrofits or upgrades</li> <li>• Number of critical facilities connected to cogeneration systems</li> <li>• Use of the City's electricity demand-response program</li> </ul>	Yes	
Encourage critical facilities and institutions to connect to existing cogeneration systems, or develop new cogeneration systems	Energy Office (MEO)	BOS,BGE, Building owners, DOP, DPW, Energy Office, PSC	Short-Long	<ul style="list-style-type: none"> <li>• Federal Emergency Grant Funds</li> <li>• Local Funds</li> </ul>		Yes	ESF-12
Continue the City's electricity demand-response program during peak usage or pre-blackout periods	BGE	BGE, Building owners, City Delegates, DOP, DPW, Energy Office, PSC	Medium	<ul style="list-style-type: none"> <li>• BGE</li> <li>• Federal Funds</li> </ul>	To Be Determined with Future Data	Yes	
IN-3	(MEO)	Ensure backup power generation for critical facilities and identified key infrastructure during power outages					
Investigate off-grid, on-site renewable energy systems, generators, and technologies for critical facilities to ensure redundancy of energy systems	DGS	BGE, DGS, DHMH, DOP, DOT, DPW, MOEM	Medium	<ul style="list-style-type: none"> <li>• Baltimore City CIP</li> <li>• Federal Programs</li> </ul>	<ul style="list-style-type: none"> <li>• Number of critical facilities with backup power generation sources</li> <li>• Percentage of hospital and healthcare facility patient capacity (e.g. hospital beds) in flood-prone areas meeting resiliency requirements</li> <li>• City buildings with backup generators</li> <li>• Number of critical facilities connected to CHP cogeneration systems</li> </ul>	Yes	ESF-8,12
Seek funding to purchase and install generators for all city building designated as critical to agency functions	DGS	DGS, DOP, DOT, DPW, MOEM	Short	<ul style="list-style-type: none"> <li>• Federal Grants</li> <li>• State Grants</li> </ul>	To Be Determined with Future Data	No	ESF-12, 7
Develop Combined Heat and Power (CHP) co-generation plants at identified critical facilities	MEO	DGS, DOP, DOT, DPW, MOEM	Medium	<ul style="list-style-type: none"> <li>• Federal Funds</li> <li>• State Funds</li> <li>• Local Funds</li> </ul>	To Be Determined with Future Data	Yes	
Evaluate and ensure backup power generation is available to healthcare facilities (nursing homes, critical care facilities, hospitals, etc.)	MDH2E	DGS, DOP, DOT, DPW, MOEM	Medium	<ul style="list-style-type: none"> <li>• Hospital Budgets</li> <li>• Federal Emergency Funds</li> </ul>	To Be Determined with Future Data		
IN-4	(MOEM)	Protect and manage compressed liquefied natural gas sites and (city) fueling stations before and during hazard events					
Work with BGE to ensure existing preparedness plans for Spring Gardens liquefied natural gas site incorporate its vulnerability to present and predicted flooding, storm surge and sea level rise	BGE	BGE, DGS, DOP, DOT, DPW, Veolia	Medium	BGE	<ul style="list-style-type: none"> <li>• Completion of a Spring Gardens study and evaluation</li> <li>• Percentage of liquid fuel assets in the floodplain hardened against flood events</li> <li>• Revisions to building codes to address hazard resilience</li> <li>• Liquid fuel facilities with anchored storage tanks that are 50 gallons or larger</li> </ul>		ESF-3, 10
Adopt building code that requires anchoring of 50 gallon storage tanks or larger	MOEM/HCD	MDE,BGE, DGS, DOP, DOT, DPW, Veolia	Medium		To Be Determined with Future Data		
Support the Maryland Public Service Commission's effort to accelerate replacement of aging natural gas infrastructure which will harden the system against flooding	BGE	BGE, DGS, DOP, DOT, DPW, Veolia	Medium	BGE			

ACTION	LEAD AGENCY	STAKEHOLDERS	ESTIMATED TIMEFRAME (short 1-2yrs, med 3-5yrs, long 6+)	FINANCING OPTIONS	PERFORMANCE METRICS	OVERLAP WITH CAP	EOP, ESF, COOP
IN-5	(MOEM)	Evaluate and improve resiliency of liquid fuels infrastructure					
Design and implement a generator program that assists private gas stations in securing backup generators, especially those stations along major evacuation routes	MOEM	BCFD, BCPD, DES, DOT, DPW, MOE	Medium	<ul style="list-style-type: none"><li>Fuel Up Maryland</li><li>Federal Sources</li></ul>	<ul style="list-style-type: none"><li>Percentage of gas stations with quick-connects for generators</li><li>Percentage of liquid fuel assets in the floodplain hardened against a flood event</li><li>Development and implementation of a generator program</li><li>Program or plan for allocating fuel supplies to emergency responders first</li></ul>		
Increase and ensure fuel availability during distribution disruptions	MOEM	BCFD, BCPD, DES, DOT, DPW, MOE	Medium		To Be Determined with Future Data		
Ensure fuel for generators and delivery priority is given to critical facilities and emergency responders.	MOEM	BCFD, BCPD, DES, DOT, DPW, MOE	Medium		To Be Determined with Future Data		
IN-6	(MOEM)	Evaluate and improve resiliency of communication systems that are in place for sudden extreme weather events					
Utilize new technologies such as fiber optics, external hook-ups, and mobile generators to improve resiliency	MOEM	BGE, DOT, Energy Office, FCC, MOIT, Private Entities, PSC	Medium	<ul style="list-style-type: none"><li>Federal Grant Programs</li><li>State Grant Programs</li><li>Baltimore City CIP</li></ul>	<ul style="list-style-type: none"><li>Percentage of communication system transitioned to fiber optics and/or other alternative technologies</li></ul>	No	ESF-2
Build redundancy into all public and inter-agency warning and communication systems	MOEM	BGE, DOT, Energy Office, FCC, MOIT, Private Entities, PSC	Short	<ul style="list-style-type: none"><li>Federal Grant Programs</li><li>State Grant Programs</li><li>Baltimore City CIP</li></ul>	<ul style="list-style-type: none"><li>Number or percentage of critical telecommunication facilities implementing hazard resiliency measures into planning and operations</li></ul>	No	ESF-2
Identify best practices for the installation and management of flood proofing of all communications infrastructure at risk of water damage	DGS + DOP	BGE, DOT, MOE, MOEM, FCC, MOIT, Private Entities, PSC	Short	<ul style="list-style-type: none"><li>Federal Grant Programs</li><li>State Grant Programs</li><li>Baltimore City CIP</li></ul>	<ul style="list-style-type: none"><li>Number of buildings transitioned per year</li></ul>	No	ESF-2, 3
Implement additional nurse triage phone lines and community health centers to reduce medical surge on hospitals	MDH2E	BGE, MOEM, DOT, Energy Office, FCC, MOIT, Private Entities, PSC	Short	<ul style="list-style-type: none"><li>Private Funding</li></ul>	<ul style="list-style-type: none"><li>Percentage of hospitals where triage phone lines are added</li></ul>	No	ESF-8,12
Evaluate and improve early warning systems for hazard events	MOEM	BCPD, BCFD, BGE, DHMH, DOP, DOT, Energy Office, FCC, JIS, MOIT, Private Entities, PSC	Short	<ul style="list-style-type: none"><li>Baltimore City CIP</li></ul>	<ul style="list-style-type: none"><li>Percentage of people reached</li><li>System improvements</li></ul>	Yes	
Ensure continued operation of city governments various computer mainframes for email, control systems, and internet service by having stand-by batteries for each with a capacity sufficient for backup generation to operate	MOIT	BGE, DOT, Energy Office, FCC, MOEM, Private Entities, PSC	Short	<ul style="list-style-type: none"><li>Baltimore City CIP</li></ul>	<ul style="list-style-type: none"><li>Systems functioning in an emergency</li></ul>		COOP
Identify shared communication technology for emergency responders and government agencies to ensure continued and coordinated communication during emergency events	MOEM	BGE, DOT, Energy Office, FCC, MOIT, Private Entities, PSC	Short	<ul style="list-style-type: none"><li>Baltimore City CIP</li></ul>	To Be Determined with Future Data		
IN-7	(DOT)	Integrate climate change into transportation design, building and maintenance					
Determine the coastal storm vulnerability and complete an exposure assessment of City transportation assets	DOT	CSX, DOT, DPW, MTA, Private Contractors	Short	<ul style="list-style-type: none"><li>Federal Grant Programs</li></ul>	<ul style="list-style-type: none"><li>Number of lane-miles reconstructed, repaved, or resurfaced</li><li>Percentage of Baltimore's transportation assets adapted for climate change resiliency</li><li>Reference to climate adaptation and hazard mitigation in transportation planning documents</li><li>New project compliance with the alternative rating systems</li></ul>	No	ESF-1
Improve stormwater management, operations and maintenance for stream flooding that erodes away bridge supports	DOT	CSX, DOT, DPW, MTA, Private Contractors	Ongoing	<ul style="list-style-type: none"><li>Incorporate into existing Capitol Projects</li></ul>	To Be Determined with Future Data	No	ESF-1,3
Incorporate compliance with earthquake standards to withstand a magnitude eight earthquake for all new, improved and rebuilt bridges	DOT	CSX, DOT, DPW, MTA, Private Contractors	Medium	<ul style="list-style-type: none"><li>Federal Funds</li><li>City Capitol Funds</li></ul>	To Be Determined with Future Data	No	ESF-1
Design bridges expansion joints for longer periods of high heat and develop a more robust inspection and maintenance process	DOT	CSX, DOT, DPW, MTA, Private Contractors	Short	<ul style="list-style-type: none"><li>Incorporate into existing Capitol Projects</li></ul>	To Be Determined with Future Data	No	ESF-1

ACTION	LEAD AGENCY	STAKEHOLDERS	ESTIMATED TIMEFRAME (short 1-2yrs, med 3-5yrs, long 6+)	FINANCING OPTIONS	PERFORMANCE METRICS	OVERLAP WITH CAP	EOP, ESF, COOP
Research utilizing existing and new rating systems for all new infrastructure and road projects	DOT	CSX, DOT, DPW, MTA, Private Contractors	Medium		To Be Determined with Future Data		
Identify, investigate, and incorporate Best Management Practices as they relate to transportation design, construction and maintenance	DOT	CSX, DOT, DPW, MTA, Private Contractors	Medium		To Be Determined with Future Data		
Require that backup solar powered street lights and signals be integrated along evacuation routes and high traffic areas	DOT	CSX, DOT, DPW, MTA, Private Contractors	Medium	Emergency Grant Programs	To Be Determined with Future Data	Yes	
IN-8	(MOEM)	Identify additional alternative routes and modes for effective transport and evacuation efforts during emergency situations					
Evaluate existing systems and develop a comprehensive evacuation plan	MOEM	BCFD, BCHD, DOP, DOT, MOEM	Short	• Consider looking to MEMA or FEMA for planning assistance through the hazard mitigation grant program	• Inventory and database of transportation routes and vulnerability to current and future flood • Altered evacuation route procedures where necessary	No	ESF-1, 11
Coordinate evacuation plans with regional partners	MOEM	BCFD, BCHD, DOP, DOT, MOEM	Short-Medium	• Federal Funds • State Funds • Local Funds	To Be Determined with Future Data	No	
Develop and prioritize clearance of specified transportation routes for delivery of emergency response supplies	DOT MOEM	BCFD, BCHD, DOP, DOT, MOEM	Short	• Federal Funds • State Funds • Local Funds	To Be Determined with Future Data	No	
Educate the public on the dangers of driving through flooded roads	DOT MOEM	BCFD, BCHD, DOP, DOT, MOEM	Short	• Federal Funds • State Funds • Local Funds	To Be Determined with Future Data	No	
Make available a network of dedicated pedestrian and bicycle transportation routes leading into and throughout the City	DOT	BCFD, BCHD, DOP, DOT, MOEM	Ongoing	• Federal Funds • State Funds • Local Funds	To Be Determined with Future Data	Yes	
Identify and collaborate with bicycle groups and repair shops to assist in emergency response and accommodate alternate transportation needs	DOT	BCFD, BCHD, DOP, DOT, MOEM	Short	• Private Funds		No	
IN-9	(DOT)	Alter transportation systems in flood-prone areas in order to effectively manage stormwater					
Prioritize infrastructure upgrades for roads identified at risk of flooding through the use of elevation data and Sea, Lake and Overland Surges from Hurricanes (SLOSH) model results	DOT	Amtrak, BCRP, CSX, Developers, DOT, DPW, FHWA, MDTA, MON, NGOs	Long	• The City's existing capital plan	• Number of lane-miles of reconstructed, repaved, or resurfaced roadways in flood-prone areas • Percentage of Baltimore's transportation assets adapted for climate change resiliency • Stormwater management technologies implemented with transportation projects within flood-prone areas	No	ESF-1
Raise streets in identified flood prone areas as they are redeveloped	DOT	Amtrak, BCRP, CSX, Developers, DOT, DPW, FHWA, MDTA, MON, NGOs	Long	• Federal Emergency Mangement Funding programs • Baltimore City Capitol Budget	To Be Determined with Future Data	No	
Encourage development of Green Streets in flood prone areas and throughout the City	Planning/ DOT	DOT, DPW, MON, Public, NGO's, Property Owners	Short-Ongoing		To Be Determined with Future Data	Yes	ESF-1
Encourage use of permeable pavement in non-critical areas – low-use roadways, sidewalks, parking lots and alleys where soils permit proper drainage	DPW	DOT, DPW, MON, Public, NGO's, Property Owners, Rec & Parks	Medium		To Be Determined with Future Data	No	ESF-1
Add pumps or other mitigation alternatives to streets as they are redeveloped (if needed)	DPW	Amtrak, BCRP, CSX, Developers, DOT, DPW, FHWA, MDTA, MON, NGOs	Long	• Federal Emergency Mangement Funding programs • Baltimore City Capitol Budget	To Be Determined with Future Data	Yes	ESF-1, 3
Assess need for new culvert capacity and identify where upgrades are needed	DPW	Amtrak, BCRP, CSX, Developers, DOT, DPW, FHWA, MDTA, MON, NGOs	Long	• Emergency Grant Programs	To Be Determined with Future Data	No	



ACTION	LEAD AGENCY	STAKEHOLDERS	ESTIMATED TIMEFRAME (short 1-2yrs, med 3-5yrs, long 6+)	FINANCING OPTIONS	PERFORMANCE METRICS	OVERLAP WITH CAP	EOP, ESF, COOP
Conduct an in-depth analysis of the impacts of drain fields that feed the harbor	DPW	Amtrak, BCRP, CSX, Developers, DOT, DPW, FHWA, MDTA, MON, NGOs	Medium-Long	• Emergency Grant Programs	To Be Determined with Future Data	No	ESF-3
Expand and reinforce existing stormwater education programs	DPW	MTA, Amtrak, BCRP, CSX, Developers, DOT, DPW, FHWA, MDTA, MON, NGOs	Long		To Be Determined with Future Data	No	ESF-11
Design and implement floodgates and barriers in transportation tunnels	MOEM	Amtrak, BCRP, CSX, Developers, DOT, DPW, FHWA, MON, NGOs, MTA	Long	• Funding options dependent on ownership of tunnel.	To Be Determined with Future Data	No	
Encourage Federal and State Government to design and install floodgates and barriers at vulnerable transportation tunnels	FHWA	Amtrak, BCRP, CSX, Developers, DOT, DPW, FHWA, MON, NGOs,MTA	Long		To Be Determined with Future Data	No	ESF-1
Upgrade existing floodgate hardware and mechanisms to control rise rate of water into all city tunnels	MOEM, CSX, Amtrak, MTA, FHWA	Amtrak, BCRP, CSX, Developers, DOT, DPW, FHWA, MON, NGOs, MTA	Long		To Be Determined with Future Data	No	ESF-3
IN-10	(CSX, Amtrak, MTA)	Ensure structural stability of all transportation tunnels to reduce impact from seismic activity					
Repair cracks and leaks in all tunnels to reduce impact of seismic activity	CSX, Amtrak, MTA	Amtrak, CSX, DOT, DPW, FHWA, MDTA, MOEM, MTA	Medium	Funding options dependent on ownership of tunnel.	• Database of all transportation tunnels and their vulnerability to seismic activity • Construction and maintenance projects addressing vulnerability of tunnels to seismic activity	No	ESF-1
Follow Federal, State and Local criteria for the stabilization of Historic transportation tunnels (e.g. Howard Street)	CSX, Amtrak, MTA	Amtrak, CSX, DOT, DPW, FHWA, MOEM, MTA	Long	Funding options dependent on ownership of tunnel.	To Be Determined with Future Data	No	
Install a seismically resistant fire standpipe, air monitoring, and automatic valve system in all tunnels to provide a fully automated and monitored fire suppression system	CSX, Amtrak, MTA	Amtrak, CSX, DOT, DPW, FHWA, MDTA, MOEM	Long		To Be Determined with Future Data	No	ESF-1, 4, 10
IN-11	(DOT)	Evaluate changes to road maintenance and construction materials based on anticipated changes in climate					
Implement a repaving strategy that reduces heat-related damage to asphalt and incorporates maintenance and operations that extend the life of the road surface	DOT	DOT, SHA	Long	• The analysis of City infrastructure is an ongoing priority and could be completed as part of this ongoing process. • The City's existing capital plan	• Development of a repaving strategy • Number of lane-miles reconstructed, repaved, or resurfaced • Percentage of Baltimore's transportation assets adapted for climate change resiliency • Reference to climate change and scientific projections in road maintenance and construction project materials.	Yes	ESF-1
Develop a reconstruction and repair strategy that reduces damage to concrete and incorporates better maintenance and operations	DOT	DOT, SHA	Long	• The analysis of City infrastructure is an ongoing priority and could be completed as part of this ongoing process. • The City's existing capital plan	To Be Determined with Future Data	No	
Develop deicing strategies and materials that are effective in extreme cold temperatures and prolonged events to stabilize roadway and bridge surfaces	DOT	DOT, SHA	Long		To Be Determined with Future Data	No	
Design pavement sections and materials that withstand longer periods of extreme heat events	DOT	DOT, SHA	Long	• The analysis of City infrastructure is an ongoing priority and could be completed as part of this ongoing process. • The City's existing capital plan	To Be Determined with Future Data	No	

ACTION	LEAD AGENCY	STAKEHOLDERS	ESTIMATED TIMEFRAME (short 1-2yrs, med 3-5yrs, long 6+)	FINANCING OPTIONS	PERFORMANCE METRICS	OVERLAP WITH CAP	EOP, ESF, COOP
IN-12	(DOT)	Enhance the resiliency of the city's waterfront to better adapt to impacts from hazard events and climate change					
Raise bulkhead height along shoreline areas most at risk	DOT	BDC, Development Community, DGS, DHCD, DOP, DOT, MDE, MDNR, MOEM	Long	• Federal Funding Sources	• Federal dollars secured for coastal protection projects • Linear miles of coastal edge restored • Number or percentage of buildings with reduced coastal risk due to coastal protection projects • Map and database of waterfront edges • Revisions to coastal area design guidelines that incorporate climate change	No	
Utilize vegetation and stone to stabilize and armor unprotected shorelines	DOT	BDC, Development Community, DGS, DHCD, DOP, DOT, MDE, MDNR, MOEM	Short		To Be Determined with Future Data	No	
Encourage the development of integrated flood protection systems that use structural (engineering) and non-structural (wetlands) measures	USACE DOT MOEM DGS	BDC, Development Community, DGS, DHCD, DOP, DOT, MDE, MDNR, MOEM	Long	• Federal Emergency Management Funds • Wetland and Wildlife funds • City Capitol Budget	To Be Determined with Future Data	No	
Review and enhance coastal area design guidelines to better mitigate the impacts of flooding	MDNR/ Planning	BDC, Development Community, DGS, DHCD, DOP, DOT, MDE, MDNR, MOEM	Long	• Federal Funds • State Funds • Local Funds	To Be Determined with Future Data	No	
Enhance and strengthen waterfront zoning and permitting	Planning MDNR	BDC, Development Community, DGS, DHCD, DOP, DOT, MDE, MDNR, MOEM	Long	• Federal Funds • State Funds • Local Funds	To Be Determined with Future Data	No	
IN-13	(DPW)	Increase the resilience of all wastewater systems and protect them from current and projected extreme weather events					
Ensure all water and wastewater pumping stations have off-grid, on-site energy sources and/or reliable backup power sources by increasing the number of backups and pulling electricity from different grids	DPW/MEO	DPW, Energy Office, MOEM	Long	• Utility CIP	• Number or percentage of wastewater facilities protected or raised above flood protection levels • Map and database of wastewater systems • Reference to climate change and scientific projections in wastewater project documentation	Yes	ESF-3, 12
Evaluate the sewer system to identify and develop key areas for prevention of raw sewage overflows	DPW	DPW, MOEM	Long	• Federal Funds • State Funds • Local Funds		No	
Develop and adopt increased level of protection for construction, redevelopment, and design of all water and wastewater facilities that incorporate future climate projections	DPW	DPW, Energy Office, MOEM	Long	• Federal Funds • State Funds • Local Funds		No	
Retrofit and harden low-laying pumping stations and treatment plants in flood hazard areas	DPW	DPW, Energy Office, MOEM	Long	• Utility CIP	To Be Determined with Future Data	No	
Ensure effective operations and security for wastewater treatment plants if facilities are overwhelmed by hazard event	DPW	DPW, Energy Office, MOEM	Long		To Be Determined with Future Data	No	ESF-3; COOP
Establish the capability of wastewater treatment plants to function during large storm events and establish protocols for storms that overwhelm the system	DPW	DPW, Energy Office, MOEM	Long	Federal, State and Local funds	To Be Determined with Future Data	No	ESF-3
Increase stormwater recharge areas and quantity management to prevent flooding from overflows	DPW	DPW, MOEM	Long	• Utility CIP	To Be Determined with Future Data	No	
Conduct an assessment of the City's current water system to identify age, condition of infrastructure, capacity, weaknesses and areas for priority upgrades	DPW	DPW, MOEM	Long		To Be Determined with Future Data	No	ESF-3
Conduct and utilize a detailed risk assessment to determine vulnerability of the sewage treatment plant to prevent overflows from extreme storm events	DPW	DPW, Energy Office, MOEM	Long	• Federal Funds • State Funds • Local Funds		No	

ACTION	LEAD AGENCY	STAKEHOLDERS	ESTIMATED TIMEFRAME (short 1-2yrs, med 3-5yrs, long 6+)	FINANCING OPTIONS	PERFORMANCE METRICS	OVERLAP WITH CAP	EOP, ESF, COOP
Determine the elevation of sewage treatment buildings, tank construction details, and if the plant is at risk of back flow, for improvements to withstand coastal storm events	DPW	DPW, Planning, MOEM	Long	• Utility CIP	To Be Determined with Future Data	No	
Retrofit wastewater treatment facility and methane gas storage system to withstand seismic activity to protect against earthquakes. Design facility to exceed current building codes	DPW	DPW, DGS, MOEM	Long	• Federal Funds • State Funds • Local Funds	To Be Determined with Future Data	No	ESF-3
IN-14	(DPW)	Integrate resiliency, redundancy, and structural stability into the City’s drinking and water system to ensure safe and reliable water storage and distribution					
Repair leaks and improve connection from all City reservoirs and the Susquehanna River	DPW	BCHD, BCRP, DHCD, DHMH, DOP, DOT, DPW, MCC, MDE, Regional Watershed Groups, Reservoir Watershed Management Committee, SHA, Water Utility	Short-Long	• The City’s existing capital plan • Federal Funding Sources	• Number and percentage of facilities that have integrated security and preparedness into budgeting, training, and manpower responsibilities • Percentage of utilities that can meet minimum daily demand with their primary production/treatment plant non-functional	No	
Provide water conservation education, and continue to protect our watersheds to assist in maintaining water quality	DPW MDNR	BCHD, BCRP, DHCD, DHMH, DOP, DOT, DPW, MCC, MDE, Regional Watershed Groups, Reservoir Watershed Management Committee, SHA, Water Utility	Short	• Grant Progams • Educational Budget of Stormwater Utility	To Be Determined with Future Data	Yes	
Ensure dam emergency plans account for impacts of climate change	DPW MOEM	BCHD, BCRP, DHCD, DHMH, DOP, DOT, DPW, MCC, MDE, Regional Watershed Groups, Reservoir Watershed Management Committee, SHA, Water Utility	Medium		To Be Determined with Future Data	No	
Identify and document post damage responsibilities in memorandums of understanding as addendums to Reservoir Watershed Management Agreement	DPW	MOEM, Planning,	Short			No	ESF-3 ESF-5
Review dam capacity, load and failure points and review them against 1,000 year and 10,000 year precipitation events	DPW MOEM	BCHD, BCRP, DHCD, DHMH, DOP, DOT, DPW, MCC, MDE, Regional Watershed Groups, Reservoir Watershed Management Committee, SHA, Water Utility	Medium	Federal Emergency Grants	To Be Determined with Future Data	No	
Conduct a study to determine seismic design standards and seismic resiliency of drinking water distribution system (tunnels, piping, clean water pump stations, dams, shafts, and tanks)	DPW	BCHD, BCRP, DHCD, DHMH, DOP, DOT, DPW, MCC, MDE, Regional Watershed Groups, Reservoir Watershed Management Committee, SHA, Water Utility	Medium	Federal Emergency Grants	To Be Determined with Future Data	No	ESF-3
Increase stormwater recharge areas and quantity management	DPW	BCHD, BCRP, DHCD, DHMH, DOP, DOT, DPW, MCC, MDE, Regional Watershed Groups, Reservoir Watershed Management Committee, SHA, Water Utility	Short			Yes	ESF-3
Evaluate the impacts of sediment loading on reservoir capacity	DPW	BCHD, BCRP, DHCD, DHMH, DOP, DOT, DPW, MCC, MDE, Regional Watershed Groups, Reservoir Watershed Management Committee, SHA, Water Utility	Short	Utility CIP funds	To Be Determined with Future Data	No	
Manage watershed forests to provide maximum benefits for water quality and to maintain resiliency during extreme weather events	MDNR	BCHD, BCRP, DHCD, DHMH, DOP, DOT, DPW, MCC, MDE, Regional Watershed Groups, Reservoir Watershed Management Committee, SHA, Water Utility	Short		To Be Determined with Future Data	Yes	

ACTION	LEAD AGENCY	STAKEHOLDERS	ESTIMATED TIMEFRAME (short 1-2yrs, med 3-5yrs, long 6+)	FINANCING OPTIONS	PERFORMANCE METRICS	OVERLAP WITH CAP	EOP, ESF, COOP
Adopt new policies on salt application to prevent high salinization on drinking water supplies	DOT	DPW, MDE, SHA, Balto Co Govt, Regional watershed groups, NGO's	Medium	<ul style="list-style-type: none"> <li>Federal Funds</li> <li>State Funds</li> <li>Local Funds</li> </ul>	To Be Determined with Future Data	No	ESF-3, 10, 8
Establish a structured Firming Program to maintain adequate storage and water quality in the source-water reservoirs during drought conditions	DPW MOEM	BCHD, BCRP, DHCD, DHMH, DOP, DOT, DPW, MCC, MDE, Regional Watershed Groups, Reservoir Watershed Management Committee, SHA, Water Utility	Medium		To Be Determined with Future Data		
Maintain appropriate agreements with Susquehanna River Basin Commission (SRBC) and the Exelon Power Company to ensure adequate water withdraws from the Susquehanna River during drought emergency	DPW	BCHD, BCRP, DHCD, DHMH, DOP, DOT, MOEM, MCC, MDE, Regional Watershed Groups, Reservoir Watershed Management Committee, SHA, Water Utility	Medium		To Be Determined with Future Data		
IN-15	(DPW)	Conduct an assessment that evaluates and improves all pipes' ability to withstand extreme heat and cold					
Replace old and malfunctioning pipes with new pipes or retrofit existing pipes with new lining	DPW	DOT	Short to Medium; Ongoing	<ul style="list-style-type: none"> <li>The analysis of City infrastructure is an ongoing priority and could be completed as part of this ongoing process.</li> <li>The City's existing capital plan</li> </ul>	<ul style="list-style-type: none"> <li>Map and database of water pipes highlighting key vulnerabilities</li> <li>Ongoing maintenance and construction of pipe systems with increased resiliency for natural hazards</li> </ul>	Yes	ESF-3
Evaluate and utilize new technology that allows for greater flexibility in pipes as they are replaced	DPW	DOT	Short to Medium; Ongoing	Federal Grant Programs, City Utility CIP	To Be Determined with Future Data		ESF-4
IN-16	(DPW)	Enhance and expand stormwater infrastructure and systems					
Implement the requirements of Baltimore's MS4 (separate stormwater and sewer system) permit	DPW	Community Groups, DOT, DPW, MOEM, MDNR, NGOs, Private Developers, Stormwater Utility	Short	<ul style="list-style-type: none"> <li>The Stromwater Utility existing capital plan</li> </ul>	<ul style="list-style-type: none"> <li>Storm drain upgrades in areas with reoccurring floods</li> <li>Installation and utilization of flood mitigation devices and strategies</li> <li>Revisions to storm drain design guidelines</li> </ul>	No	
Prioritize storm drain upgrades and replacement in areas with reoccurring flooding	DPW	DOT, Community Groups	Short	Stormwater Utility		No	
Install backflow-prevention devices or other appropriate technology along waterfront to reduce flood risk	DPW	Community Groups, DOT, MOEM,	Medium-Long	<ul style="list-style-type: none"> <li>Federal Funds</li> <li>State Funds</li> <li>Local Funds</li> </ul>		No	
Preserve and protect natural drainage corridors	DPW	Community Groups, DOT, DPW, MOEM, MDNR, NGOs, Private Developers, Stormwater Utility	Short	Ongoing as part of environmental enforcement efforts and stream restoration projects.	To Be Determined with Future Data	No	
Review and revise storm drain design on a continuous basis, to accommodate projected changes in intense rainfall	DPW	Community Groups, DOT, DPW, MOEM, MDNR, NGOs, Private Developers, Stormwater Utility, USACE	Long, Ongoing	<ul style="list-style-type: none"> <li>The analysis of City infrastructure is an ongoing priority and could be completed as part of this ongoing process.</li> <li>The City's existing capital plan</li> </ul>	To Be Determined with Future Data	No	
IN-17	(DOP)	Modify urban landscaping requirements and increase permeable surfaces to reduce stormwater runoff					
Support existing stormwater requirements and continue to evaluate and improve Best Management Practices	Planning	BCRP, BDW, BDC, Citizens, DHCD, DOP, DOT, DPW, NGOs, Private Developers	Medium		<ul style="list-style-type: none"> <li>Revisions of urban landscape requirement guidelines</li> <li>Percentage of land covered by impervious surfaces</li> <li>Number of vegetative roofs or other water conservation elements</li> </ul>	No	ESF-3
Encourage urban landscaping requirements and permeable surfaces into community managed open spaces	Planning	BCRP, BDW, BDC, Citizens, DHCD, DOP, DOT, DPW, NGOs, Private Developers	Short	Small grants programs at Parks and People, Other Foundation Grants	To Be Determined with Future Data	No	ESF-3
Utilize water conservation elements such as green roofs, rain gardens, cisterns, and bioswales on residential, commercial, industrial, and City-owned properties to capture stormwater	HCD, Planning, DPW	BDC, BCRP, BDW, Citizens, DHCD, DOP, DOT, DPW, NGOs, Private Developers	Short-Medium		To Be Determined with Future Data	Yes	ESF-3
Encourage permeable paving on low-use pathways	Planning	BCRP, BDC, Citizens, DHCD, DOP, DOT, DPW, NGOs, Developers	Medium			No	



ACTION	LEAD AGENCY	STAKEHOLDERS	ESTIMATED TIMEFRAME (short 1-2yrs, med 3-5yrs, long 6+)	FINANCING OPTIONS	PERFORMANCE METRICS	OVERLAP WITH CAP	EOP, ESF, COOP
IN-18	(DPW)	Evaluate and support DPW's stream maintenance program.					
Review and improve status of standing maintenance requirements	DPW	DOT, DOP, MDE, MDNR, MOEM, USACE	Ongoing	<ul style="list-style-type: none"> <li>The analysis of City infrastructure is an ongoing priority and could be completed as part of this ongoing process.</li> <li>The City's existing capital plan</li> </ul>	<ul style="list-style-type: none"> <li>Number and scale of stream restoration projects</li> <li>Revisions to maintenance requirements that exceed standard minimums to account for projected changes in climate</li> </ul>	No	
Ensure adequate funding is in place to support stream maintenance	DPW	DOT, DOP, MDE, USACE	Ongoing	Stormwater Utility CIP	To Be Determined with Future Data	No	
Identify opportunities where stream restoration efforts will off-set maintenance costs	DPW	DOT, DNR, MDE, MDNR, MOEM, USACE	Ongoing		To Be Determined with Future Data	No	
Identify interdependencies and benefits of stream maintenance with other transportation programs	DOT	DPW, MDE, MDNR	Ongoing		To Be Determined with Future Data	No	
Clear streams on a regular basis, prioritize dredging the stream beds, and increase inspection and cleaning of culverts and storm drains to prevent flooding	DPW	DOT, MDE, MOEM, USACE	Ongoing	Stormwater and DOT ongoing maintenance programs	To Be Determined with Future Data	No	ESF-3
IN-19	(DPW)	Support and increase coordination and information sharing across jurisdictions to better enable mitigation of cross-border impacts on the regions watersheds (e.g., understanding flood conditions upstream in the County)					
Partner with local counties to evaluate major tributaries in all watersheds to determine best management practices for capturing run-off and slowly releasing it (stormwater quantity management)	DPW	BCRP, County Governments, DOP, DPW, MCC, MDNR, NGOs, Stormwater Utility	Ongoing		<ul style="list-style-type: none"> <li>Discussion of cross-jurisdictional concerns within comprehensive watershed plans</li> <li>Coordinated evaluation of regional conditions affecting watersheds</li> </ul>	No	
Encourage information sharing within the Chesapeake Bay community to assist in developing best management practices	DPW	County Governments, DOP, MDNR, NGOs	Ongoing		To Be Determined with Future Data	No	
IN-20	(DPW)	Reevaluate and support a comprehensive debris management plan for hazard events					
Investigate best practices for managing and disposing of downed trees, yard waste, building debris, as well as additional household garbage	DPW	Planning, MOEM, R&P, MOEM, BGE, NGOs	Short		<ul style="list-style-type: none"> <li>Development of a comprehensive debris management plan</li> <li>Reference to climate change and hazard resiliency in debris management program documentation</li> </ul>	No	ESF-3
Expand and integrate existing programs to reduce or intercept debris before it gets into the streams and harbor	DPW	DPW, DOT, NGOs	Medium	Stormwater Utility Operating Progams and CIP	To Be Determined with Future Data	No	
Develop and promote solid waste management actions for citizens to implement before a hazard event	DPW	DPW, MOEM, NGOs	Short	Existing trash management education budgets.	To Be Determined with Future Data	Yes	
IN-21	(DOP)	Encourage the integration of climate change and natural hazards into private and State planning documents, systems, operations, and maintenance					
Incorporate consideration of hazards and climate adaptation efforts into all plans, systems, operations, and maintenance.	DOP	DPW, DOT, DGS, SHA, MTA, MEMA, MOEM	Medium		<ul style="list-style-type: none"> <li>Percentage of hospitals and healthcare facilities incorporating resiliency into programs and planning</li> <li>Reference to hazard mitigation and climate adaptation actions in new and updated planning documents statewide</li> <li>Coordination between jurisdictions for improved resiliency efforts</li> </ul>	Yes	ESF-1
Ensure Red Line planning incorporates adaptation strategies.	MTA	DOT, DOP	Short		To Be Determined with Future Data	Yes	ESF-1
Ensure hazard scenarios, utilized in vulnerability assessments, are at a minimum 25% greater in intensity and impact than historical record events to date.	DOP	MOEM, DOT, Health Care Community, Hospitals, MD2HE, MEMA, MTA, MOEM, SHA	Ongoing		To Be Determined with Future Data	No	
Develop guidelines for hospital, health care facilities and other institutional entities (e.g. Universities).	MOEM	DOT, Health Care Community, Hospitals, MD2HE, MEMA, MTA, MOEM, SHA	Ongoing	Utilize Hazard Mitigation Grant Programs	To Be Determined with Future Data	No	
Partner with regional air quality institutions to integrate air quality measures and messaging into City climate change policy efforts	BCHD	Health Care Community, Hospitals, MD2HE, MEMA, MTA, MOEM, SHA	Ongoing			Yes	

ACTION	LEAD AGENCY	STAKEHOLDERS	ESTIMATED TIMEFRAME (short 1-2yrs, med 3-5yrs, long 6+)	FINANCING OPTIONS	PERFORMANCE METRICS	OVERLAP WITH CAP	EOP, ESF, COOP
IN-22	(DOP)	Develop City policy which requires new city government capital improvement projects to incorporate hazard mitigation principles					
Discourage new public projects in hazard-prone areas such as floodplains or the coastal high hazard areas	DOP	BCHD, BCRP, DGS, DOP, DOT, DPW, MOEM	Short to Medium; Ongoing	• The City's existing capital plan	<ul style="list-style-type: none"> <li>• Percent of capital improvement projects which incorporate hazard mitigation principles</li> <li>• Projects initiated in hazard-prone areas</li> <li>• Establishment of above-code design requirements for use by critical facilities</li> </ul>	No	ESF-3, 5
Utilize hazard mitigation design requirements that exceed minimum standards for critical facilities	DOP	BCHD, BCRP, DGS, DOP, DOT, DPW, Energy Office, MOEM	Short to Medium; Ongoing		To Be Determined with Future Data	No	
Use comprehensive infrastructure assessments to identify infrastructure in need of replacement and prioritize funding for those projects	DGS	BCHD, BCRP, DOP, DOP, DOT, DPW, Energy Office, MOEM	Short to Medium; Ongoing		To Be Determined with Future Data	No	
BL-1	(MOEM)	Develop and implement hazard protections for critical facilities including hospitals, fire stations, police stations, hazardous material storage sites, etc.					
Conduct educational outreach for city-owned, residential, commercial, and industrial buildings about proper storage and disposal of hazardous materials and heating oil	MOEM	BGE, DGS, DOP, DPW, Hospitals, Material Storage Sites	Short	Utilize Hazard Mitigation Grant Programs	<ul style="list-style-type: none"> <li>• Number and percentage of Critical facilities with hazard protection plans that incorporate natural hazard resilience efforts</li> <li>• Number and percent of utilities with physical and/or procedural controls in place to safeguard hazardous chemicals.</li> </ul>	No	
Require hazardous materials stored in city-owned, residential, commercial, and industrial buildings within the floodplain to be elevated a minimum of three feet above the freeboard	MOEM	BGE, DGS, DOP, Hospitals, Material Storage Sites	Medium		To Be Determined with Future Data	No	ESF-5, 10
Require new critical facilities to be designed with redundant operating systems	Planning MOEM	BGE, DGS, DOP, Hospitals, Material Storage Sites	Long	Existing Capitol Budgets	To Be Determined with Future Data	No	ESF-3, 5
Require pre-wiring for generators at all facilities designated critical to agency operations and hazard response	DGS	BGE, DGS, DOP, Hospitals, Material Storage Sites	Medium	Existing Capitol Budgets	To Be Determined with Future Data	No	ESF-3, 5, 12
Develop stricter flood regulations for critical facilities	DOP	BGE, DGS, MOEM, Hospitals, Material Storage Sites	Medium		To Be Determined with Future Data	No	ESF-3, 5
Develop partnership with private fueling stations to provide backup generators in exchange for a commitment to fueling emergency response vehicles during a hazard event	MOEM	BGE, DGS, DOP, Hospitals, Material Storage Sites	Medium		To Be Determined with Future Data	No	
Ensure storage of and access to fuel for generators in critical facilities	MOEM	BGE, DGS, DOP, Hospitals, Material Storage Sites	Medium		To Be Determined with Future Data	No	
BL-2	(DOP)	Enhance City building codes that regulate building within a floodplain or near the waterfront					
Design new projects to be resilient to a mid-century sea level rise projection and adaptable to longer-term impacts	DOP, HCD, MOEM	Baltimore County, BDC, DPW, MDE, Utilities		Existing Capitol Budgets	<ul style="list-style-type: none"> <li>• Federal dollars secured for coastal protection projects</li> <li>• Number or square footage of buildings implementing flood resiliency measures</li> <li>• Number and percentage of buildings with reduced coastal risk due to coastal protection projects</li> <li>• Revisions to building codes that exceed minimum standards for addressing building resilience within a floodplain and near the waterfront</li> </ul>	No	ESF-3, 5
Incorporate climate change and coastal hazard considerations into building codes by increasing freeboard requirements to two feet as buildings are redeveloped and renovated	DOP	Baltimore County, BDW, DHCD, DOP, DPW, MDE, Utilities	Short		To Be Determined with Future Data	No	ESF-3, 5
Continue to regulate to the existing tidal floodplain delineation as adopted 2 February, 2012	DOP	Baltimore County, BDC, DHCD, DOP, DPW, MDE, Utilities	Short		To Be Determined with Future Data	No	ESF-3, 5, 12

ACTION	LEAD AGENCY	STAKEHOLDERS	ESTIMATED TIMEFRAME (short 1-2yrs, med 3-5yrs, long 6+)	FINANCING OPTIONS	PERFORMANCE METRICS	OVERLAP WITH CAP	EOP, ESF, COOP
Incorporate outfall elevation regulations	DPW, DOP	Baltimore County, BDW, DHCD, DOP, MDE	Short-Medium		To Be Determined with Future Data	No	
Develop Construction Best Practices for development within floodplains	DOP	Baltimore County, BDC, DHCD, DOP, DPW, MDE, Utilities	Short		To Be Determined with Future Data	Yes	ESF-3
Train all code enforcement and building inspectors about flood proofing techniques and the local floodplain ordinance	MDE, DOP	Baltimore County, BDW, DHCD, DPW, MDE, Utilities	Medium		To Be Determined with Future Data	No	
Encourage green roof installations to include vegetated and reflective technologies for all new commercial, industrial, multifamily, and city-owned development	HCD	BDC, DHCD, DOP, DPW, MDE, Utilities	Medium		To Be Determined with Future Data	Yes	ESF-5
BL-3	(DOP)	Strengthen City zoning, floodplain and construction codes to integrate anticipated changes in climate					
Review zoning and strengthen language (where necessary) in order to better protect citizens and increase resiliency in buildings	DOP	BDC, City Government, Community Groups, DHCD, DGS, DPW, NAHB, NGOs, MDE, Private developers, Private land owners	Medium	Local Funding	• Revisions of city codes to incorporate scientific climate projections • Reference to climate change in current and updated zoning, floodplain, and construction code documents • The inclusion of standards that exceed NFIP minimums in zoning and building code documents	No	ESF-3, 5
Review and amend existing building and floodplain regulations to require more flood resistant new and existing structures when located in the floodplain	DOP	BDC, City Government, Community Groups, DHCD, DGS, DPW, NAHB, NGOs, MDE, Private developers, Private land owners	Medium, Ongoing	Local Funding	To Be Determined with Future Data	No	ESF-3, 5
Utilize open space category in zoning code to protect sensitive areas (e.g. stormwater sites, steep slopes, floodways, etc.)	DOP	BDW, City Government, Community Groups, DHCD, DGS, DPW, NAHB, NGOs, MDE, Private developers, Private land owners	Medium		To Be Determined with Future Data	No	ESF-5
Review and increase Flood Protection Elevation (Base Flood Elevation + Freeboard) standards to the highest available State, Federal or local elevation level	DOP	BDW, City Government, Community Groups, DHCD, DGS, DPW, NAHB, NGOs, MDE, Private developers, Private land owners	Short	• Federal Funds • State Funds • Local Funds	To Be Determined with Future Data	No	ESF-5
Evaluate and update stormwater management regulations to avoid increases in downstream flooding	DOP	BDC, Community Groups, DHCD, DGS, DPW, NAHB, NGOs, MDE, Private developers, Private land owners	Short	• Federal Funds • State Funds • Local Funds	To Be Determined with Future Data	No	ESF-3
Adopt design requirements that include wet and dry flood proofing techniques	DOP	BDC, Community Groups, DHCD, DGS, DPW, NAHB, NGOs, MDE, Private developers, Private land owners	Short	• Federal Funds • State Funds • Local Funds	To Be Determined with Future Data	No	ESF-3, 5
Review and consider adoption of the International Green Construction code	HCD	BDC, DOP, Community Groups, DHCD, DGS, DPW, NAHB, NGOs, MDE, Private developers, Private land owners	Short Ongoing	Local Funding		Yes	ESF-5
BL-4	(DOP)	Update a list of flood prone and repetitive loss buildings to consider for acquisition					
Continue to acquire property (including repetitive loss properties) in the special flood hazard areas where feasible and appropriate	DOP	DHCD, MEMA, MDE, Office of Real Estate	Ongoing	• Additional funds may be needed for print publications and web-based materials • Explore funding opportunities from MEMA, FEMA, MOEM, and other agencies	• Inventory and database of flood-prone and repetitive loss properties • Acquisition of flood-prone and repetitive loss properties	No	ESF-3, 5
Prioritize Hazard Mitigation Assistance funding for mitigation of repetitive loss properties and severe repetitive loss properties	MOEM	DHCD, DOP, MEMA, MDE, Office of Real Estate	Ongoing	• Federal Funds • State Funds • Local Funds	To Be Determined with Future Data	No	ESF-5
Develop a creative financing program for flood resiliency in industrial buildings	BDC	DHCD, DOP, MEMA, MDE, Office of Real Estate	Ongoing	• Federal Funds • State Funds • Local Funds	To Be Determined with Future Data	No	

ACTION	LEAD AGENCY	STAKEHOLDERS	ESTIMATED TIMEFRAME (short 1-2yrs, med 3-5yrs, long 6+)	FINANCING OPTIONS	PERFORMANCE METRICS	OVERLAP WITH CAP	EOP, ESF, COOP
BL-5	(DHCD)	Improve wind resiliency of new and existing structures					
Review local building codes to determine if revisions are needed to improve the structures ability to withstand greater wind velocities and storm impacts	HCD	BDC, Commercial Building Owners, DGS, DOP, MDE, MOEM, Private Developers	Short	• Federal Funding Sources	<ul style="list-style-type: none"> <li>• New construction and renovation projects utilizing increased wind resiliency standards</li> <li>• Revision of local codes (if necessary) to raise wind resiliency requirements</li> <li>• Renovations for improved wind resiliency at emergency shelters</li> </ul>	No	ESF-3
Retrofit emergency shelter windows to withstand winds associated with coastal storm events	DGS	Commercial Building Owners, DCHD, DGS, DOP, MDE, MOEM, Private Developers	Long	• Federal Emergency Management Funding	To Be Determined with Future Data	No	ESF-3,6
BL-6	(DGS)	Evaluate various seismic design enhancements using prototypical Baltimore City building types					
Determine engineering effectiveness and cost-benefit of various earthquake mitigation measures using computer modeling	DGS	DCHD, MOEM, USGS	Short	<ul style="list-style-type: none"> <li>• The analysis of City infrastructure is an ongoing priority and could be completed as part of this ongoing process.</li> <li>• The City's existing capital plan</li> </ul>	• Completion of a study to evaluate potential effectiveness and feasibility of engineering measures.	No	ESF-3
BL-7	(DOP)	Retrofit existing buildings in the designated Flood Area to increase resiliency					
Target and encourage flood resiliency retrofits for buildings in the designated Flood Area	DOP	BDC, DHCD, DPW, Federal and State Partners, MCC, MON, NGOs, MOEM	Long	<ul style="list-style-type: none"> <li>• Federal Funding Sources</li> <li>• Housing Recovery Funding</li> <li>• NFIP</li> <li>• Commercial Insurance Policies</li> <li>• FEMA Public Assistance Program</li> </ul>	<ul style="list-style-type: none"> <li>• Number or square footage of buildings implementing flood resiliency measures</li> <li>• Inventory of existing buildings within the 100-year floodplain and database of resiliency measures taken</li> <li>• Renovation of existing buildings in the 100-year floodplain</li> <li>• Creation of a mandate for flood resiliency retrofits within flood-prone areas</li> <li>• Modifications to exposed public housing facilities</li> </ul>	No	
Prioritize retrofitting and increasing resiliency of Public Housing units in the designated Flood Area and other high risk areas	DHCD, DOP	BDC, DPW, Federal and State Partners, MON, MOEM	Long			No	
Educate building owners within the floodplain to ensure that all electrical, mechanical, and key building systems are above the base flood elevation and meet existing codes	DOP	BDC, DHCD, DPW, Federal and State Partners, MCC, MON, NGOs, MOEM	Long			No	
BL-8	(DGS)	Improve resource conservation practices in all city owned buildings					
Install energy-efficient and low-water-use equipment during renovations in all City-owned buildings	DGS	MOE, BCPSS, DCHD, DGS, DOP	Medium	<ul style="list-style-type: none"> <li>• MEA's Jane E. Lawton Conservation Loan Program</li> <li>• MEA's State Agency Loan Program (SALP)</li> </ul>	<ul style="list-style-type: none"> <li>• Resource conservation measures used in city-owned buildings</li> <li>• Mandate requiring resource conservation measures in city-owned buildings</li> <li>• Energy efficiency and weatherization upgrades at Baltimore City Schools/Reference of efficiency and weatherization upgrades within BCPSS Ten-Year plan</li> </ul>	Yes	
Support energy efficiency, weatherization and renewable energy generation as part of Baltimore City schools ten-year plan	DOP	MOE, BCPSS, DCHD, DGS, DOP	Short	BCPSS CIP	To Be Determined with Future Data	Yes	
Update Baltimore green building standards by offering multiple compliance paths for new and substantially renovated construction	DHCD, DOP	BCPSS, DCHD, DGS, DOP	Medium			Yes	



ACTION	LEAD AGENCY	STAKEHOLDERS	ESTIMATED TIMEFRAME (short 1-2yrs, med 3-5yrs, long 6+)	FINANCING OPTIONS	PERFORMANCE METRICS	OVERLAP WITH CAP	EOP, ESF, COOP
BL-9	(DOP)	Conduct educational outreach to increase resource conservation practices in private buildings					
Conduct educational outreach and provide information about savings related to reduced water use	DPW	BCPSS, BGE, BOS, DOP, Exelon, MON, NGOs, MOEM	Short	<ul style="list-style-type: none"> <li>Housing Recovery Funding</li> <li>MEA's Jane E. Lawton Conservation Loan Program</li> </ul>	<ul style="list-style-type: none"> <li>Directory of print and web-based educational materials created and delivered to City stakeholders, residents, and property owners</li> <li>Inventory of agency publications made available to residents and property owners</li> <li>Creation and use of training courses, workshops and seminars presented to residents, property owners, and City officials</li> <li>The number of CRS credits achieved through education and outreach activities.</li> </ul>	Yes	ESF-5
Educate and provide resources and information about utility rebate programs	BGE	BCPSS, DOP, DPW, Exelon, MON, NGOs, MOEM	Short		To Be Determined with Future Data	Yes	ESF-11
Provide energy efficiency education to include information on conserving electrical power. Emphasize reductions during summer peak demand hours	DOP	BCPSS, BGE, DPW, Exelon, MON, NGOs, MOEM	Short	State, Local and Foundation Funding	To Be Determined with Future Data	Yes	
BL-10	(DOP)	Use HAZUS-MH computer modeling to determine losses generated by coastal storms					
Utilize engineering studies and cost-benefit analyses to identify additional mitigation needs and actions	DOP	FEMA, MEMA, MOEM, NOAA	Short	Emergency Management Grant Programs	To Be Determined with Future Data	No	
Evaluate various building design enhancements to reduce losses generated by earthquakes, floods, and storm surge	DOP	DHCD,FEMA, MEMA, MOEM, NOAA	Short		To Be Determined with Future Data	No	ESF-3
NS-1	(BCRP)	Utilize green corridors and parks to help protect surrounding communities from the impacts of hazard events					
Evaluate green corridors and parks for possible improvements for floodplain management	Rec & Parks	DOP, Community Groups, DPW, NGO's	Medium		<ul style="list-style-type: none"> <li>Reference of a connected green corridor system in City and community planning documents</li> <li>Increase of green spaces and vegetative cover in the city</li> <li>Resiliency renovations to park facilities and buildings</li> </ul>	Yes	
Increase the resiliency of park facilities and buildings	R&P	DOP, MOEM, Community Groups, NGOs	Medium	Ongoing R&P Capitol Budget	To Be Determined with Future Data	Yes	
NS-2	(BCRP Forestry)	Increase and enhance the resilience and health of Baltimore's urban forest					
Anticipate the impacts of future changes in temperature and weather on the urban forest by developing a comprehensive list of plant and tree species known to have a broad range of environmental tolerances	Rec & Parks	BGE, Community Groups, DOP, DOT, DPW, MDNR, NGOs	Short	Local and Foundation Funding	<ul style="list-style-type: none"> <li>Size and growth of Baltimore's Urban Forest</li> <li>Percentage of facilities in flood-prone zones being upgraded for greater resiliency</li> <li>Number of trees inspected, pruned, and maintained</li> <li>Completion of a comprehensive tree inventory</li> <li>Formation of a comprehensive tree maintenance program</li> </ul>	Yes	
Establish and routinely update a comprehensive tree inventory to anticipate insect and forest structural impacts of climate change	Rec & Parks	BGE, Community Groups, DOP, DOT, DPW, MDNR, NGOs	Short	State, Local and Foundation Funding	To Be Determined with Future Data	Yes	
Establish a comprehensive maintenance program that includes pruning for sound structure and the removal of hazardous limbs and trees. First focus on areas where vulnerable infrastructure is nearby such as energy supply and roads	Rec & Parks	USFS, BGE, Community Groups, DOP, DOT, DPW, MDNR, NGOs	Medium	R&P Operating Budget Federal, State, Local and Foundation Funding	To Be Determined with Future Data	No	
Continually adjust and modify planting details and specifications to assure the health and longevity of trees	Rec & Parks	USFS, BGE, Community Groups, DOP, DOT, DPW, MDNR, NGOs	Short	Federal, State, Local and Foundation Funding	To Be Determined with Future Data	Yes	
Increase the urban tree canopy and target areas with urban heat island impacts	Rec & Parks	USFS, BGE, Community Groups, DOP, DOT, DPW, MDNR, NGOs	Ongoing	Baltimore City Capitol Budget, Mitigation Funds, Forest Conservation Program	To Be Determined with Future Data	Yes	

ACTION	LEAD AGENCY	STAKEHOLDERS	ESTIMATED TIMEFRAME (short 1-2yrs, med 3-5yrs, long 6+)	FINANCING OPTIONS	PERFORMANCE METRICS	OVERLAP WITH CAP	EOP, ESF, COOP
NS-3	(DOP)	Create an interconnected network of green spaces to support biodiversity and watershed based water quality management					
Utilize the Growing Green Initiative to increase green spaces in areas where there is available vacant land in order to reduce the heat island effect	Planning	HCD, DPW, Rec & Parks, BDC, State Agencies, Federal Agencies, NGO's, Community Groups	Ongoing	<ul style="list-style-type: none"> <li>Federal Grants</li> <li>State Grants</li> <li>Foundation Grants</li> </ul>	<ul style="list-style-type: none"> <li>Reference of a connected green network in City and community planning documents</li> <li>Percentage of facilities in flood-prone zones being upgraded for greater resiliency</li> <li>Number of trees inspected, pruned, and maintained</li> <li>Identification of a benchmark biodiversity index and continued evaluation</li> <li>Percentage of green spaces within the watershed areas</li> <li>Utilization of natural stormwater management technologies</li> </ul>	Yes	
Convert vacant land and row houses into meaningful and connected open space	HCD	BCRP, BDC, Community Groups, DHCD, DOP, DPW, Federal Agencies, MDNR, NGOs, State Agencies	Ongoing	<ul style="list-style-type: none"> <li>Baltimore City Bond Funds</li> </ul>	To Be Determined with Future Data	Yes	
Complete a habitat analysis and plan for the City	DOP	BCRP, BDC, Community Groups, DHCD, DOP, DPW, Federal Agencies, MDNR, NGOs, State Agencies	Ongoing	<ul style="list-style-type: none"> <li>Federal Grants</li> <li>State Grants</li> <li>Foundation Grants</li> </ul>	To Be Determined with Future Data	Yes	
Create a strategic plan that identifies areas of focus for tree planting, stormwater management, and forest preservation	DOP	BCRP, BDC, Community Groups, DHCD, DOP, DPW, Federal Agencies, MDNR, NGOs, State Agencies	Ongoing	<ul style="list-style-type: none"> <li>Federal Grants</li> <li>State Grants</li> <li>Foundation Grants</li> </ul>	To Be Determined with Future Data	Yes	
Certify Baltimore as a Community Wildlife Habitat through the National Wildlife Foundation (NWF)	NWF Planning	BCRP, BDC, Community Groups, DHCD, DOP, DPW, Federal Agencies, MDNR, NGOs, State Agencies	Ongoing	<ul style="list-style-type: none"> <li>Federal Grants</li> <li>State Grants</li> <li>Foundation Grants</li> </ul>	To Be Determined with Future Data	Yes	
NS-4	(DOP)	Expand, protect and restore riparian areas in the city					
Conduct regular maintenance of stream restoration projects and stormwater quality facilities	DPW	BCRP, DOP, DPW	Ongoing	<ul style="list-style-type: none"> <li>Federal Grants</li> <li>State Grants</li> <li>Local Grants</li> <li>Foundation Grants</li> </ul>	<ul style="list-style-type: none"> <li>Number and scale of stream restoration projects</li> <li>Use of riparian buffers in all new development and capital projects</li> <li>Revisions (if appropriate) to floodplain and stream buffer regulations</li> </ul>	No	
Evaluate current regulations regarding stream buffers and floodplains and modify them (if appropriate) to assure they adequately protect perennial stream corridors	Planning	BCRP, DOP, DPW	Ongoing	<ul style="list-style-type: none"> <li>Federal Grants</li> <li>State Grants</li> <li>Local Grants</li> <li>Foundation Grants</li> </ul>	To Be Determined with Future Data		
NS-5	(DOP)	Preserve and create new coastal buffer efforts and support creating more wetlands and soft shoreline along coastal areas					
Integrate natural buffer requirements, such as wetlands and soft shorelines, into new development or redevelopment	Planning	BCRP, BDC, DOP, DPW, NGOs, State Agencies, Waterfront Partnership	Short	<ul style="list-style-type: none"> <li>Federal Grants</li> <li>State Grants</li> <li>Local Grants</li> <li>Foundation Grants</li> </ul>	<ul style="list-style-type: none"> <li>Linear miles of coastal edge restoration</li> <li>Federal dollars secured for coastal protection projects</li> <li>Number and percentage of buildings with reduced coastal risk due to coastal protection projects</li> <li>Number and scale of stream and coastline restoration projects</li> <li>Use of natural buffer requirements in all new waterfront development and capital projects</li> <li>Completion of an evaluation of property in the Critical Area</li> </ul>	No	
Complete stream restoration projects in Baltimore City and County stream valleys that lead into the coastal wetlands so as to increase habitat and reduce sedimentation	DPW	BCRP, BDC, DOP, DPW, NGOs, State Agencies, Waterfront Partnership	Long	<ul style="list-style-type: none"> <li>Federal Grants</li> <li>State Grants</li> <li>Local Grants</li> <li>Foundation Grants</li> </ul>	To Be Determined with Future Data	No	
Identify and evaluate areas in the Critical Area buffer to prioritize ecological buffer restoration efforts	Planning	BCRP, BDC, DOP, DPW, NGOs, State Agencies, Waterfront Partnership	Medium	<ul style="list-style-type: none"> <li>Critical Area Buffer Offset Fees</li> <li>Private Funds</li> </ul>	To Be Determined with Future Data	No	

ACTION	LEAD AGENCY	STAKEHOLDERS	ESTIMATED TIMEFRAME (short 1-2yrs, med 3-5yrs, long 6+)	FINANCING OPTIONS	PERFORMANCE METRICS	OVERLAP WITH CAP	EOP, ESF, COOP
NS-6	(DPW)	Require the City’s drought management plan to account for changes in climate					
Map drought risks and water availability via climate change scenarios	DPW	BCHD, Water Utility	Short	<ul style="list-style-type: none"> <li>Federal Grants</li> <li>State Grants</li> <li>Foundation Grants</li> </ul>	<ul style="list-style-type: none"> <li>Reference of climate change in drought management plans</li> <li>Modification of drought management plans to exceed current standards</li> </ul>	No	
Update drought management plans to recognize changing conditions	DPW	BCHD, Water Utility	Short		To Be Determined with Future Data	Yes	
NS-7	(DOP)	Integrate climate change and natural hazards planning into small watershed action plans (SWAPs)					
Review existing watershed management plans and identify future actions to address climate impacts		DOP, DPW, NGO’s	Ongoing		<ul style="list-style-type: none"> <li>Reference of hazard mitigation and climate change in new and updated SWAP planning documents</li> <li>Integration of standards that exceed current minimums for watershed planning</li> </ul>		
NS-8	(DOP)	Conduct detailed ongoing analysis of climate information, trends in storm events and hydrology to support policy changes responding to climate change					
Expand the use of climate information (e.g. seasonal forecasts) in water resources planning and management.	Planning	BDC, FEMA, MDE, MDNR, MEMA, NGOs, State Agencies, Waterfront Partnership	Short	State, Local and Foundation Funding	<ul style="list-style-type: none"> <li>Reference of sea level rise in new and updated flood regulations and planning documents</li> <li>Integration of standards that exceed current minimum design and development restrictions to account for sea level rise</li> </ul>	No	
Research and actively monitor trends in storm events, stream flow and other conditions affecting hydrology and water		BDC, FEMA, MDE, MDNR, MEMA, NGOs, State Agencies, Waterfront Partnership	Ongoing	<ul style="list-style-type: none"> <li>Federal Grants</li> <li>State Grants</li> <li>Foundation Grants</li> </ul>	To Be Determined with Future Data	No	
Update flood maps to reflect changing risk associated with climate change.	Planning	BDC, FEMA, MDE, MDNR, MEMA, NGOs, State Agencies, Waterfront Partnership	Short	<ul style="list-style-type: none"> <li>Federal Grants</li> <li>State Grants</li> <li>Local Grants</li> </ul>	To Be Determined with Future Data	No	
Continuously improve and enhance flood vulnerability data.	Planning	BDC, FEMA, MDE, MDNR, MEMA, NGOs, State Agencies, Waterfront Partnership	Ongoing	<ul style="list-style-type: none"> <li>Federal Grants</li> <li>State Grants</li> <li>Foundation Grants</li> </ul>	To Be Determined with Future Data	No	
PS-1	(MOEM)	Strengthen emergency preparedness coordination between local government, NGOs, and private entities by updates to the City Emergency Operations Plan (EOP) and related Emergency Support Functions (ESF)					
Identify and develop a common database that all city government agencies and departments should utilize for hazard information, preparedness and response	MOEM	BCHD, County Governments, DOP, DHMH, Humane Society, MOIT, PSC	Short	<ul style="list-style-type: none"> <li>Federal Grants</li> <li>State Grants</li> <li>Foundation Grants</li> </ul>	<ul style="list-style-type: none"> <li>Formation of a database for hazard information, preparedness, and response procedures</li> <li>Inclusion of outreach efforts that are integrated between agencies</li> <li>Number and percentage of animal rescue facilities that incorporate natural hazard emergency procedure strategies</li> </ul>	Yes	
Ensure consistency and integration with existing and future response plans within and between agencies	MOEM	BCHD, County Governments, DOP, DHMH, Humane Society, MOIT, PSC	Ongoing		To Be Determined with Future Data	Yes	
Continue to identify and improve coordination with Key Partners including private sector, State partners, Federal partners, community, universities and industry leaders through Local Emergency Planning Committee	MOEM	BCHD, City Agencies, County Governments, DOP, DHMH, FEMA, General Public, Humane Society, MDE, MDNR, MEMA, MOIT, PSC	Ongoing	<ul style="list-style-type: none"> <li>Foundation Grants</li> </ul>	To Be Determined with Future Data	Yes	
Coordinate outreach efforts of the Mayor’s Office of Emergency Management, Mayor’s Office of Neighborhood and Constituent Services and Baltimore City Health Department to leverage messages related to all-hazards emergency preparedness	MOEM DHMH	BCFD, BCHD, BCPD, Community Groups, County Governments, DOP, DHMH, Humane Society, MOEM, MOIT, MON, PSC	Medium	<ul style="list-style-type: none"> <li>State Grants</li> <li>Local Grants</li> <li>Foundation Grants</li> </ul>	To Be Determined with Future Data	No	
Develop strong working relationships with local experts to provide technical assistance to refine and improve city government emergency preparation	MOEM	BCHD, County Governments, DOP, DHMH, Humane Society, MOIT, PSC	Ongoing	<ul style="list-style-type: none"> <li>State Grants</li> <li>Local Grants</li> <li>Foundation Grants</li> </ul>	To Be Determined with Future Data	No	
Review and improve specific response plans contained in the EOP and related ESFs that relate to extreme weather events (snow, heat, flood, wind, electrical outages, and other hazard events)	MOEM	BCHD, County Governments, DOP, DHMH, Humane Society, MOIT, PSC	Ongoing	<ul style="list-style-type: none"> <li>State Grants</li> <li>Local Grants</li> <li>Foundation Grants</li> </ul>	To Be Determined with Future Data	No	EOP

ACTION	LEAD AGENCY	STAKEHOLDERS	ESTIMATED TIMEFRAME (short 1-2yrs, med 3-5yrs, long 6+)	FINANCING OPTIONS	PERFORMANCE METRICS	OVERLAP WITH CAP	EOP, ESF, COOP
Ensure equipment purchases and communication systems are compatible across agencies and jurisdictions	PSC MOEM	BCHD, County Governments, DOP, DHMH, Humane Society, MOEM, MOIT, PSC	Ongoing	<ul style="list-style-type: none"> <li>Federal Funding</li> <li>State Funding</li> <li>Local Funding</li> </ul>	To Be Determined with Future Data	Yes	
Encourage all animal rescue and care shelters to further develop their internal plans for animal's health and safety during and after a hazard event	Humane Society	BCHD, County Governments, DOP, DHMH, Humane Society, MOIT, PSC	Ongoing	<ul style="list-style-type: none"> <li>Federal Funding</li> <li>State Funding</li> <li>Local Funding</li> </ul>	To Be Determined with Future Data	No	
Ensure all animal rescue and care shelters located within the floodplain are provided the support to apply for and obtain funds to relocate	Humane Society	BCHD, County Governments, DOP, DHMH, Humane Society, MOIT, PSC	Ongoing	<ul style="list-style-type: none"> <li>State Grants</li> <li>Local Grants</li> <li>Foundation Grants</li> </ul>	To Be Determined with Future Data	No	
Develop and implement a case study of hospital-based practices that foster community resilience to climate change		BCHD, County Governments, DOP, DHMH, Humane Society, MOIT, PSC	Ongoing	<ul style="list-style-type: none"> <li>Private funding</li> </ul>	To Be Determined with Future Data	Yes	
PS-2	(MOEM)	Develop a Hazard Awareness Program					
Create a standardized early warning system for members of the public	MOEM	BCHD, DHMH, DOP, MDH2E, MEMA, MOEM	Short	<ul style="list-style-type: none"> <li>Local Funding</li> </ul>	<ul style="list-style-type: none"> <li>Creation of a hazard awareness program</li> <li>Number and extent of ongoing educational programs, including workshops, seminars, and other outreach events</li> </ul>	Yes	
Evaluate and improve community health center strategies for communicating with patients during an emergency	MOEM	BCHD, MDH2E, MEMA, MOEM	Ongoing	<ul style="list-style-type: none"> <li>Private funding</li> </ul>	To Be Determined with Future Data	No	
Educate citizens about the existing early warning systems and actions they should take when alarms sound	MOEM	BCHD, MDH2E, MEMA, MOEM	Ongoing	<ul style="list-style-type: none"> <li>Foundation Grants</li> </ul>	To Be Determined with Future Data	No	ESF-11
Prepare and integrate occupational health and safety messages and instructions for first responders	DHMH	BCHD, DHMH, MDH2E, MEMA, MOEM	Ongoing	<ul style="list-style-type: none"> <li>Foundation Grants</li> </ul>	To Be Determined with Future Data	Yes	
Hold climate specific seminars, in partnership with MDH2E and MHA, for hospital emergency and sustainability managers	Local Hospitals	BCHD, MDH2E, MEMA, MOEM	Ongoing	<ul style="list-style-type: none"> <li>Federal Grants</li> <li>State Grants</li> <li>Foundation Grants</li> </ul>	To Be Determined with Future Data	Yes	
PS-3	(MOEM)	Designate community leaders and organizations that can assist and provide support during hazard events					
Prior to a hazard event, identify lead contacts serving vulnerable populations and coordinate actions to maximize safety and information sharing	MOEM DOP	BCFD, BCHD, BCPD, Community Groups, DOP, HABC, Hospitals, MOEM, MON	Ongoing	<ul style="list-style-type: none"> <li>Community Development Block Grant Program (CDBG)</li> </ul>	<ul style="list-style-type: none"> <li>Creation of a directory of community hazard mitigation leaders</li> <li>Formation of a hazard response procedure plan for community leaders.</li> </ul>	Yes	
Develop a community group coordination plan and implementation guide	MOEM	BCFD, BCHD, BCPD, Community Groups, DOP, HABC, Hospitals, MOEM, MON	Medium			No	
Identify and evaluate plans already in place and work to improve utilization of community based leaders to assist in preparedness and response	MOEM	BCFD, BCHD, BCPD, Community Groups, DOP, HABC, Hospitals, MOEM, MON	Long	<ul style="list-style-type: none"> <li>State Grants</li> <li>Local Grants</li> <li>Foundation Grants</li> </ul>		No	
PS-4	(MOEM)	Integrate climate change and natural hazards planning into all City and community plans					
Develop guidelines to include proactive resilience planning into plan development process	DOP, DHCD	BCHD, MOEM, State and Federal Agencies	Ongoing, Medium	<ul style="list-style-type: none"> <li>Community Development Block Grant Program (CDBG)</li> </ul>	<ul style="list-style-type: none"> <li>Inclusion of hazard mitigation and climate adaptation actions in new and updated planning documents</li> <li>Development and employment of an institutional checklist for resiliency at health care facilities</li> </ul>	Yes	
Incorporate language that strengthens the ability of city government officials to enforce rules and restrictions that support public health, safety and welfare related to hazard events and conditions	MOEM	BCFD, BCHD, BCPD, DHCD, DOP, MOEM, State and Federal Agencies	Medium	<ul style="list-style-type: none"> <li>State Grants</li> <li>Local Grants</li> <li>Foundation Grants</li> </ul>	To Be Determined with Future Data	Yes	
Partner with Maryland Department of Health and Mental Hygiene or other pertinent entity to develop institutional checklist and materials for health care specific resilience plans	Local Hospitals	BCHD, DOP, MOEM, State and Federal Agencies	Ongoing, Medium	<ul style="list-style-type: none"> <li>Private funding</li> </ul>	To Be Determined with Future Data	No	



ACTION	LEAD AGENCY	STAKEHOLDERS	ESTIMATED TIMEFRAME (short 1-2yrs, med 3-5yrs, long 6+)	FINANCING OPTIONS	PERFORMANCE METRICS	OVERLAP WITH CAP	EOP, ESF, COOP
PS-5	(MOEM)	Better equip emergency workers for natural hazards					
Research and identify personal protective equipment (PPE) needs based on specific hazards	MOEM	BCFD, BCPD, MOEM	Ongoing	<ul style="list-style-type: none"> <li>• State Grants</li> <li>• Local Grants</li> <li>• Foundation Grants</li> </ul>	<ul style="list-style-type: none"> <li>• Number of training programs for educating emergency workers about natural hazard risks and response procedures.</li> <li>• Number of emergency workers undergoing hazards training</li> <li>• Evaluation of personal protective equipment (PPE) needs</li> </ul>	Yes	
PS-6	(BCHD)	Anticipate and address potential disease outbreaks caused by extreme weather events and changing climatic conditions					
Support studies of heat and flood related vector borne diseases in the Baltimore the region based on changing temperature and moisture	BCHD	BCHD, CDC, DHMH, MDNR, MEMA, MH2E, MOEM, State Agencies	Ongoing	<ul style="list-style-type: none"> <li>• Federal Grants</li> <li>• State Grants</li> <li>• Foundation Grants</li> </ul>	<ul style="list-style-type: none"> <li>• Identification of potential disease outbreaks and incorporation of prevention measures into ongoing health programs</li> <li>• Revisions of existing programs to better detect and respond to disease outbreaks</li> </ul>	Yes	
Evaluate existing programs that detect disease outbreaks to determine their flexibility to respond to new conditions	BCHD	BCHD, CDC, State Agencies	Ongoing		To Be Determined with Future Data	Yes	
PS-7	(MOEM)	Protect Baltimore residents from the effects of hazard events and plan for more frequent hazard instances					
Re-evaluate and update existing heat alerts, advisories, and updates to healthcare and emergency service providers	MOEM, BCHD	BCFD, BCHD, BCPD, BCRP, DHMH, Licenses and Permitting, MDE, MOEM, Healthcare providers	Short	<ul style="list-style-type: none"> <li>• State Grants</li> <li>• Local Grants</li> <li>• Foundation Grants</li> </ul>	<ul style="list-style-type: none"> <li>• Revisions to existing hazard advisory programs</li> <li>• Inventory and evaluation of existing cooling centers, as well as their hours and accessibility, to determine necessary program modifications</li> <li>• Inclusion of code red information in event permitting documentation</li> <li>• Total number of poor air quality days</li> </ul>	No	
Ensure that residents and visitors have access and transportation to cooling centers during extreme heat events	MOEM, BCHD	BCHD, BCRP, Community Groups, DHMH, Licenses and Permitting, MDE, MOEM, Transportation partners	Ongoing	<ul style="list-style-type: none"> <li>• State Grants</li> <li>• Local Grants</li> <li>• Foundation Grants</li> </ul>			
Evaluate code red plans to ensure all agencies adequately protect their own workers	MOEM, BCHD	BCFD, BCHD, BCPD, BCRP, DHMH, Licenses and Permitting, MDE, MOEM, Agencies with outdoor workers	Short	<ul style="list-style-type: none"> <li>• Federal Grants</li> <li>• State Grants</li> <li>• Foundation Grants</li> </ul>	To Be Determined with Future Data	Yes	
Consider extending hours for public wading pools during extreme heat events	MOEM, BCHD	BCHD, BCRP, Community Groups, DHMH, Licenses and Permitting, MDE	Medium	<ul style="list-style-type: none"> <li>• State Grants</li> <li>• Local Grants</li> <li>• Foundation Grants</li> </ul>	To Be Determined with Future Data	Yes	
Include information about Code Red in the event permitting process, and incorporate language that allows BCHD to cancel outdoor events	MOEM, BCHD	BCHD, BCRP, Licenses and Permitting, MDE	Medium, Ongoing	<ul style="list-style-type: none"> <li>• State Grants</li> <li>• Local Grants</li> <li>• Foundation Grants</li> </ul>	To Be Determined with Future Data	No	
Work with Regional, State and Local partners to improve air quality and reduce respiratory illnesses	MDE	BCHD, BCRP, Licenses and Permitting, MDE	Medium, Ongoing	<ul style="list-style-type: none"> <li>• Federal Grants</li> <li>• State Grants</li> <li>• Foundation Grants</li> </ul>	To Be Determined with Future Data	Yes	
Create and implement programs to manage combined health impacts of heat and air pollution	BCHD	BCHD, BCRP, DHMH, Licenses and Permitting, MDE	Medium, Ongoing	<ul style="list-style-type: none"> <li>• Federal Grants</li> <li>• State Grants</li> <li>• Foundation Grants</li> </ul>	To Be Determined with Future Data	Yes	

ACTION	LEAD AGENCY	STAKEHOLDERS	ESTIMATED TIMEFRAME (short 1-2yrs, med 3-5yrs, long 6+)	FINANCING OPTIONS	PERFORMANCE METRICS	OVERLAP WITH CAP	EOP, ESF, COOP
PS-8	(MOEM)	Conduct climate, resiliency, and emergency planning education and outreach					
Incorporate environmental health and climate change into curriculum at schools, universities and health care facilities	BCPSS	BCHD, DNR, DOP, DPW, DHMH, MH2E, MOEM, MOIT, MON, Hospitals	Ongoing	<ul style="list-style-type: none"><li>Community Development Block Grant Program (CDBG)</li><li>Federal Funding Sources</li></ul>	<ul style="list-style-type: none"><li>Directory of print and web-based educational materials created and delivered to City stakeholders, residents, and property owners</li><li>Inventory of outside agency publications made available to residents and property owners</li><li>A list of training courses, workshops and seminars presented to residents, property owners, and City officials, etc.</li><li>Number of CRS credits achieved through education and outreach activities.</li></ul>	Yes	
Educate communities on how city agencies respond to hazard events, their role in an event, and how agencies work together	MOEM	BCHD, DNR, DOP, DPW, DHMH, MH2E, MOEM, MOIT, MON, Hospitals	Ongoing	<ul style="list-style-type: none"><li>Federal Grants</li><li>State Grants</li><li>Foundation Grants</li></ul>	To Be Determined with Future Data	Yes	
Educate and train community groups to participate in responding to hazards	MOEM	BCHD, DNR, DOP, DPW, DHMH, MH2E, MOEM, MOIT, MON, Hospitals	Ongoing	<ul style="list-style-type: none"><li>Federal Grants</li><li>State Grants</li><li>Foundation Grants</li></ul>	To Be Determined with Future Data	Yes	
Generate a comprehensive community-specific all hazards outreach campaign	MOEM DOP	BCHD, DNR, DOP, DPW, DHMH, MH2E, MOEM, MOIT, MON, Hospitals	Short	<ul style="list-style-type: none"><li>State Grants</li><li>Foundation Grants</li></ul>	To Be Determined with Future Data	Yes	
Develop and communicate a simplified process for Baltimore residents to follow after a hazard event	MOEM	BCHD, DNR, DOP, DPW, DHMH, MH2E, MOEM, MOIT, MON, Hospitals	Short	<ul style="list-style-type: none"><li>State Grants</li><li>Foundation Grants</li></ul>	To Be Determined with Future Data	Yes	
Create curriculum for hospitals to teach communities about climate change as part of hospital community benefits programs	MOEM	BCHD, DNR, DOP, DPW, DHMH, MH2E, MOEM, MOIT, MON, Hospitals	Medium	<ul style="list-style-type: none"><li>Federal Grants</li><li>State Grants</li><li>Foundation Grants</li></ul>	To Be Determined with Future Data	Yes	
Utilize existing preparedness messaging to include information on universal precautions to insect-borne and other infectious diseases	MOEM, BCHD	BCHD, DNR, DOP, DPW, DHMH, MH2E, MOEM, MOIT, MON, Hospitals	Short	<ul style="list-style-type: none"><li>State Grants</li><li>Foundation Grants</li></ul>	To Be Determined with Future Data	Yes	
PS-9	(FEMA/ MEMA)	Improve awareness and education about the importance of flood insurance and preparation for Baltimore citizens					
Create an educational program centered on flood hazards, coastal construction practices and evacuation procedures	MOEM DOP	Community Groups, DHCD, DHMH, DOP, FEMA, MEMA, MOEM, MON, NFIP, NGOs, MOEM	Short	<ul style="list-style-type: none"><li>Housing Recovery Funding</li><li>NFIP</li></ul>	<ul style="list-style-type: none"><li>Educational and informative communication with property owners in flood-prone areas</li><li>Percentage of property owners in 100-year floodplain purchasing flood insurance</li><li>Average premium paid for NFIP policies</li><li>Inventory of flood-prone properties and use of an outreach program to monitor property sales</li><li>Development of a newsletter about floodplains and flood insurance</li><li>Financial assistance provided to property owners in flood-prone areas</li><li>Use of a flood disclosure form and education information sheets alongside lease agreements</li></ul>	Yes	
Encourage owners of properties to purchase flood insurance and improve policyholder awareness at time of sale or renewal	FEMA, NFIP DOP	Community Groups, DHCD, DHMH, DOP, FEMA, MEMA, MOEM, MON, NFIP, NGOs, MOEM	Ongoing	<ul style="list-style-type: none"><li>Housing Recovery Funding</li><li>NFIP</li></ul>	To Be Determined with Future Data	Yes	
Inform property owners who have paid off their mortgage that flood insurance is still necessary	FEMA, NFIP DOP	Community Groups, DHCD, DHMH, DOP, FEMA, MEMA, MOEM, MON, NFIP, NGOs, MOEM	Short	<ul style="list-style-type: none"><li>State and Foundation Grants</li></ul>	To Be Determined with Future Data	Yes	
Identify programs and grants that assist citizens in purchasing flood insurance and making flood proofing changes	FEMA, NFIP DOP	Community Groups, DHCD, DHMH, DOP, FEMA, MEMA, MOEM, MON, NFIP, NGOs, MOEM	Medium	<ul style="list-style-type: none"><li>Housing Recovery Funding</li><li>NFIP</li></ul>	To Be Determined with Future Data	Yes	

ACTION	LEAD AGENCY	STAKEHOLDERS	ESTIMATED TIMEFRAME (short 1-2yrs, med 3-5yrs, long 6+)	FINANCING OPTIONS	PERFORMANCE METRICS	OVERLAP WITH CAP	EOP, ESF, COOP
Develop an annual newsletter to inform and remind owners of property in the floodplain about flood insurance and flood proofing activities they should undertake	FEMA, NFIP DOP	Community Groups, DHCD, DHMH, DOP, FEMA, MEMA, MOEM, MON, NFIP, NGOs, MOEM	Short, Ongoing	<ul style="list-style-type: none"> <li>• State Grants</li> <li>• Foundation Grants</li> </ul>	To Be Determined with Future Data	Yes	
Provide information on how to file for reimbursement for impacts of hazards	MOEM	Community Groups, DHCD, DHMH, DOP, FEMA, MEMA, MOEM, MON, NFIP, NGOs, MOEM	Short, Ongoing	<ul style="list-style-type: none"> <li>• Federal Grants</li> <li>• State Grants</li> <li>• Foundation Grants</li> </ul>	To Be Determined with Future Data	No	
Require a flood disclosure form, and educational information as part of lease agreements for commercial and residential properties	DOP	Community Groups, DHCD, DHMH, DOP, FEMA, MEMA, MOEM, MON, NFIP, NGOs, MOEM	Short	<ul style="list-style-type: none"> <li>• Federal Grants</li> <li>• State Grants</li> <li>• Foundation Grants</li> </ul>	To Be Determined with Future Data	No	
Develop floodplain awareness information for rental tenants and ensure distribution as tenants change	HCD MOEM Planning	Community Groups, DHCD, DHMH, DOP, FEMA, MEMA, MOEM, MON, NFIP, NGOs, MOEM	Ongoing	<ul style="list-style-type: none"> <li>• Federal Grants</li> <li>• State Grants</li> <li>• Foundation Grants</li> </ul>	To Be Determined with Future Data	No	
PS-10	(DOP)	Increase Baltimore's Food Security					
Develop a food security plan for Baltimore	DOP	BOS, DOP, MDA, Urban Farms and Community Gardens (P&P and CGRN)	Ongoing, Long	<ul style="list-style-type: none"> <li>• Federal Grants</li> <li>• State Grants</li> <li>• Foundation Grants</li> </ul>	To Be Determined with Future Data	No	
Increase land under cultivation for commercial urban agriculture	DOP	BOS, DOP, MDA, Urban Farms and Community Gardens (P&P and CGRN)	Ongoing, Long	<ul style="list-style-type: none"> <li>• Federal Grants</li> <li>• State Grants</li> <li>• Foundation Grants</li> </ul>	To Be Determined with Future Data	No	
Link Jessup, Maryland Food Hub, and regional/local food producers to local distributors	MD Dept. of Agriculture	BOS, DOP, MDA, Urban Farms and Community Gardens (P&P and CGRN)	Ongoing, Long	<ul style="list-style-type: none"> <li>• Federal Grants</li> <li>• State Grants</li> <li>• Foundation Grants</li> </ul>	To Be Determined with Future Data	No	
Incorporate Baltimore’s food policy initiative into planning efforts	DOP	BOS, DOP, MDA, Urban Farms and Community Gardens (P&P and CGRN)	Ongoing, Long	<ul style="list-style-type: none"> <li>• Federal Grants</li> <li>• State Grants</li> <li>• Foundation Grants</li> </ul>	To Be Determined with Future Data	No	
Double the size and number of food producing community gardens by 2025	DOP	BOS, DOP, MDA, Urban Farms and Community Gardens (P&P and CGRN)	Ongoing, Long	<ul style="list-style-type: none"> <li>• Community Development Block Grant Program (CDBG)</li> </ul>	<ul style="list-style-type: none"> <li>• Number of grocery stores with backup power supplies, including generators or quick connects for generators</li> <li>• Number of communities with community gardens</li> <li>• Total number of community gardens</li> <li>• Percent of urban agriculture land uses</li> <li>• Reference of Baltimore’s food policy in new and revised planning documents</li> <li>• Development of a comprehensive food security plan for use during emergency events</li> </ul>		

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## Endnotes

### Chapter 1 Endnotes

- 1 Center for American Progress, as cited by Banerjee, 2013: 5
- 2 Kasper, 2013.
- 3 EPA, 2013, retrieved from <http://www.epa.gov/environmentaljustice/>
- 4 MADE CLEAR, 2012: 1.
- 5 Klein, n.d.: n.p.
- 6 Center for Integrative Environmental Research, 2008: 11.
- 7 Maryland Commission on Climate Change, 2008: 23.
- 8 Climate Central, 2012: 2.
- 9 Center for Integrative Environmental Research, 2008: 11.
- 10 Baltimore Department of Planning, 2013: 63.
- 11 NRDC, 2008: vi.
- 12 Foot, 2013.
- 13 The Scientific and Technical Working Group, 2008: 20-21.
- 14 Center for Integrative Environmental Research, 2008: 12.

### Chapter 2 Endnotes

- 1 National Institute of Building Sciences, 2005; as cited by City of Lewes, 2011: 9.

### Chapter 3 Endnotes

- 1 FEMA, 2012: 2.
- 2 FEMA, 1998: I-6.
- 3 FEMA, 2012: 4.
- 4 Maryland Department of the Environment, 1997.
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- 6 Baltimore Department of Planning, Maryland Department of Natural Resources, National Oceanic and Atmospheric Administration, MEMA; 2000: 24.
- 7 James, Moyer, Wagner, & Setzer, n.d.
- 8 Baltimore Department of Planning et al., 2000: 25.
- 9 Scientific and Technical Working Group, 2013: 15.
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- 11 Scientific and Technical Working Group, 2013: 15.
- 12 Ibid: 2-6.
- 13 Peralta, Eyder. (2013, June 25). NOAA: A Rare Tsunami Hit The East Coast Earlier This Month. <http://www.npr.org/blogs/thetwo-way/2013/06/25/195593652/noaa-a-rare-tsunami-hit-east-coast-earlier-this-month>
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- 15 Un-explained Mini Tsunami on US East Coast. <http://www.jocabo.net/tag/meteo-tsunami/>
- 16 Local Governments for Sustainability USA, 2012.
- 17 MADE CLEAR, 2012: 1.
- 18 Badger, 2012.
- 19 Northeast Climate Impacts Assessment (NECIA) Synthesis Team, 2007.
- 20 The Scientific and Technical Working Group, 2008: 20.
- 21 Metcalfe, 2013.
- 22 National Severe Storms Laboratory, n.d.
- 23 University Corporation for Atmospheric Research, <http://www.ucar.edu/communications/factsheets/Hail.html>; as cited by Maryland Emergency Management Agency, 2011: 174.
- 24 Bulletin of the American Meteorological Society April 2013 <http://journals.ametsoc.org/doi/pdf/10.1175/BAMS-D-11-00262.1>

- 25 IPCC, 2007a: 376.
- 26 Ibid.
- 27 Our Children's Trust, n.d.
- 28 U.S. Weather Bureau, 1930, v. 35, no.13; as cited in James et al., n.d.
- 29 Maryland Commission on Climate Change, 2008: 22.
- 30 FEMA, 1997: 52.
- 31 National Weather Service, 2012.
- 32 Dance, 2012.
- 33 Livingston, 2011.
- 34 NECIA, 2007: 8.
- 35 NCADAC, 2013: 552.
- 36 U.S. Environmental Protection Agency (EPA), 2013.
- 37 NASA Earth Observatory, cited by Maryland Environmental Management Agency, 2011: 241.
- 38 MADE CLEAR, 2012: 1.
- 39 U.S. Department of Commerce, 2013: D-1.
- 40 American Lung Association, 2013. <http://www.stateoftheair.org/2013/states/maryland/>
- 41 Wheeler, 2013.
- 42 Maryland Commission on Climate Change, 2008: 75.
- 43 NCADAC, 2013: 238.
- 44 CACCIM, 2008: 21; as cited by The City of Lewes, 2011 : 31.
- 45 NECIA, 2007: 12.
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- 47 Maryland Geological Survey, 2010.
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- 49 Maryland Commission on Climate Change, 2008: 50.
- 50 Sherwood, 2004: 4.
- 51 MEMA, 2011: 176.
- 52 Rector, 2012.
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- 54 (2012, Dec. 29). "Add sinkholes to 'new normal' list of major earth changes worldwide: Dec 2012." Examiner.com. Retrieved from <http://www.examiner.com/article/add-sinkholes-to-new-normal-list-of-major-earth-changes-worldwide-dec-2012>

### Chapter 4 Endnotes

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- 2 MDNR, 2005: 28.
- 3 NOAA, 2013; Critical Facilities Flood Exposure Tool, <http://www.csc.noaa.gov/criticalfacilities/>
- 4 Maryland Port Administration, 2008; as cited by the National Climate Assessment and Development Advisory Committee (NCADAC), 2013: 558
- 5 C.J., 2013.
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- 7 Hasbrouck, 2004, as cited in footnote 51 by Maryland Emergency Management Agency, 2011: 176.
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- 9 Maryland Commission on Climate Change, 2008: 72-73.
- 10 Wheeler, 2013. For a discussion of the findings from a recent U.S. Forest Service study, see the Extreme Heat Hazard Profile.
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- 12 Maryland Geological Survey, 2010.
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