Waterfront Development in a Changing Climate

Planning, Implementation and Integration in Baltimore City

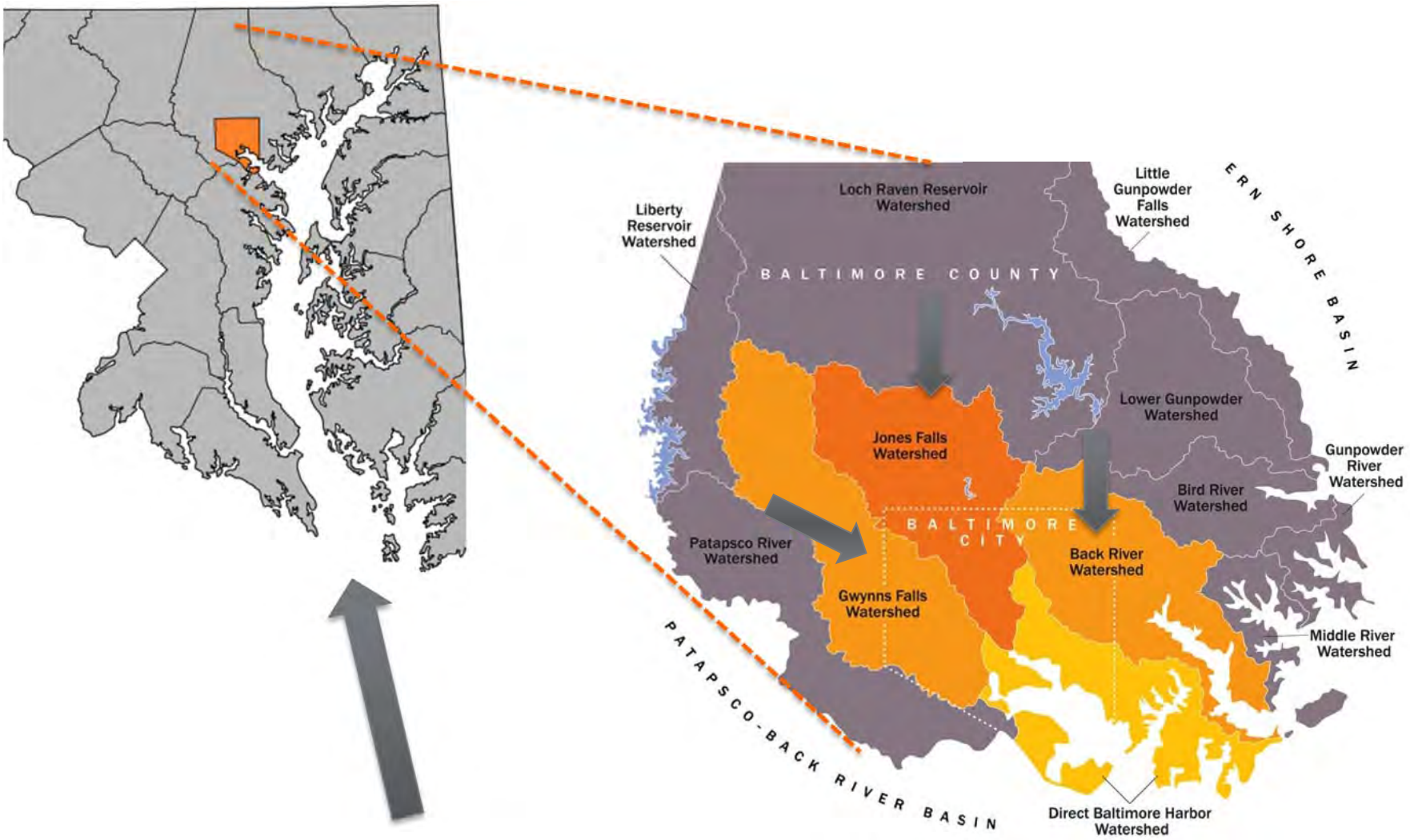
Kristin Baja

Climate and Resilience Officer

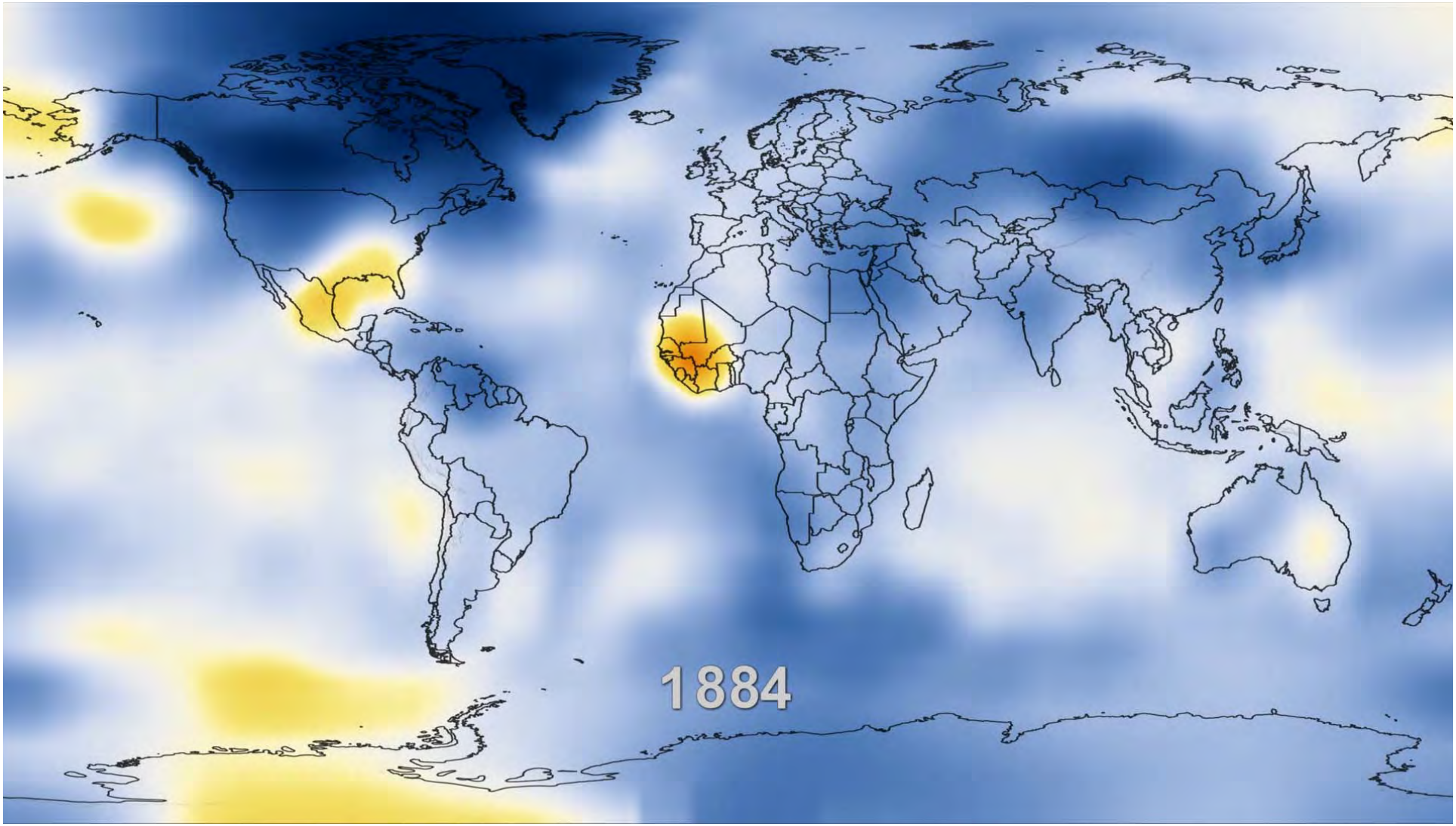
Overview

- Hazards and Climate
- Planning
- Implementation
- Integration

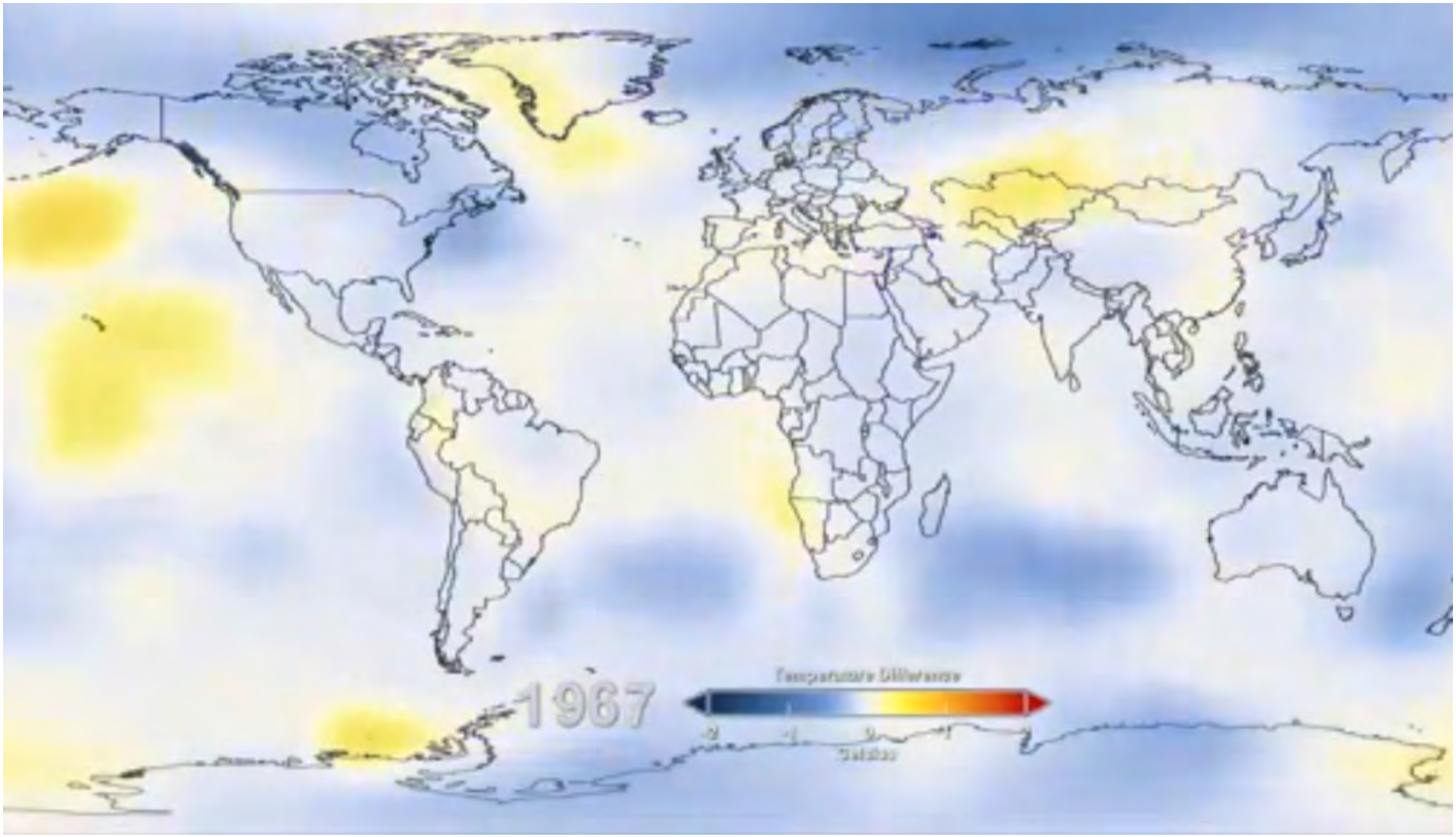
Relationship with Water



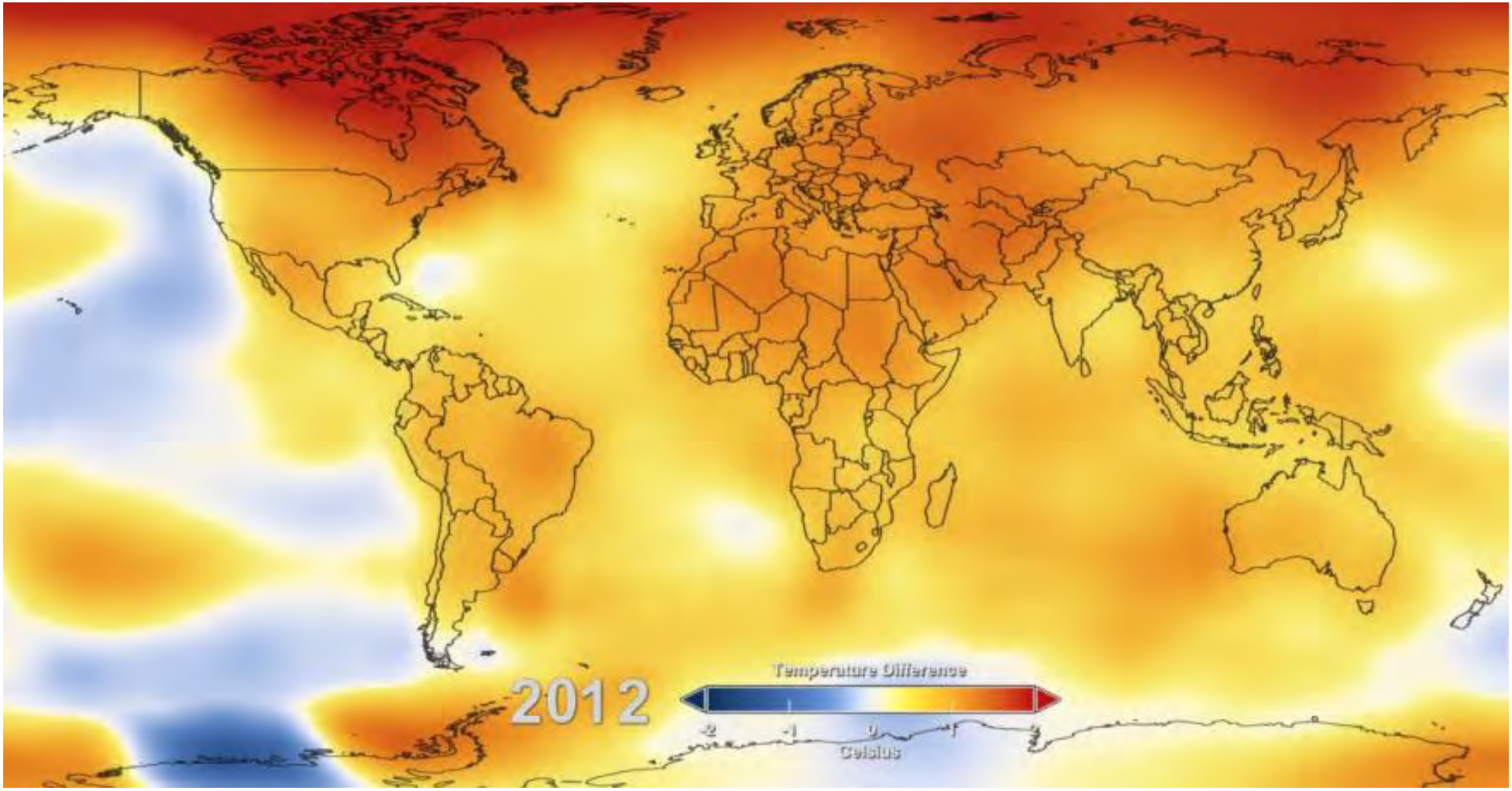
Global Surface Temperature 1884



Global Surface Temperature 1967



Global Surface Temperature 2012



Unique Approach

All Hazard Mitigation Plan
(Current and Historical Hazards)

\+ = Resilience

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

Resilience- Definition

The ability of our community to anticipate, accommodate, and positively adapt to or thrive amidst changing climate conditions or hazard events and enhance quality of life, reliable systems, economic vitality, and conservation of resources for present and future generations.

Shocks and Stresses

Shocks

Shocks are typically considered single event disasters, such as fires, earthquakes, and floods.

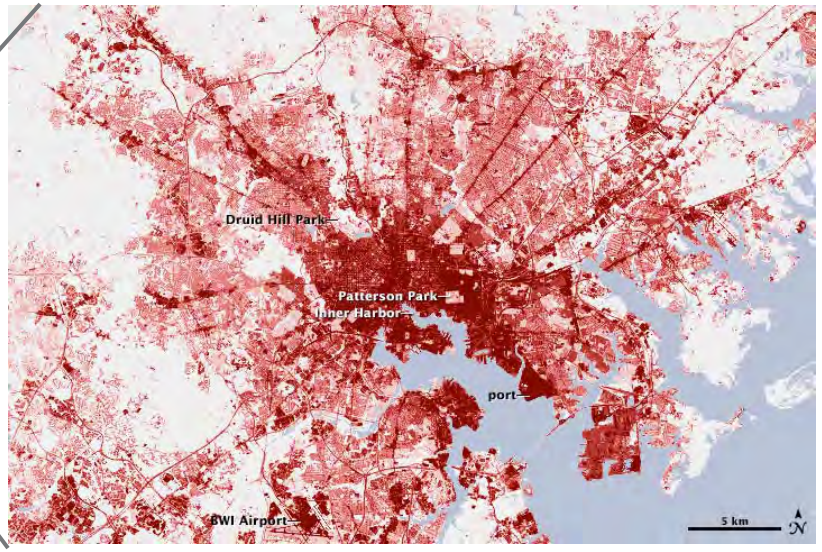
Stresses

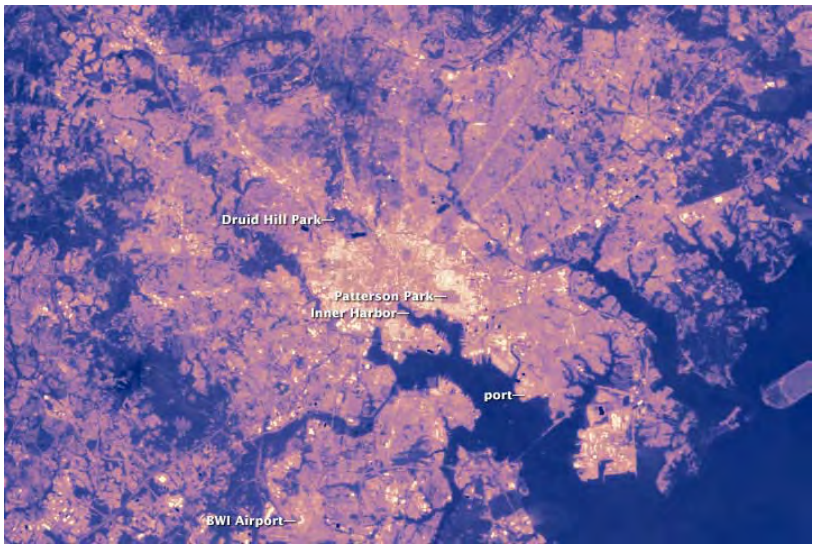
Stresses are factors that pressure the City on a daily or reoccurring basis, such as endemic violence or high unemployment.

Focus on both shocks and stresses to enhance community adaptive capacity and resilience, especially in more vulnerable areas

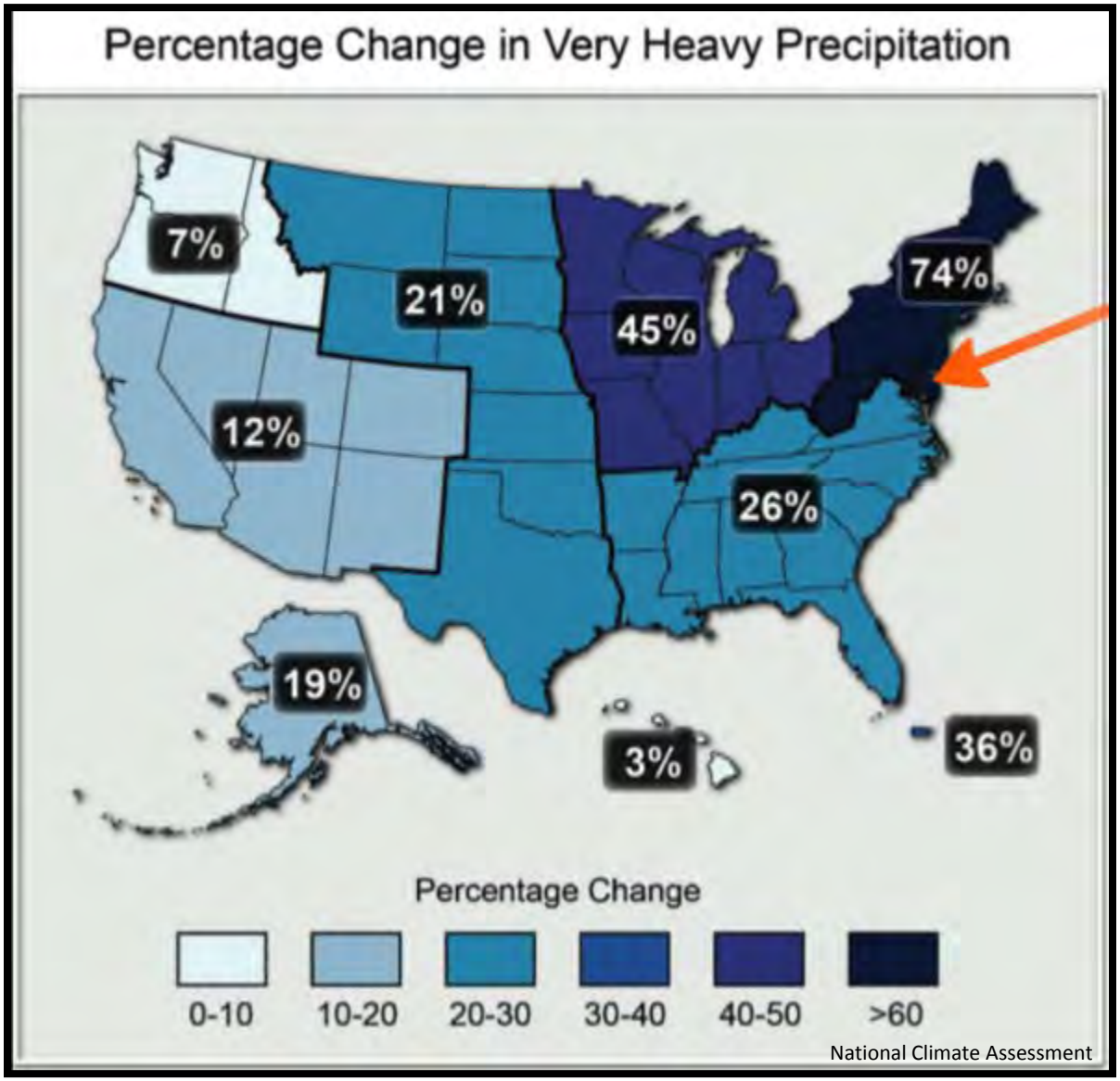
Why combine these plans?

Extreme Heat

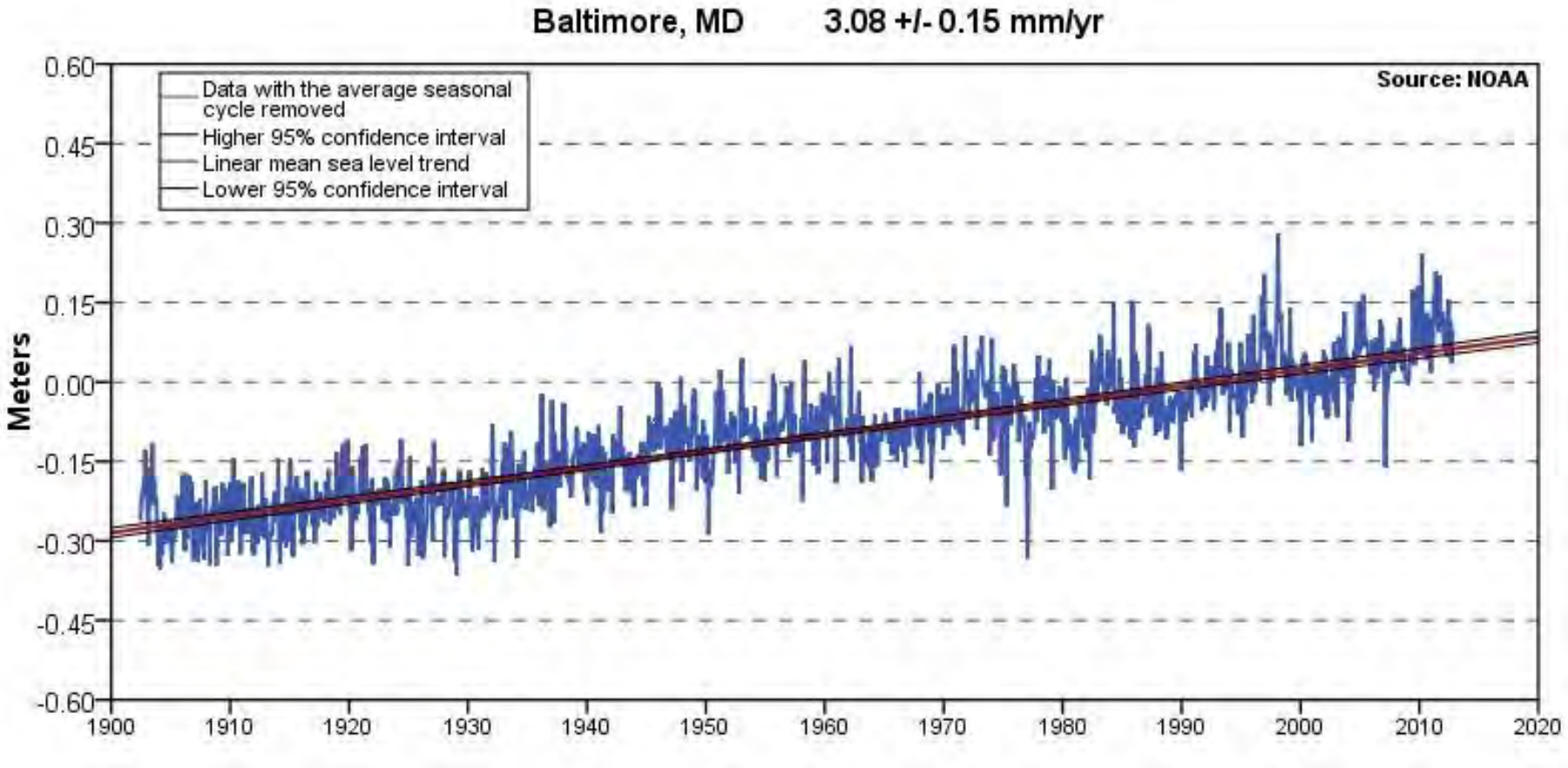




Precipitation Variability



Sea Level Rise



Coastal Storms

There has been a substantial increase in hurricane activity in the Atlantic since the 1970's.

Recent Tropical Storms/Hurricanes impacting Baltimore:

2013 Hurricane Sandy

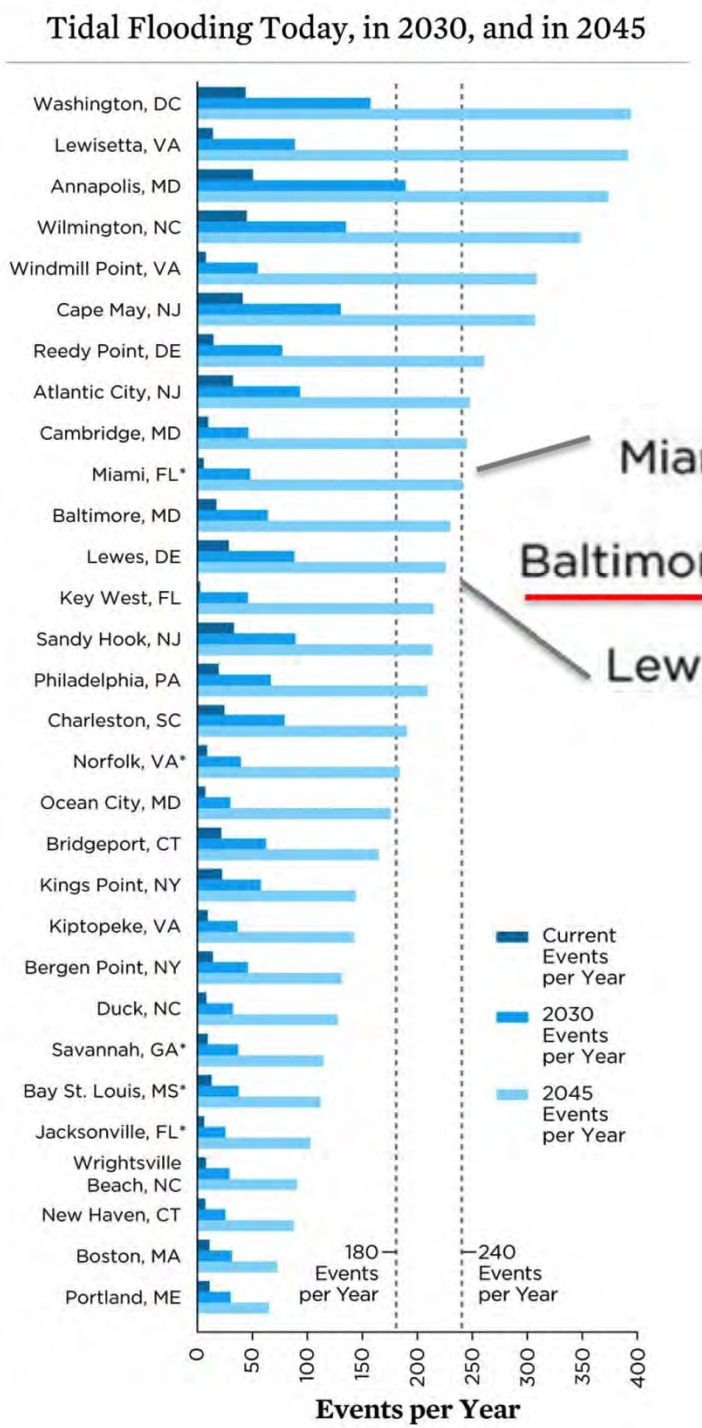
2011 Tropical Storm Lee

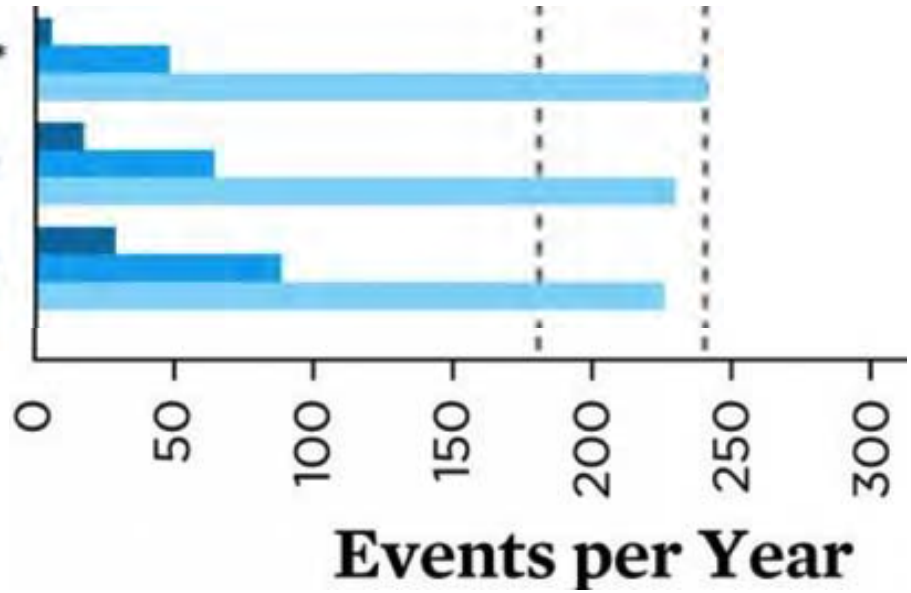
2011 Hurricane Irene

2006 Tropical Storm Ernesto

2003 Hurricane Isabel

Tidal Flooding





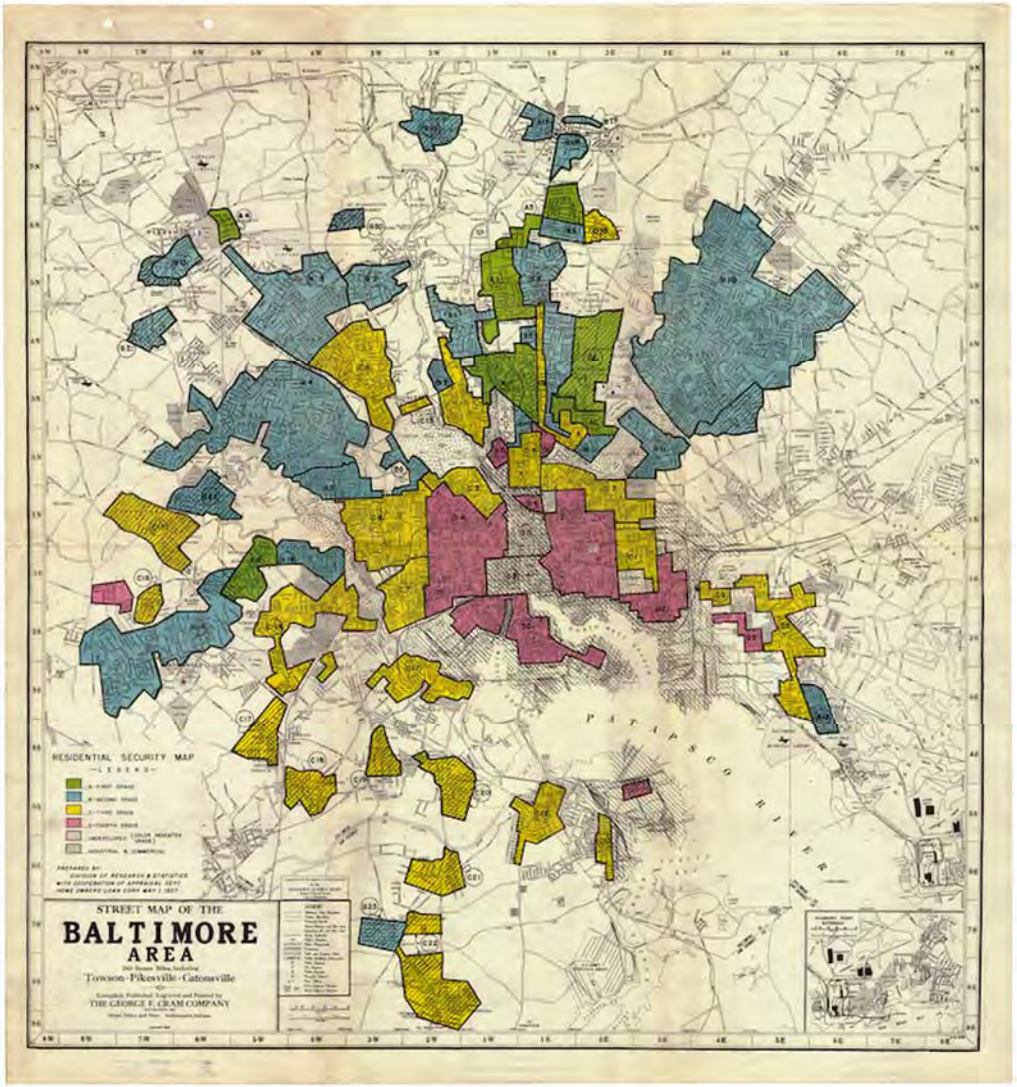
Union of Concerned Scientists, 2014

Shocks

Coastal Storms	more severe
Floods	more extensive
Severe Thunderstorms	more severe
Wind	increase intensity
Winter Storms	less snow, more flooding
Extreme Heat/Drought	more severe and intense
Sea Level Rise	increased threat
Air Quality	lower quality and increase risk

Key: Acknowledge History

- Historic planning practices
- From 1951 to 1971 80-90% of the 25,000 families displaced to build new highways, schools and housing were black
- Honestly acknowledge racism within policies and practices



Two Baltimores: The White L vs. the Black Butterfly

Lawrence Brown (@bmoredoc)

Baltimore is a city that is hypersegregated into two parts: the "White L" and the "Black Butterfly." Due to 105 years of racist policies and practices, Baltimore's hypersegregated neighborhoods experience radically different realities. Due to this dynamic, White L neighborhoods accumulate structured advantage due to Baltimore Apartheid while neighborhoods in the Black Butterfly accumulate structured disadvantages. Baltimore's hypersegregation is the root cause of racial inequity, crime, health inequities/disparities, and civil unrest.

Policies and practices	The White L (structured advantage)	The Black Butterfly (structured disadvantage)
Buses	Charm City Circulator (free for riders)	Maryland Transit Authority (riders must pay)
Charm City Bikeshare	Bike stations in these neighborhoods	No bike stations in these neighborhoods
Highways	Had highways built for downtown access	Had highways built over their neighborhoods, causing displacement
TIF policy	Enriched with 100s of millions in TIF $$	Disinvested, redlined communities languish without being rebuilt
Enterprise Zone policy	Concentrated here for developer benefit	Very few funded Enterprise Zones are located in the Black Butterfly
Bank locations	Traditional banks are concentrated here	Plagued with check cashing, payday lending facilities, and pawn shops
Home mortgage lending	Receive great #'s mortgage originations	Redlined from receiving a proportionate number of mortgage originations
Small business lending	Receive great #'s of small biz loans	Redlined from receiving a proportionate number of small business loans
Big bank prime lending	Homebuyers receive prime rates	Homebuyers receive subprime mortgages, resulting in more foreclosures
Curfew policing in 05/15	BPD begged Hamdenites to leave site	BPD used tear gas against protestors at Penn & North; cleared corner
Normal policing	Courteous, high quality policing	Police brutality, rough rides, zero tolerance, Stop-and-Frisk residents
Public housing sites	Very few found in these neighborhoods	Public housing sites are disproportionately concentrated here
Section 8 vouchers	Very few found in these neighborhoods	The vast majority of Baltimore City Section 8 vouchers are here
Community benefits	CB districts provide extra services	Many neighborhoods that don't have community benefits districts
Public schools	Well-resourced and supported by BCPS	Features 50+ apartheid schools, many school closures, low resources
Property taxes	Property tax privileged, historic tax credit	Property tax punished; pay relatively more taxes while receiving less
Food access	Better access to quality grocery stores	More prone to feature food deserts with fewer quality grocery stores

Equity as a Lens

- Prioritize neighborhoods with highest vulnerability and historic disinvestment
- Provide job training and green job opportunities as part of most initiatives

- Actively listen to residents and collect their stories
- Build trust and relationships = partners in implementation
- Interactive meetings/events


Planning

Planning Process

Risk Assessment

Hazard Identification

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

Vulnerability Assessment

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

Impacts Assessment

- HAZUS Modeling
- Integrate projected climate conditions
- Identify weaknesses

Plan Development

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

Plan Structure

Infrastructure

- Energy
- Liquid Gas
- Communication
- Transportation
- Waterfront
- Wastewater
- Stormwater
- Solid Waste
- Policy

Buildings

- City Codes
- Structural
- Non-Structural

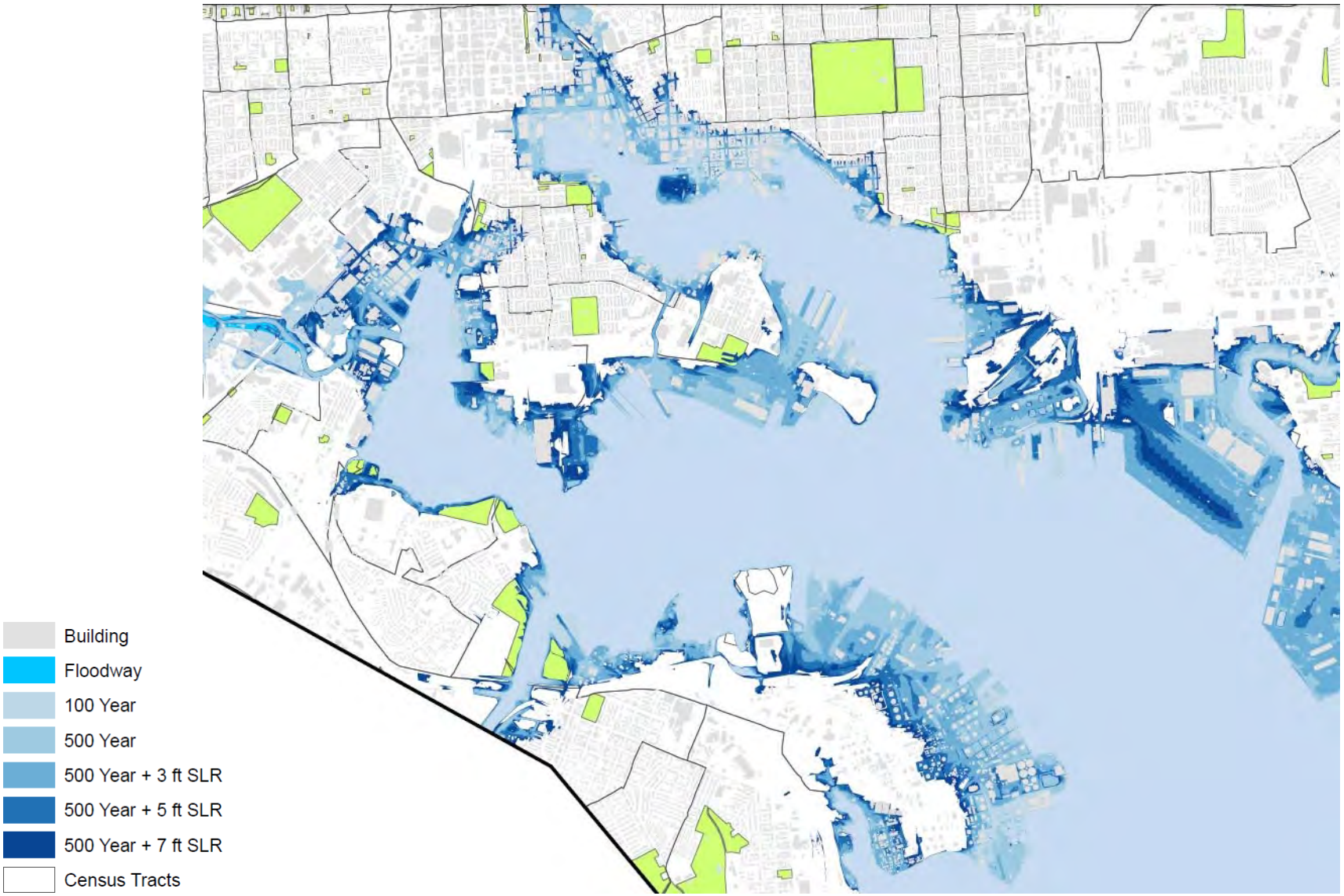
Natural Systems

- Urban Parks & Forests
- Water Supply and Management

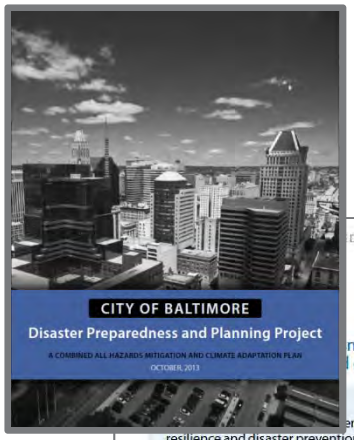
Public Services

- Emergency Preparedness & Response
- Health
- Education & Outreach
- Food Systems

Extensive Modeling for Risk



Disaster Preparedness Plan



Adopted unanimously in October, 2013

DNESS AND PLANNING PROJECT

ment that evaluates and improves all pipes' ability to withstand
l cold

em is dated and in need of upgrades. It is important to build extreme weather resilience and disaster prevention into water and wastewater systems by using both adaptation and mitigation actions. Additionally, structural and infrastructural upgrades must be made to reduce loss of water supply from the distribution system.

Baltimore Water Pipe Source: BaltimoreSun

1. Replace old and malfunctioning pipes with new pipes or retrofit existing pipes with new lining

   Pipes that have already begun experiencing problems, or older pipes which are more vulnerable to the impacts of hazards, should be upgraded using the best available technology.

2. Evaluate and utilize new technology that allows for greater flexibility in pipes as they are replaced

   It is essential to prepare for future changes in hazard events and proactively upgrade pipe systems to prevent cracking and bursting.

IMPLEMENTATION GUIDELINES	
Lead Agency	DPW
Stakeholders	DOT, DPW, Water and Wastewater Utilities
Alignment with Goals	Goal 3
Connection with Existing Efforts	CAP; ORS; MD DNR; ESF-3; ESF-4
Timeframe	

STRATEGIES AND ACTIONS 191

STORMWATER

IN-16 Enhance and expand stormwater infrastructure and systems

Future changes in precipitation frequency and intensity may require reconsideration of the design of existing stormwater infrastructure systems.

Increase resiliency and disaster prevention measures related to stormwater systems by enhancing drainage systems in stream corridors and improving and repairing stormwater conveyance popes and outfalls.

1. Implement the requirements of Baltimore's MS4 (separate stormwater and sewer system) permit (S)

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

2. Prioritize storm drain upgrades and replacement in areas with reoccurring flooding (S)

   While proximity to a floodplain or floodway can increase vulnerability to flooding, certain measures can reduce this vulnerability. Inadequate or older pipes, which cannot accommodate the excessive amounts of stormwater, should be upgraded so as to handle extreme rainfall and storm surge events.

3. Install backflow-prevention devices or other appropriate technology along waterfront to reduce flood risk (M-L)

   Backflow-prevention devices are used to ensure that water does not flow back through drainage infrastructure. Through the installation of backflow-prevention devices, the City can improve the performance of the drainage network and prevent risk of flooding impact along the waterfront.

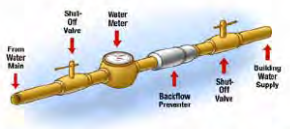
4. Preserve and protect natural drainage corridors (S)

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

5. Review and revise storm drain design on a continuous basis, to accommodate projected changes in intense rainfall (O)

   The City's storm drains will require continual revision to incorporate new and projected changes in intense rainfall. This will ensure that the storm drains maintain adequate capacity.

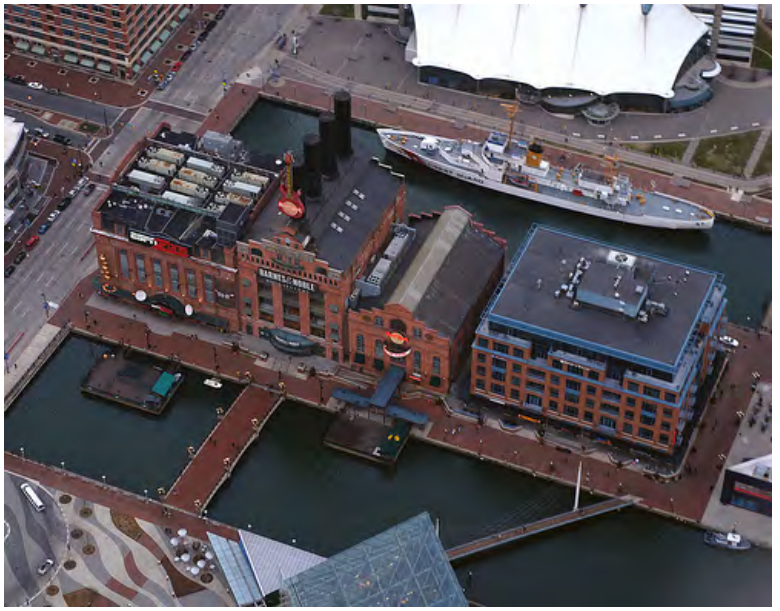
IMPLEMENTATION GUIDELINES	
Lead Agency	DPW
Stakeholders	Community Groups, DOT, DPW, MOEM, MDNR, NGOs, Private Developers, Stormwater Utility
Alignment with Goals	Goals 1, 3, and 6
Connection with Existing Efforts	ORS; MD DNR
Timeframe	



Backflow Preventer Source: DemarPlumbingNYC

Port and Waterfront

- Historic Buildings and Areas mapped and considered
- Engineering Studies on Critical Facilities along the waterfront (WWTP)
- Hard and soft infrastructure options for vulnerable properties



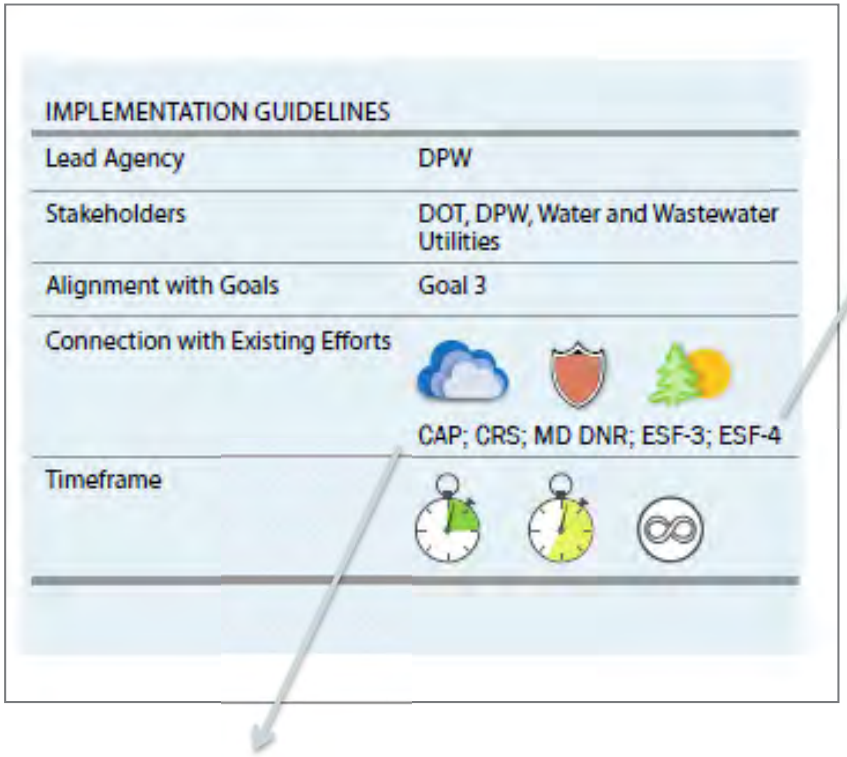
Implementation

Crosswalk

- Identify overlaps with existing planning efforts
- Prioritize Strategies and Actions with lead stakeholders

STRATEGY NUMBER	STRATEGY	ACTION	Water a	C1	C2	C3	PP1	PP2	PP3	PP4	PP5	RC1	RC2	RC3	RC4	G1	G2	G3	G4	T1	T2	T3	T4	T5	EA1	EA2	EA3	EA4	GE1	GE2
		Review and revise storm drain design on a continuous basis, to accommodate projected changes in intense rainfall							x				x																	
IN-17	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							x				x			x			x											
		Encourage urban landscaping requirements and permeable surfaces into community managed open spaces							x				x			x		x	x											
		Utilize water conservation elements such as green roofs, rain gardens, cisterns, and bioswales on residential, commercial, industrial, and City-owned properties to capture stormwater							x				x			x		x	x											
		Encourage permeable paving on low-use pathways							x				x					x	x											
IN-18	Evaluate and support DPW's stream maintenance program.	Review and improve status of standing maintenance requirements			x				x										x											
		Ensure adequate funding is in place to support stream maintenance			x				x										x											
		Identify opportunities where stream restoration efforts will off-set maintenance costs			x				x										x											
		Identify interdependencies and benefits of stream maintenance with other transportation programs			x				x										x	x	x	x	x	x						
		Clear streams on a regular basis, prioritize dredging the stream beds, and increase inspection and cleaning of culverts and storm drains to prevent flooding		x	x				x										x											
IN-19	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)							x				x						x											
		Encourage information sharing within the Chesapeake Bay community to assist in developing best management practices							x				x						x											
IN-20	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		x	x									x																
		Expand and integrate existing programs to reduce or intercept debris before it gets into the streams and harbor		x	x									x																
		Develop and promote solid waste management actions for citizens to implement before a hazard event		x	x									x																
		Incorporate consideration of hazards and climate adaptation efforts into all plans, systems,		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

Identify Connections

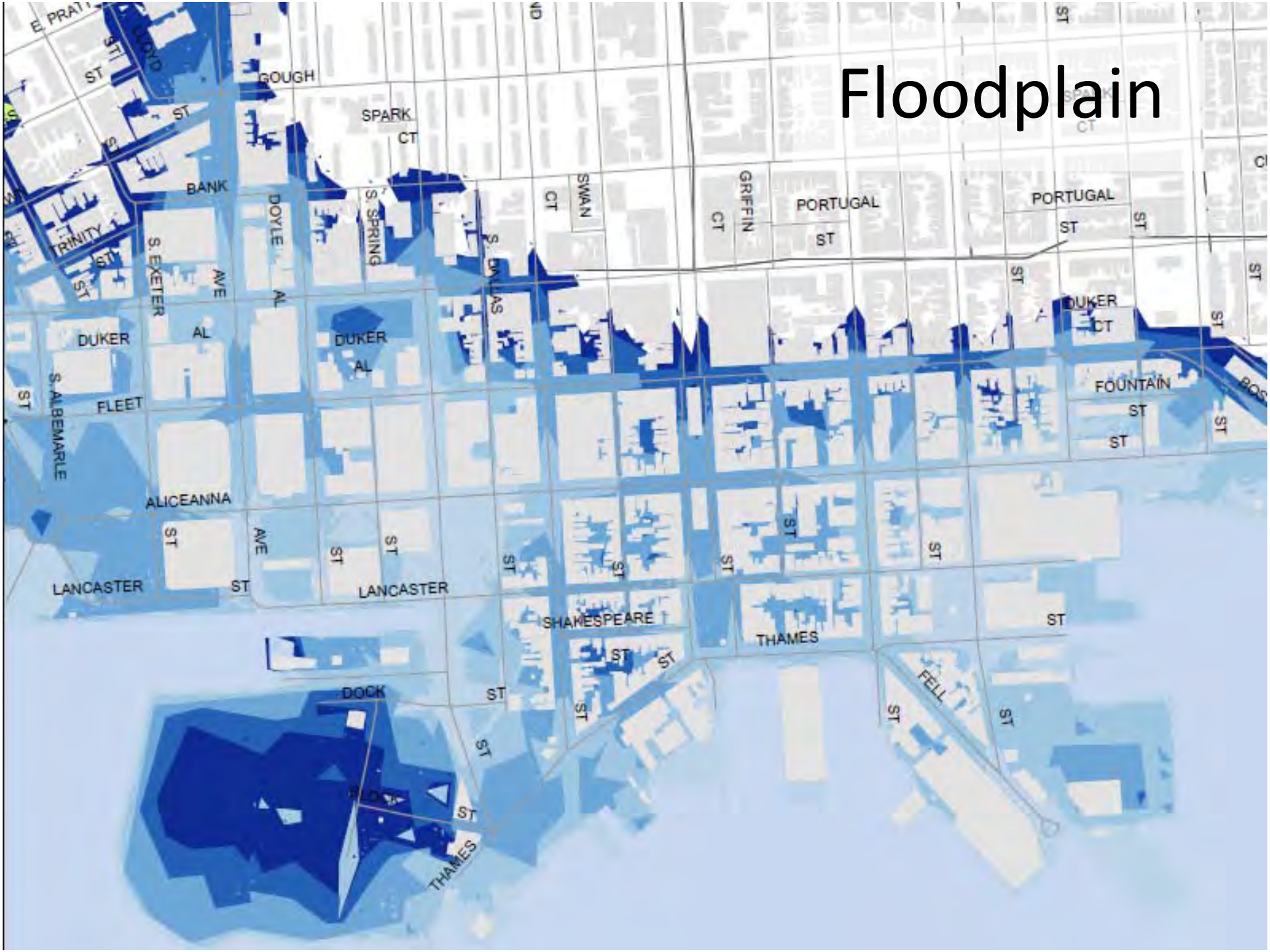


Emergency Support Functions

Governmental and certain private sector capabilities that provide support, resources, and services needed to save lives, protect property and environment, restore essential services and critical infrastructure and help communities.

Climate Action Plan

Increasing resiliency of the electricity system and increasing energy conservation efforts


Floodplain
E. PRATT
LLOYD
ST
GOUGH
SPARK
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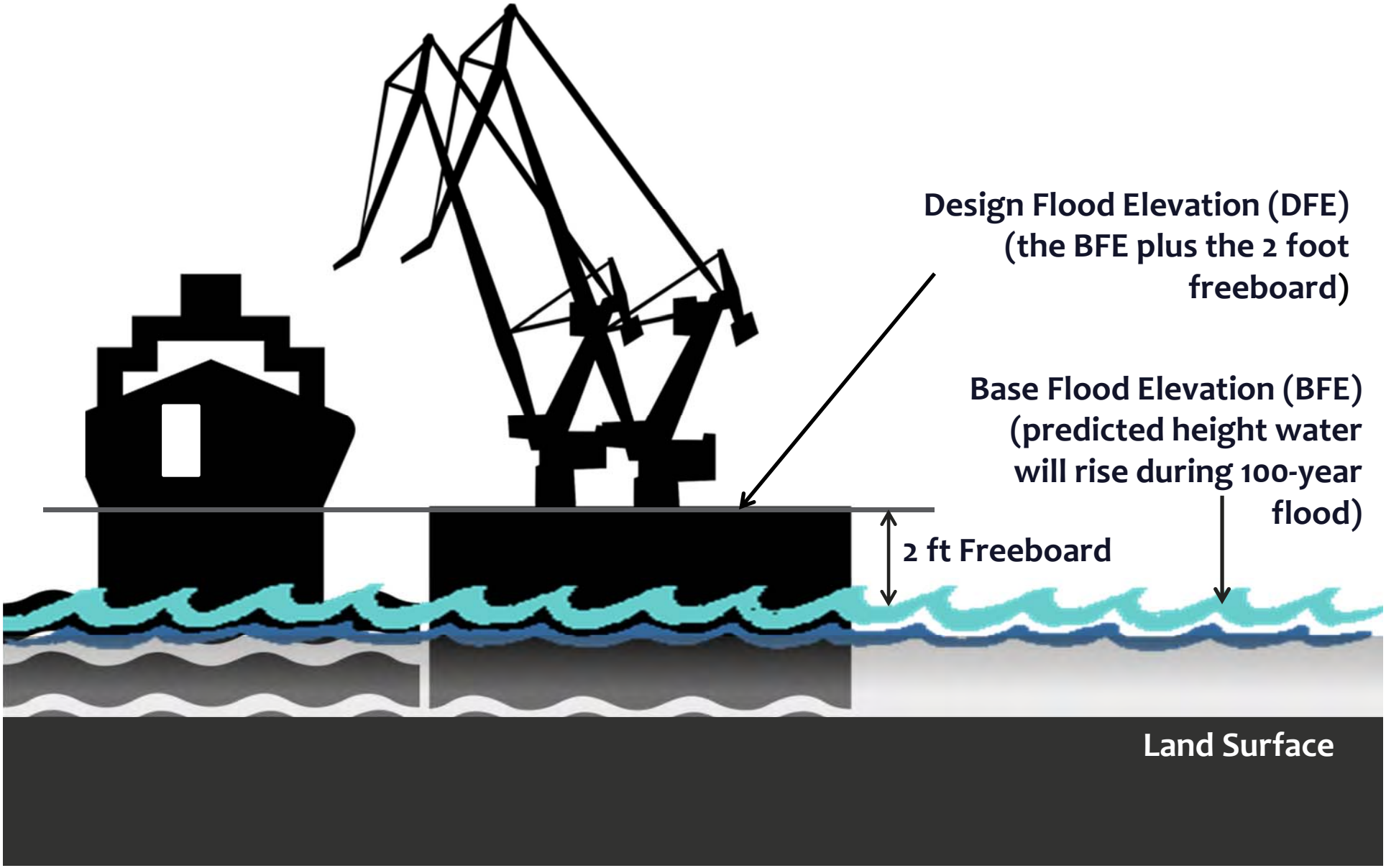
BANK
TRINITY
S. EXETER
AVE
DOYLE
AL
S. SPRING
S. DOUGLAS
SWAN
GRIFFIN
PORTUGAL
DUKER
FLEET
S. ALBEMARLE
ALICEANNA
LANCASTER
SHAKESPEARE
THAMES
DOCK
FOUNTAIN
FELL

Flooding

- Floods are the most common natural disaster.
- Yearly, almost 200 Americans lose their lives in floods.
- 90 % of all presidential declarations of emergency or major disaster area involve flooding.
- Flood hazard areas exist in almost every American community. 7.4 million buildings are located in flood hazard areas.
- On average, flood damages throughout the nation annually exceed $3 billion.
- Direct and indirect costs of flood recovery are borne by all American taxpayers - not just flood victims.

http://www.dcr.state.va.us

Basics- understanding BFE, DFE, FB



Floodplain Regulations

- **The City of Baltimore regulates to the height <u>and</u> extent of the 500-year flood in tidal areas**

Height

500

Both 100 and 500

Extent

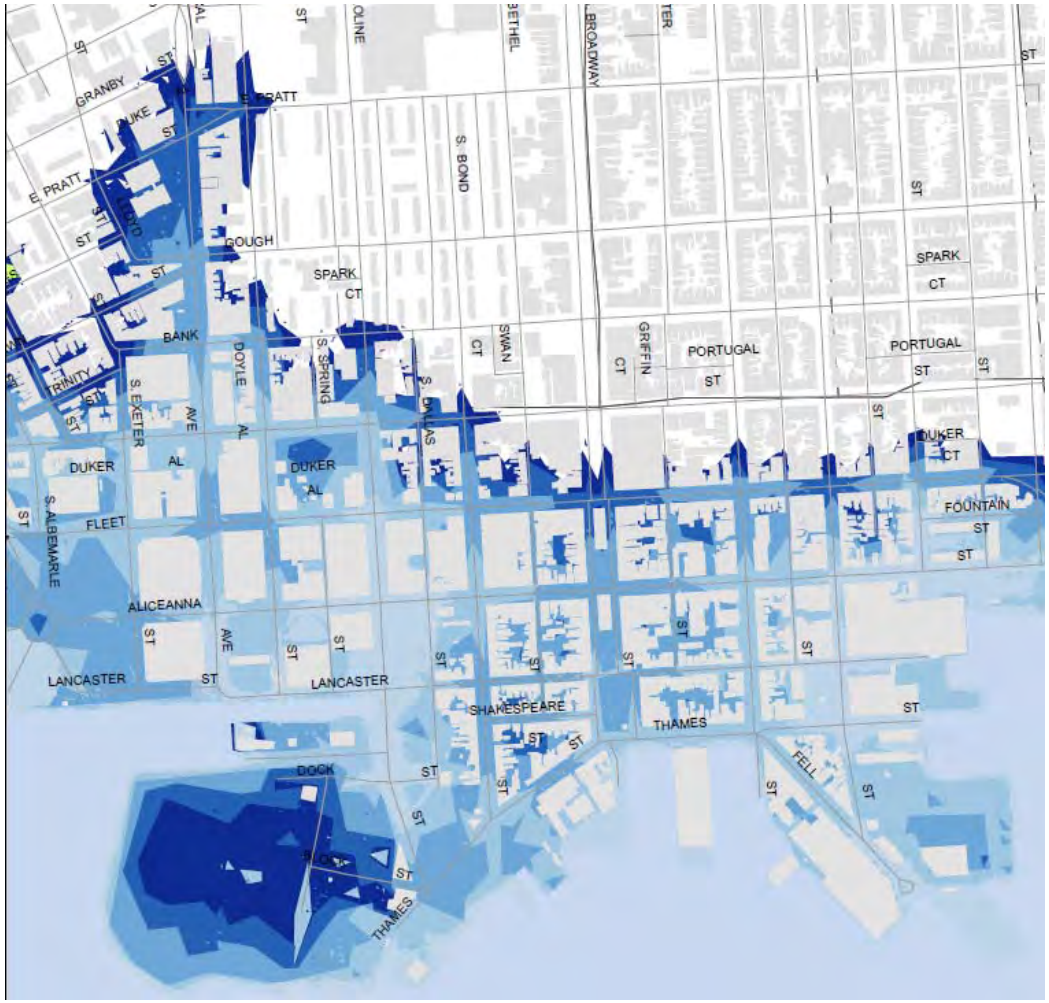
In non-tidal areas, the City regulates to the height of the 100-year flood and to the extent of the 500-year flood

100

Both 100 and 500

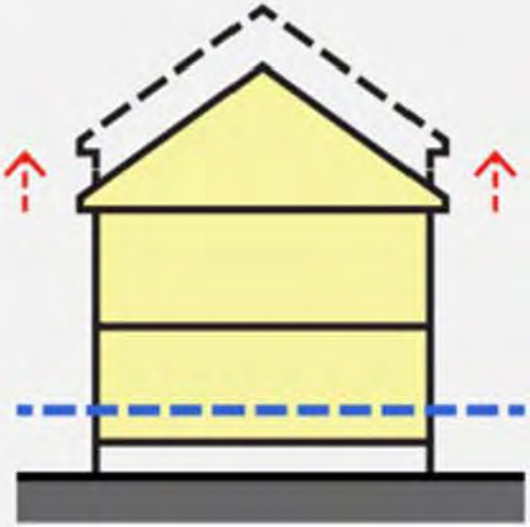
Flood Resilience Area

- In the Tidal Floodplain
- Regulate to the height of the 500-year flood
- Regulate to the extent of the 500-year flood
- Utilize ASCE-24 construction standards which creates higher standards based on building categories (critical facilities)

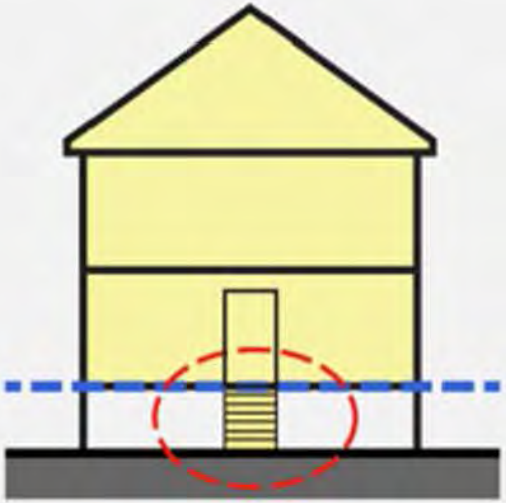


Codes - Building and Floodplain

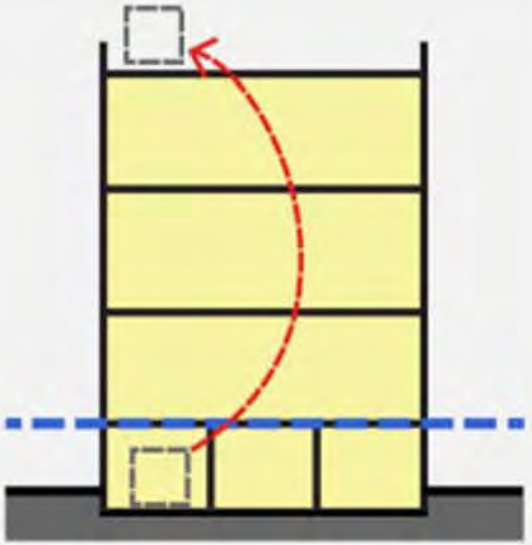
- Baltimore adopted the International Green Construction Code (IgCC) in 2014. Energy efficiency and mitigation were reasons for this.
- Updated Floodplain Ordinance in 2014 establishing:
  - Two (2) feet of freeboard
  - Flood Resilience Area and 500-year extent
  - ASCE-24 construction standards
- Floodplain code integrated into new building code
- Higher regulatory standards



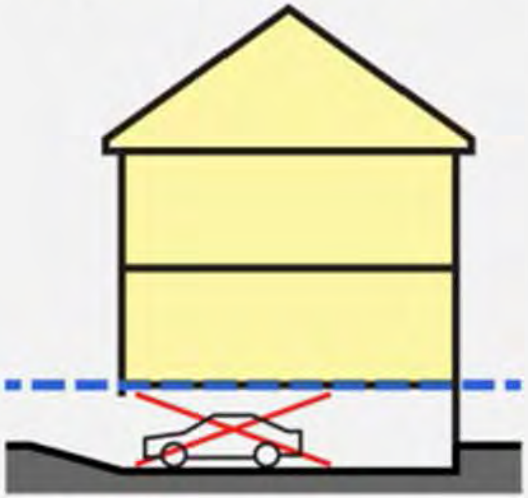
HEIGHT
must recognize elevation requirements in flood zones



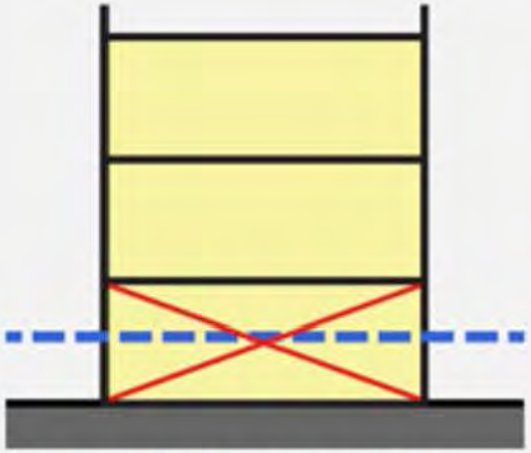
ACCESS
need for stairs or ramps requires imaginative solutions



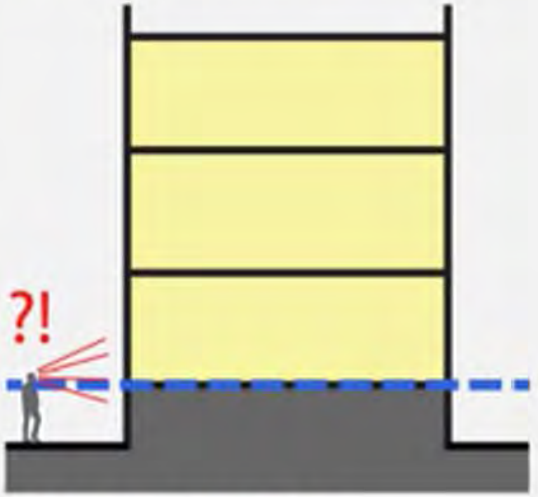
MECHANICAL SYSTEMS
must allow relocation out of flood-prone areas



PARKING
may not be possible below ground



GROUND FLOOR USE
buildings may be allowed only limited use of ground floors



STREETSCAPE
limit negative effect of blank walls on streetscape

Simple Mitigation Options

Backflow preventers

Ground Fault Circuit Interrupters

GFI Receptacle

GFI Circuit Breaker

Waterproof receptacle covers

Waterproof conduit

Larger Mitigation Options

Flood doors and/or gates

Flood walls/barriers

Example

- Raised the Pier four feet
- Flood proof the first floor to the DFE
- Backflow prevention & raised utilities
- Automatic floodgate in rear entrance

Flood Design Manual

- Flood Elevation
- Zoning and Access
- Critical and Structural Systems (Category IV buildings)

Community Rating System (CRS)

Big Insurance Changes

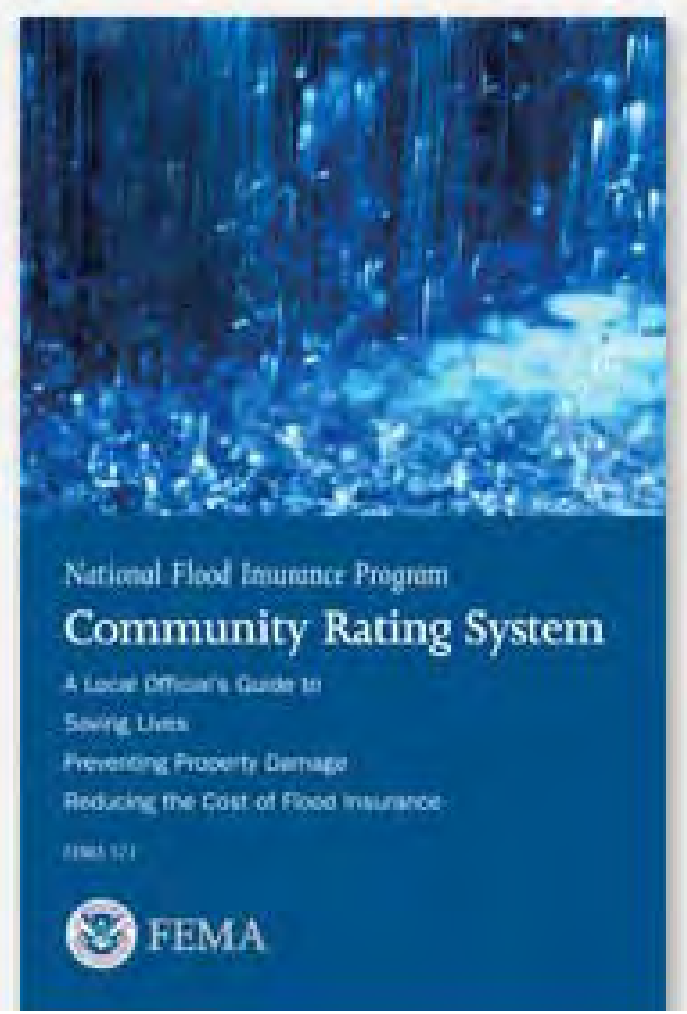
Biggert-Waters Flood Insurance Reform Act of 2012

- Intended to phase in increases in flood insurance rate for homes in flood zones
- Proposed loss of subsidies and grandfathered status

Homeowner Flood Insurance Affordability Act of 2014 (HFIAA)

- Repeal and modifies Biggert-Waters
- Slows some flood insurance rate increases
- Phases out subsidies for some older buildings in high-risk areas
- Insurance rates for these buildings will rise quickly until they reach full-risk rates
- All policyholders subject to new assessments and surcharges

Community Rating System



Voluntary incentive program that recognizes and encourages floodplain management activities that exceed the minimum NFIP requirements.

Leads to reduced flood insurance rates to reflect the reduced flood risk

Reduces flood damage to insurable property and encourages a comprehensive approach to floodplain management.

CRS

Communities can participate in any of the 18 activities in the following 4 categories:

- **Public Information Activities**
- **Mapping and Regulatory Activities**
- **Flood Damage Protection Activities**
- **Flood Preparedness Activities**

For a community to be eligible, it must be in full compliance with the National Flood Insurance Program and regulating its code properly.

Integration

Capital Improvement

- Department of Planning manages process
- Developed a Resiliency Checklist for projects
- Identify how each project will help reduce risk and improve the City's ability to adapt and respond to natural hazards
- Projects must take into account anticipated impacts from climate change
- Include extreme weather events, adaptation, SLR, floodplain considerations, and mitigation

In-depth Staff Trainings

- Climate Adaptation Trainings for City Departments
- Equity and Inclusion Trainings
- Focus on decision makers and middle managers
- Stormwater, Surface-water, and Transportation Engineers
- Collaboration with other cities throughout the U.S. to develop next level of training

Training with Games

Team Scenario 1

Planning Horizon: 2050
Sea Level Rise: Mid range (12" by 2050)
Precipitation: 20% increase in precipitation intensity

Town History:
Originally settled by longline fisherman in the 1890s, the area became heavily farmed in the 1930s, and transitioned to a resort community during the economic boom of the 1980s. The town's economy is now based on a mix of technology-related industry, tourism, fishing, and agriculture.

Current Resident Population = 225,000

City Planning and Sustainability

Role: City Planner and Sustainability Director

You represent the interests of the Resilience Harbor Planning Department. It is your role to ensure the recommendations and decisions made ensure a safe, healthy, and sustainable path for Resilience Harbor to continue to grow and function in the face of future climate change.

Asset Condition Cards

Historic Courthouse

The Historic Courthouse is a registered landmark beloved by the community and frequently used for weddings. Because it is a historic structure, the building cannot be elevated or

Asset Condition Cards

Riverfront Estates

Originally settled in the 1890s by fishermen, the Estates neighborhood has tripled over the last two decades and now comprises 300 homes. Housing styles range from original Craftsmen to sprawling 1950s ranch homes to new, luxury vacation estates. This neighborhood is home to many wealthy residents. The Abundance River has overflowed its banks twice in the last decade, causing millions of dollars worth of damage.

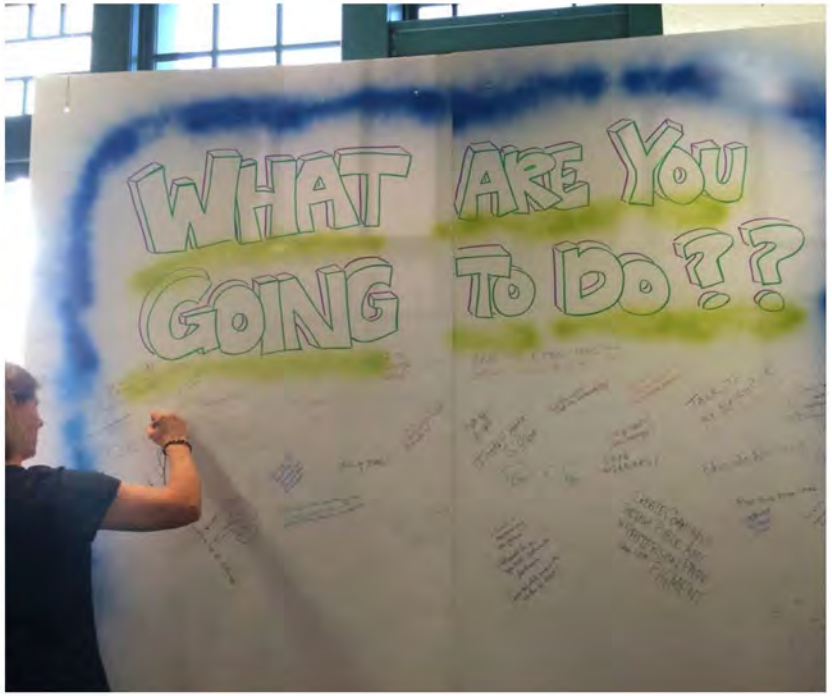
Built gradually, 1890s-present.

Peer-to-Peer Engagement


PAST
1975
1990


EXIT
1932
1937
1936


Discussion
Participation
Awareness
Fairness
Equity
Justice
Opportunity
Discrimination
Gender
Safety
Age
Inclusion
Involvement
Community
Identity
Disability
Representation
Feedback
Race
Sustainability
Jobs
Sustainability
Connectivity
Education
Equity = everyone has full and equal access to opportunities to thrive


WHAT ARE YOU GOING TO DO??

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