Real-World Wicked Problems: Resiliency Planning and Progress in Baltimore City

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Overview

• Background
• Planning
• Implementation
• Ongoing projects
• Partnerships
Watersheds and Reservoirs
Shocks
<table>
<thead>
<tr>
<th>Natural Hazards</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coastal Storms</td>
<td>more severe</td>
</tr>
<tr>
<td>Floods</td>
<td>more extensive</td>
</tr>
<tr>
<td>Severe Thunderstorms</td>
<td>more severe</td>
</tr>
<tr>
<td>Wind</td>
<td>increase intensity</td>
</tr>
<tr>
<td>Winter Storms</td>
<td>less snow, more flooding</td>
</tr>
<tr>
<td>Extreme Heat/Drought</td>
<td>more severe and intense</td>
</tr>
<tr>
<td>Sea Level Rise</td>
<td>increased threat</td>
</tr>
<tr>
<td>Air Quality</td>
<td>lower quality and increase risk</td>
</tr>
</tbody>
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Socioeconomics in Baltimore

Following the funeral of Freddie Gray, a 25-year-old black man who died after he was injured in police custody, disturbances broke out a few blocks from the site of the service. Demonstrations turned violent and spread through parts of Baltimore on Monday.

- New Shiloh Baptist Church (location of Gray's funeral)

**BLACK/AFRICAN AMERICAN POPULATION**
As a percentage of total population

**INCOME PER CAPITA IN THE PAST 12 MONTHS**
In 2013 inflation-adjusted dollars

**UNEMPLOYMENT**
Unemployed population* as a percentage of total

Sources: 2013 American Community Survey estimates, U.S. Census Bureau; Open Baltimore, City of Baltimore; Reuters

*In civilian labor force, population aged 16 years and above

C.Chan, 28/04/2015
Map of 2015 Baltimore City Homicides,
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
Disaster Preparedness Plan

Combined All Hazard Mitigation and Climate Adaptation Plan

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.

STORMWATER

IN-16 Enhance and expand stormwater infrastructure and systems

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

1. Implement the requirements of Baltimore’s MS4 (separate stormwater and sewer system) permit (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.
Advisory Committee Engagement
Community Engagement

Small Staff Trainings and Community Meetings

Large Town Halls and Interactive Community Meetings
Community Engagement

• Busing provided to residents in low income areas without access to transportation

• Entirely hands-on and interactive meeting. No presentations

• Free food, free kits, free trees, and information

• Trusted space- community building utilized daily by residents
Equity as a Lens

- Prioritize neighborhoods with highest vulnerability and historic disinvestment
- Provide job training and green job opportunities as part of most initiatives
- Build trust and relationships
- Highlight economic and health benefits such as lower electricity costs
Implementation
- Identify overlaps with *existing* planning efforts
- Prioritize Strategies and Actions with lead stakeholders
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
Prioritization

MITIGATION

Energy Savings and Supply
Land Use and Transportation
Growing a Green City

Co-Benefits
Drinking water
Renewable Energy
Trees
Building Codes
Energy Grid
Energy Efficiency
Transportation Inf.

ADAPTATION + HAZARD MITIGATION

Infrastructure
Buildings
Natural Systems
Public Services
Whole Block Approach

Energy
- Cool Roofs
- Weatherization
- Energy Education

Additional
- Trees and Greening
- Renewable Energy
- Stormwater
- Heat sensors
The City of Baltimore regulates to the height and extent of the 500-year flood in tidal areas. In non-tidal areas, it regulates to the height of the 100-year flood and to the extent of the 500-year flood.
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
In November, 2014 we adopted the International Green Construction Code 2012 as an overlay to the City’s building, fire and related codes

For Sustainability: At least 50% of the total building materials used” in a building of 25,000 square feet or greater, must be recycled, recyclable, bio-based or indigenous (within 500 miles)

For Resiliency: Buildings are now mandated to have renewable energy systems and are encouraged to consider battery backup
**Energy**

**Residential**: Focus in low-income areas. Weatherization, cool roof installation and solar panel installation (low to no cost)

**Private Partners**: Promote energy efficiency upgrades through free audits and connection to renewable options

**Critical Facilities**: Installation at wastewater treatment plant. 4200 panels on 5 acres.
Resiliency Hubs

Building upon our energy and preparedness work, develop a pilot project to integrate solar with battery backup systems at trusted facilities in lower income areas.

Focus on creating “Resilience Hubs” in neighborhoods.

Not City-owned buildings—utilizes existing facilities that are trusted in the community.
Make a Plan, Build a Kit, Help Each Other
Overlapping City Initiatives

Using Green Infrastructure as part of a comprehensive strategy for rebuilding Baltimore

- Provides economic, environmental, and social benefits
- Capacity to support the missions and goals of multiple agencies by addressing issues including stormwater management, health issues, and economic development.
Growing Green

Effort focused on re-using vacant land to green neighborhoods, reduce stormwater runoff, grow food, and create community spaces that mitigate the negative impacts of vacant properties.
Tree Species Database

Database of Trees
• Predicted climate conditions
• Species that thrive
• Maintenance and soil requirements
• Planting specifications

Spatial Analysis Tool
• Overlay areas at risk
• Overlay soils, demographic information, water/salt water info
• Develop list of trees best for those conditions
Heat Islands and Sensors

Minimum Temperature ($^\circ$C)
Food Desert Definition:
• ¼ mile from supermarket
• Low vehicle availability
• Low Healthy Food Availability Score

Impact:
• 25% residents (158,000 people)
• 30% School aged children
• 25% Seniors
• Black residents 4x more likely to live in a food desert than White residents
Food Access Initiatives

Virtual Supermarket:
• The Health Department coordinates online grocery ordering at 5 senior, disabled and public housing sites.

Healthy Stores Program:
• 4 healthy Corner Stores (with plans to add 14 more over the next 2 years)
• 20 middle school students trained as Youth Neighborhood Food Advocates

Healthy Carryouts:
• Developed a Healthy Carryout Strategy with 36 vendors in Public Markets
Urban Agriculture

- Turning vacant lots into farms
- **Updated the City's Animal Code** to liberalize standards for the keeping of bees, chickens, rabbits, and dwarf, miniature, and pygmy goats
- Created a **Soil Safety Policy** - using funds for soil testing to support new farm sites
- Passed an **Urban Agriculture Tax Credit** - reduce tax burden on urban farms
Food Resiliency Plan and Task Force
Critical Facilities

Conducted an engineering study on critical infrastructure in riverine and coastal areas

Main focus is to integrate solar with battery backup into critical facilities around the City and lessen disruptions
Response and Recovery

- Integration of resiliency planning into After Action Reporting
- Build upon the CERT program
- Coordination with OEM on Public Safety Initiatives
- Communications coordination with Health, Emergency, Public Works, and Sustainability
Green Schools

Goal: Turn Every School in Baltimore into a Green School

Currently 26 Baltimore City Public Schools certified as Maryland Green Schools

Technical assistance, grants, workshops
• 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
New Work

- **Trainings**: We are developing trainings for city agency directors, project managers, and staff as well as stakeholders. Will have basic intro and then sector-specific phases.

- **Ambassadors**: Connecting all our ambassador programs and unifying under resiliency and sustainability messaging and outreach.

- **Historic Properties**: Developing Floodplain Design Manual for urban areas with entire section focused on retrofitting historic structures.

- **Curriculum development** for universities/schools.
Local Partners

Non-Profits

Universities

Business & Industrial
Regional and National

- Climate Consortium of Maryland
- American Society of Adaptation Planners
- Urban Sustainability Directors Network
- Association of State Floodplain Managers
- STAR Community Rating System
Thank you!

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