NEW ECOLOGY

Community-Based Sustainable Development

Building Resilience: From Assessment to Implementation

5th Annual Delaware Energy Conference

Newark, DE

Wednesday, October 31, 2018

COMMUNITY-BASED SUSTAINABLE DEVELOPMENT

New Ecology's work is to bring the benefits of sustainable development to the community level, with a concerted emphasis on underserved populations. A mission-driven non profit, we seek to address global environmental and equity issues by making the built environment more efficient, healthier, durable, and resilient. We are nationally recognized for our work on affordable and mutfifamily housing, community and government buildings, educational facilities, renewable energy and local infrastructure and for the positive effect we have on the people who live and work in these places.

Outline

- What and why?
- Hazard Assessment – Vulnerability and Risk
- Existing Resilience Tools
- NEI's Building-Level Approach, Examples, and Design
- Financing Resilience

What is Resilience?

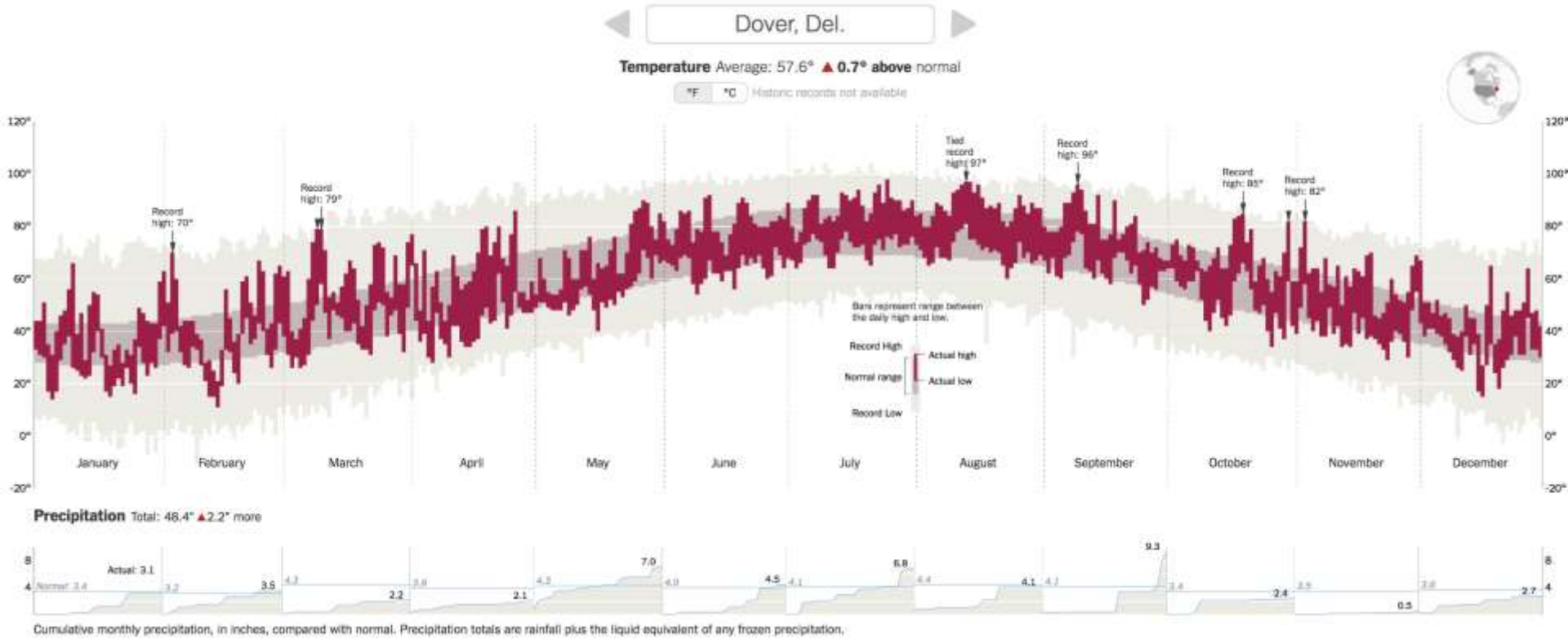
Adapting to changing climate.

Why now?

Abnormal is the new normal.

How Much Warmer Was Your City in 2016?

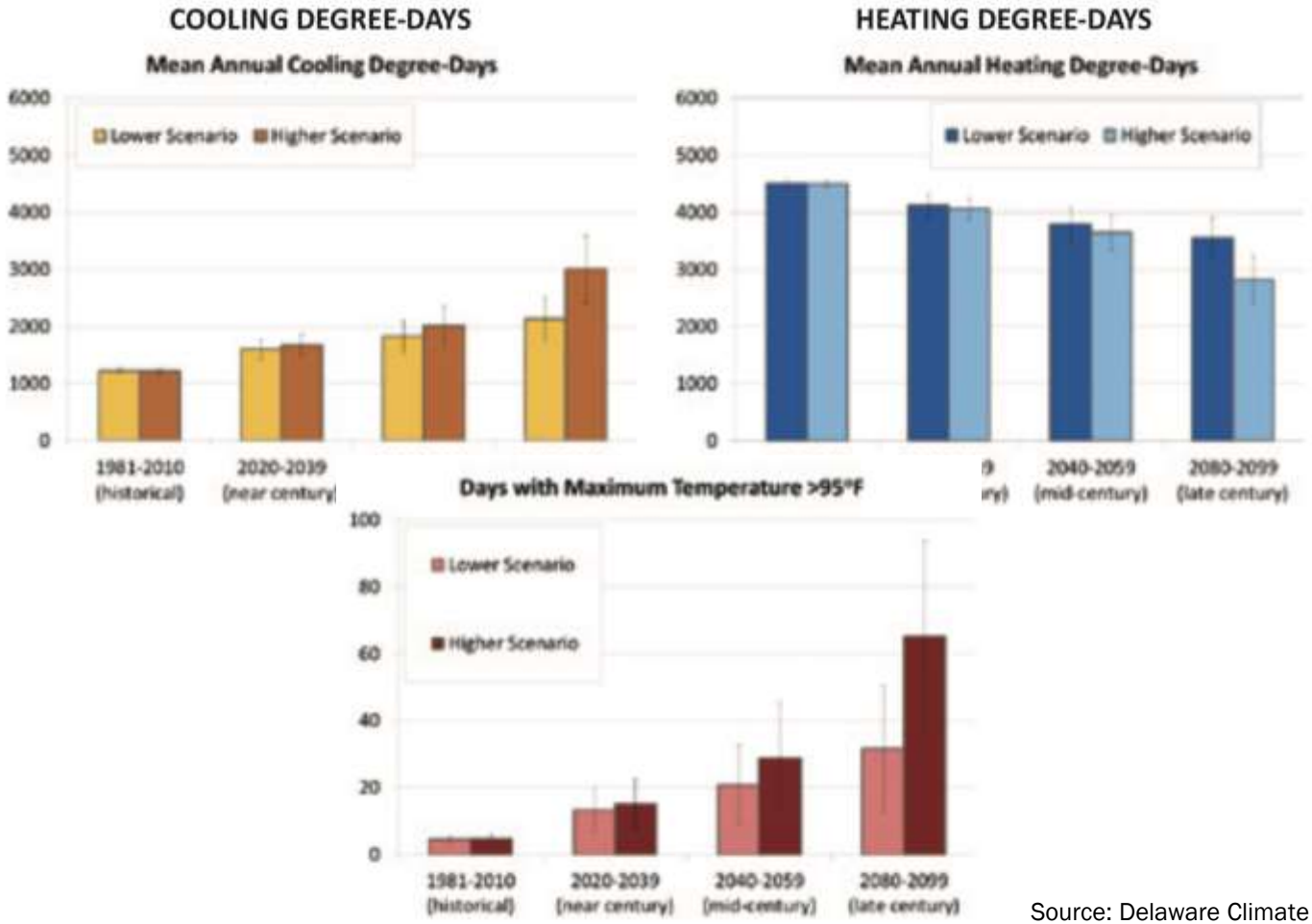
By K.K. REBECCA LAI JAN. 18, 2017



Source: https://www.nytimes.com/interactive/2017/01/18/world/how-much-warmer-was-your-city-in-2016.html#dov

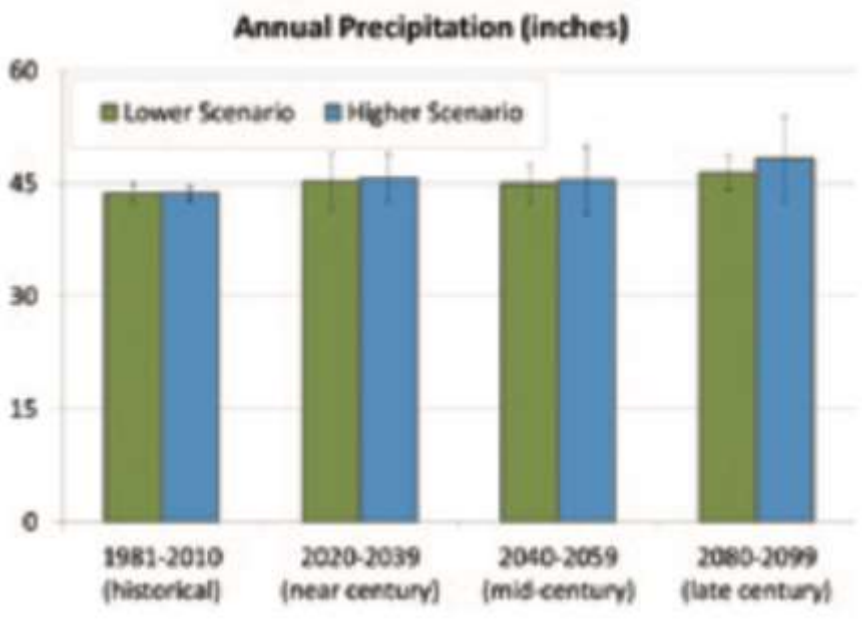
The New York Times

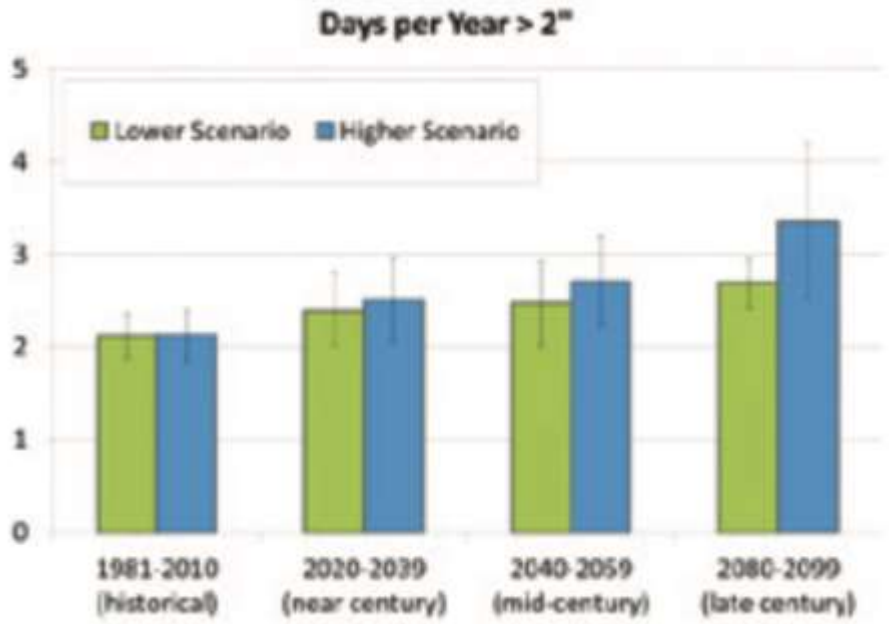
More Heat



Source: Delaware Climate Change Impact Assessment, 2014

More Water





Source: Delaware Climate Change Impact Assessment, 2014

Source: Avoiding and Minimizing Risks of Flood Damage to State Assets: A Guide for Delaware State Agencies, 2016

Source: Preparing for Tomorrow's High Tide: Sea Level Rise Vulnerability Assessment for the State of Delaware, 2012

Predicted Disasters

Rain and flooding

Snow

Storm

Tornado

Drought

Sudden Disasters

Fire

Terrorist attack

Mechanical failure

IT security breach

Chronic Hazards

Pests

Mold

Extreme heat

What are the impacts?

Loss of power

Communications interruptions

Building damage

Evacuation

Resident / occupant safety

Hazard Assessment
Vulnerability and Risk

Identify Hazards

Primary	Secondary
Coastal Flooding	Carbon Monoxide Poisoning
Coastal Erosion	Disease
Drought	Emergency Communications Failure
Inland Flooding and Stormwater	Heat Outage
Extreme Heat	Mold
Extreme Cold	Pest Range Expansion
Major Thunderstorm	Power Outage
Snow or Ice Storm	Toxin Exposure
Terrorist Attack	Water Outage
Tornado	
Urban Fire	

Vulnerability and Risk Assessment

Vulnerability – **Sensitivity** to a hazard and the **capacity to adapt** to the hazard.

Source: Virginia Living Museum

Source: Flood Panel

Vulnerability and Risk Assessment

Risk – **Likelihood** and **consequence** of a hazard.

Image: FEMA

Image: Houston Chronicle

Vulnerability and Risk Assessment

Hazard	Vulnerability		Risk	
	Sensitivity	Adaptive Capacity	Likelihood	Impact
Stormwater Flooding	**Medium**	**Low**	**High**	**High**
Sewer Backup	Medium	Low	High	Medium
Tornado	Medium	Low	High	High
High Winds	Medium	Low	Low	High
Extreme Heat	Medium	Medium	Medium	Medium
Extreme Cold	Medium	Low	Medium	Medium
Extended Electric Outage	High	Low	Low	Medium
Extended Water Outage	High	Low	Medium	Medium

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Tools for Resilience

Community Resilience Building

Get on the right path to resilience today...

NEI's Approach: Existing Buildings

Example 1

Masonry Multifamily High Rise

Building Characteristics

- Norfolk, NE
- Fork in the Elkhorn River, FEMA 1% Annual Chance Flood Zone behind Unaccredited Levee
- Built in 1972
- 9 Floors
- 92 1BR Senior Apts.

Hazards

- Stormwater Flooding and Sewer Backup
- Tornado and High Winds
- Extreme Heat and Cold
- Extended Electric, Gas, and Water Outage

Scenario: Flood

- Unaccredited Levee
- 1% Annual Chance Flood
- History of Flooding
- Continued Occupancy and Building Systems Operations
- Rapid Removal of Water and Repair

Images: Floodsax.

Example Audit 1
Masonry Multifamily
High Rise

Vulnerability and Risk

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High Winds	Medium	Low	Low	High
Extreme Heat	Medium	Medium	Medium	Medium
Extreme Cold	Medium	Low	Medium	Medium
Extended Electric Outage	High	Low	Low	Medium
Extended Water Outage	High	Low	Medium	Medium

Develop and Implement Measures

Rank	Hazard	Measures
1	Stormwater Flooding	Flood Barriers, Perimeter Drains, Elevate Electrical Panels, Relocate Hazardous Chemicals, Elevator Controls
2	Tornado	Structural and Glazing Wind Loading Review, Remove Roof Ballast Stone
2	Sewer Backup	Backflow Preventer
3	Extended Water Outage	Potable Water Storage
4	Extreme Cold	Insulate, Air Seal, Replace Windows
4	Extreme Heat	(see Extreme Heat)
5	High Winds	Structural and Glazing Wind Loading Review, Remove Roof Ballast Stone
6	Extended Electric Outage	Backup Generator

Example 2
Multifamily Low Rise

Year Built: 1963
Most Recent Year Rehabbed: 2000
Total Square Feet: 118,716
Total # Apartments: 202
Total # Bedrooms: 329
Total # Stories: 2 and 3
Basement? Conditioned?: Yes, yes
Water Meter Configuration: 1 meter per building
Electric Meter Configuration: 220 tenant, 16 common meters


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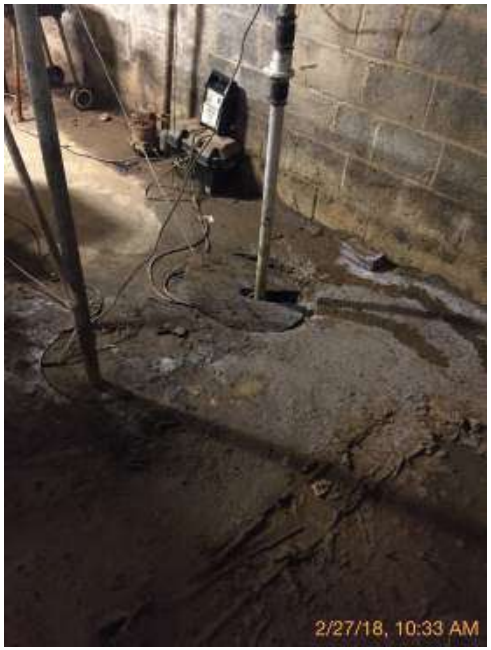
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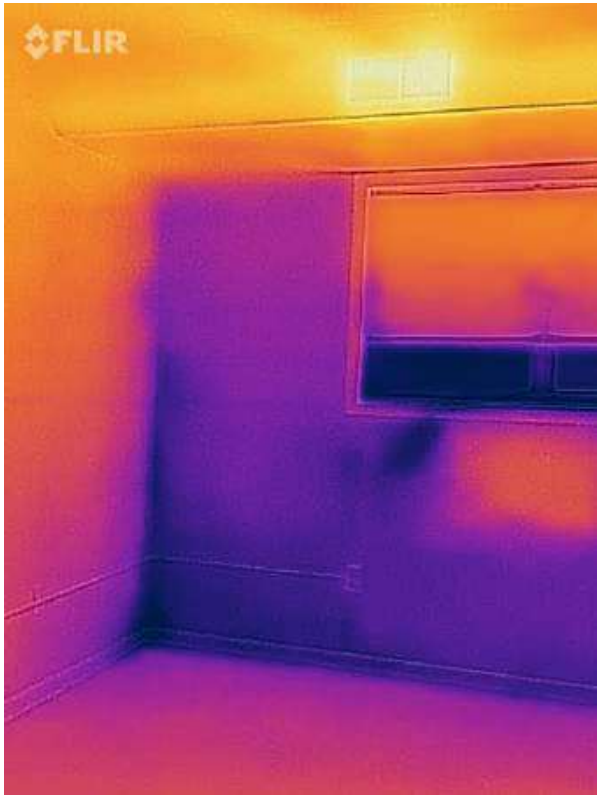

FLIR

Recommended Measure	Estimated Cost
Elevated Electrical Equipment	$50,000
Mold Remediation	$75,000
Sump Pumps	$3,000
Backwater Valves	$55,000
Building Floodproofing	$640,000
Cool Roof	$225,000
Surface Stormwater Management	$165,000
High Efficiency Ventilation	$1,315,000
Develop Emergency Management Manual	O&M

Co-Benefits

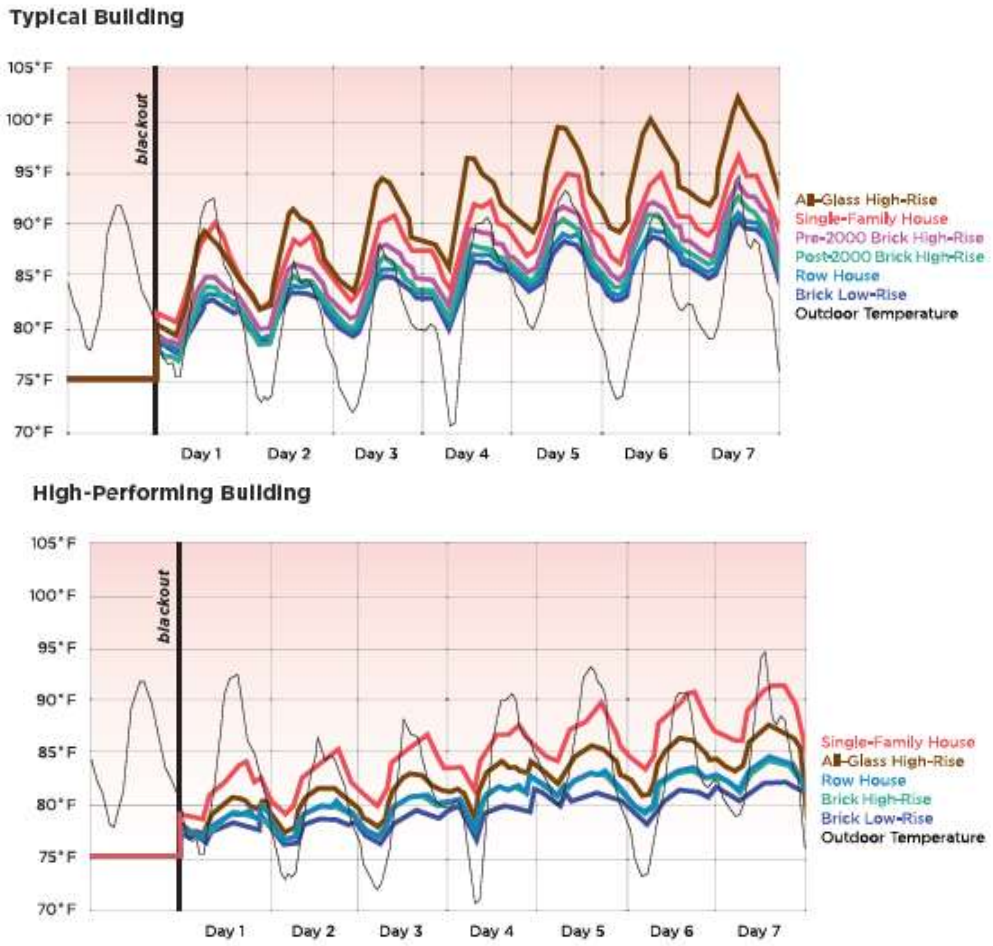
Measure with Co-Benefits

- Insulation, Air Sealing, and Window Replacement
  - Heating and Cooling Energy Savings, Improved Passive Survivability, Improved Wind Load Performance, Improved Comfort, Improved Functionality, Reduced Maintenance

Measure without Co-Benefits

- Backup Generator
  - Increased Building Services, Increased Operations and Maintenance Costs

Co-Benefits: Passive Survivability



Source: Urban Green Council, "Baby It's Cold Inside"

Co-Benefits: Cost Savings

Solar PV + Battery Storage

- Reduced electricity demand charges, backup power supply, more electricity generated on site used on site

NEI's Approach: Design


AREA OF MINIMAL FLOOD HAZARD
PANEL
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eff. 9/11/2009


Freeport
Home Depot
Hempstead Freeport
Freeport Creek
Merrick Road Park Golf Course

HVAC, DHW on Roof

Apartments Above Parking

Passive House Envelope Design

Backup LED Lights, Cell Phone Charging

8’ + 5’ = 13’

BFE = 8’

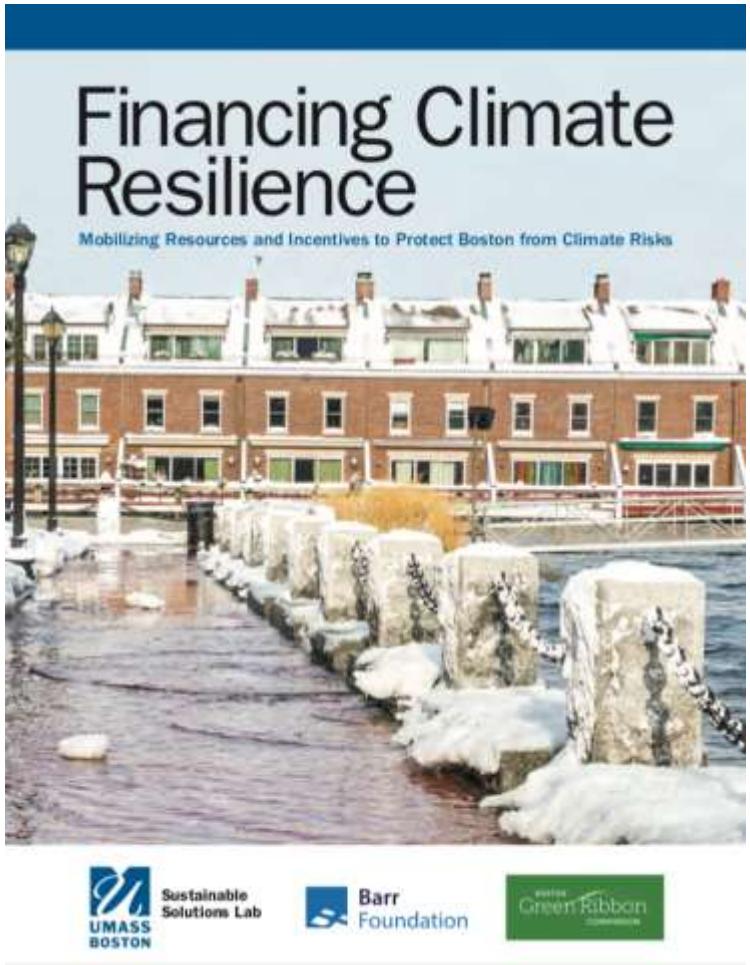
Conditioned Community Resilience Space

Backflow Prevention

Stormwater Storage and Infiltration

Generator with 72-hour Runtime

Financing Resilience



- Capital planning and investment timing
- Avoids future losses but does not generate cash flows
- Benefit-cost analysis demonstrates the business case
- Relate payments to benefits and account for ability to pay

Thank you!

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