Access speaker bios here:
https://files.asprtracie.hhs.gov/documents/healthcare-resilience-and-mitigation-webinar-speaker-bios.pdf

Access the webinar recording here: https://attendee.gotowebinar.com/recording/2700212981037313024

Access the transcript here: https://files.asprtracie.hhs.gov/documents/healthcare-resilience-webinar-transcript-final.pdf

TRACIE
HEALTHCARE EMERGENCY PREPAREDNESS INFORMATION GATEWAY

Healthcare Facility Extreme Weather Resilience and Mitigation

June 5, 2024

ASPR
Administration for Strategic Preparedness and Response

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HEALTHCARE EMERGENCY PREPAREDNESS INFORMATION GATEWAY

Rachel Lehman
Acting Program Director, ASPR TRACIE

ASPR
ADMINISTRATION FOR STRATEGIC PREPAREDNESS AND RESPONSE

ASPR Key Priorities

ASPR TRACIE: Three Domains

TECHNICAL RESOURCES

- Self-service collection of audience-tailored materials
- Subject-specific, SME-reviewed "Topic Collections"
- Unpublished and SME peer-reviewed materials highlighting real-life tools and experiences

asprtracie.hhs.gov

ASSISTANCE CENTER

- Personalized support and responses to requests for information and technical assistance
- Accessible by toll-free number (1844-5-TRACIE), email (askasprtracie@hhs.gov), or web form (ASPRtracie.hhs.gov)

1-844-5-TRACIE

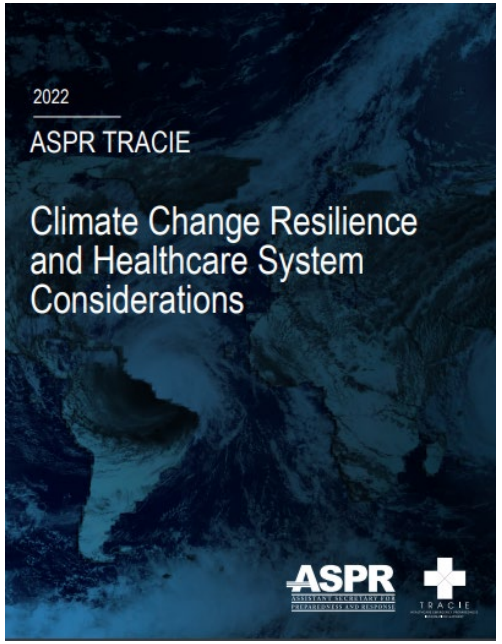
INFORMATION EXCHANGE

- Area for password-protected discussion among vetted users in near real-time
- Ability to support chats and the peer-to-peer exchange of user-developed templates, plans, and other materials

askasprtracie@hhs.gov

Select Relevant ASPR TRACIE Resources

- Climate Change Resilience and Healthcare System Considerations
- Climate Change and Healthcare System Considerations Topic Collection
- Hurricane Resources Page
- Major Hurricane Potential PH and Medical Implications
- Major Earthquakes & Cascading Events: Potential Health and Medical Implications
- Natural Disasters TC
- *The Exchange* Issue 6: Evacuating Healthcare Facilities
- *The Exchange* Issue 10: Preparing for and Responding to Wildfires and Planned Outages
- *The Exchange* Issue 19: Extreme Weather and Healthcare (Coming Soon)



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HEALTHCARE EMERGENCY PREPAREDNESS INFORMATION GATEWAY

Aparna Bole, MD

HHS Office of Climate Change & Health Equity (OCCHE)

Moderator

ASPR

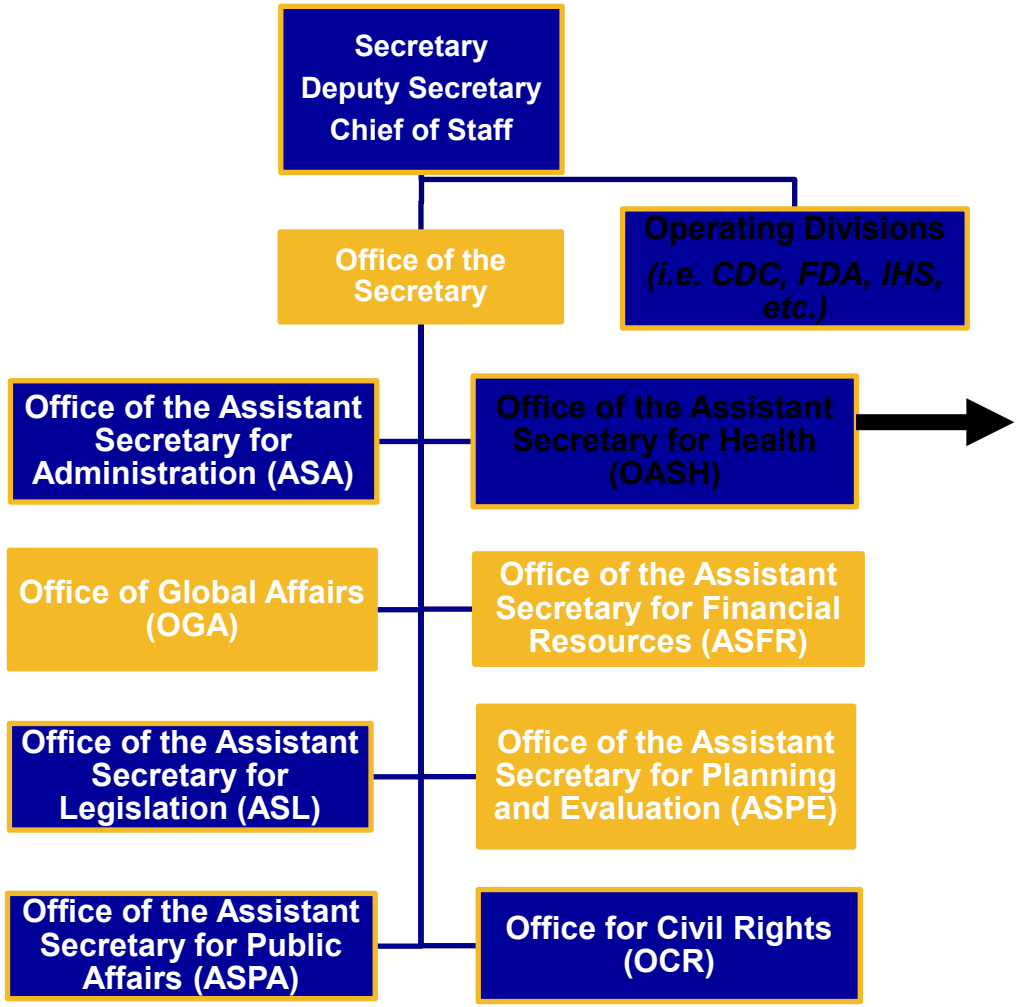
ADMINISTRATION FOR STRATEGIC PREPAREDNESS AND RESPONSE

Climate Resilience for Health Care

Aparna Bole, MD
Agency for Healthcare Research & Quality/
Office of Climate Change and Health Equity

OASH | Office of Climate Change and Health Equity

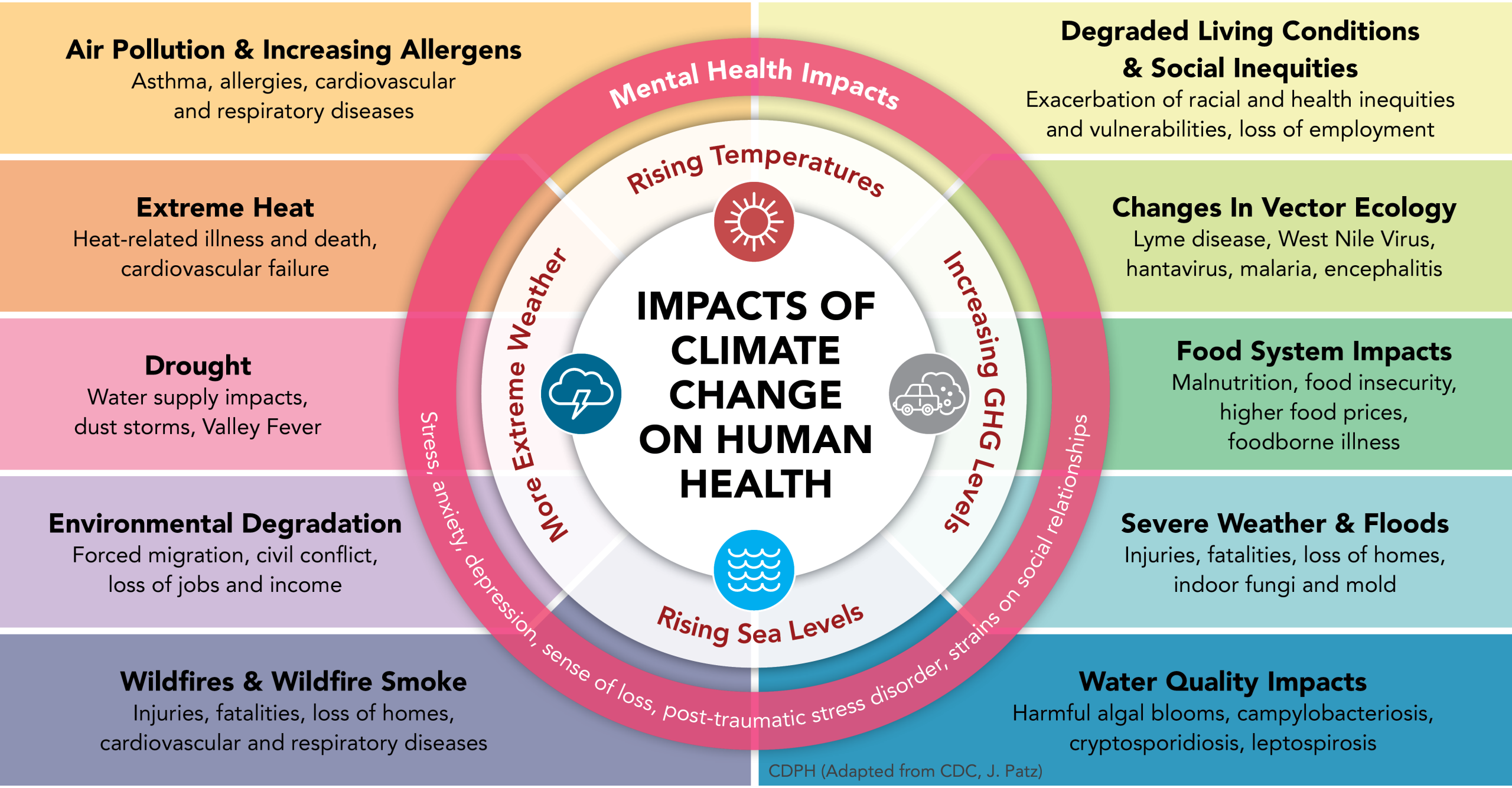
Office of the Assistant Secretary for Health



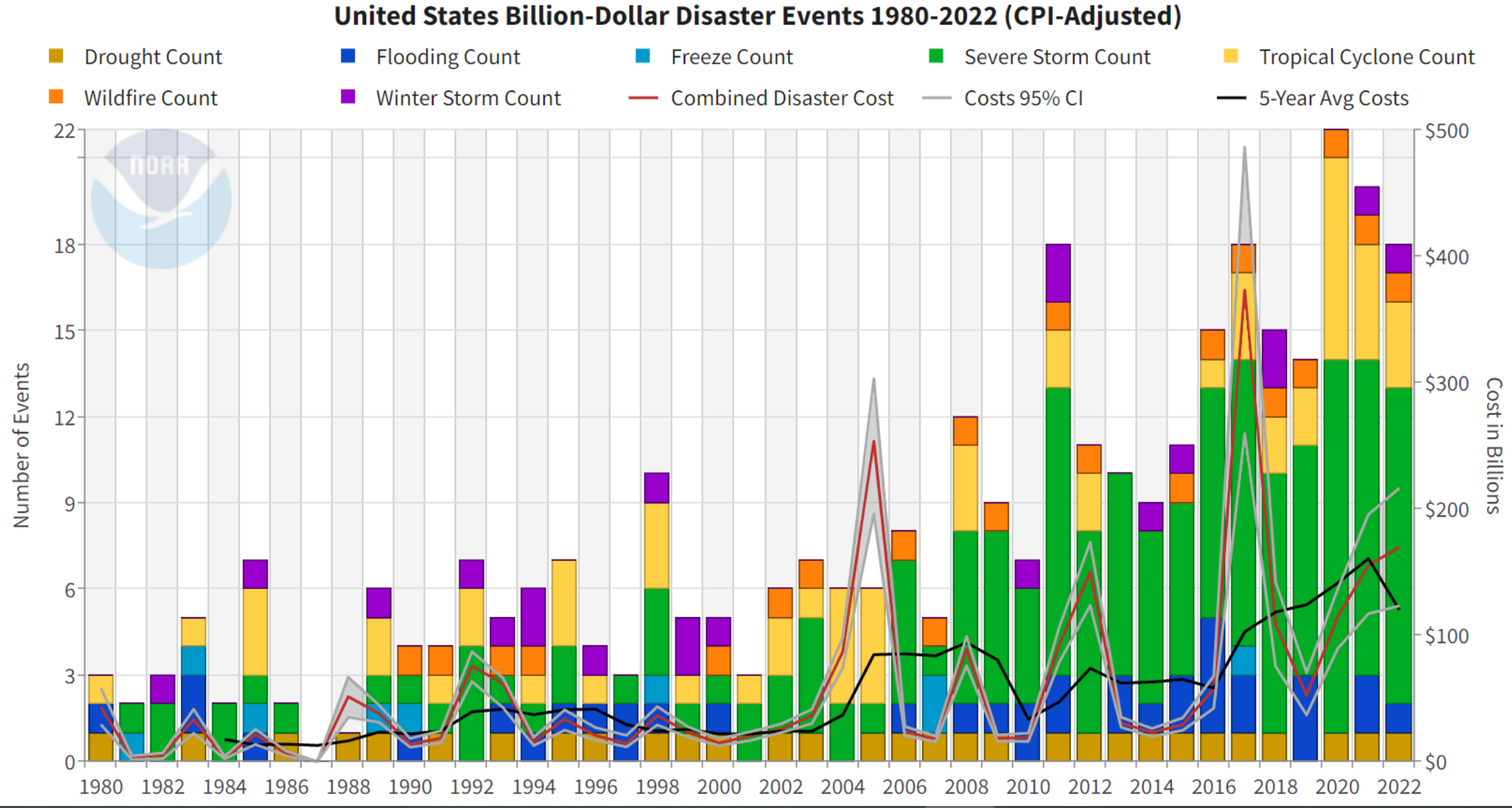
Assistant Secretary for Health
Admiral Rachel L. Levine

Office of Environmental Justice - Est. 2022
Dr. Sharunda Buchanan
Interim Director

Office of Climate Change and Health Equity - Est. 2021
Dr. John Balbus
Director



https://www.cdph.ca.gov/Programs/OHE/pages/CCHEP.aspx



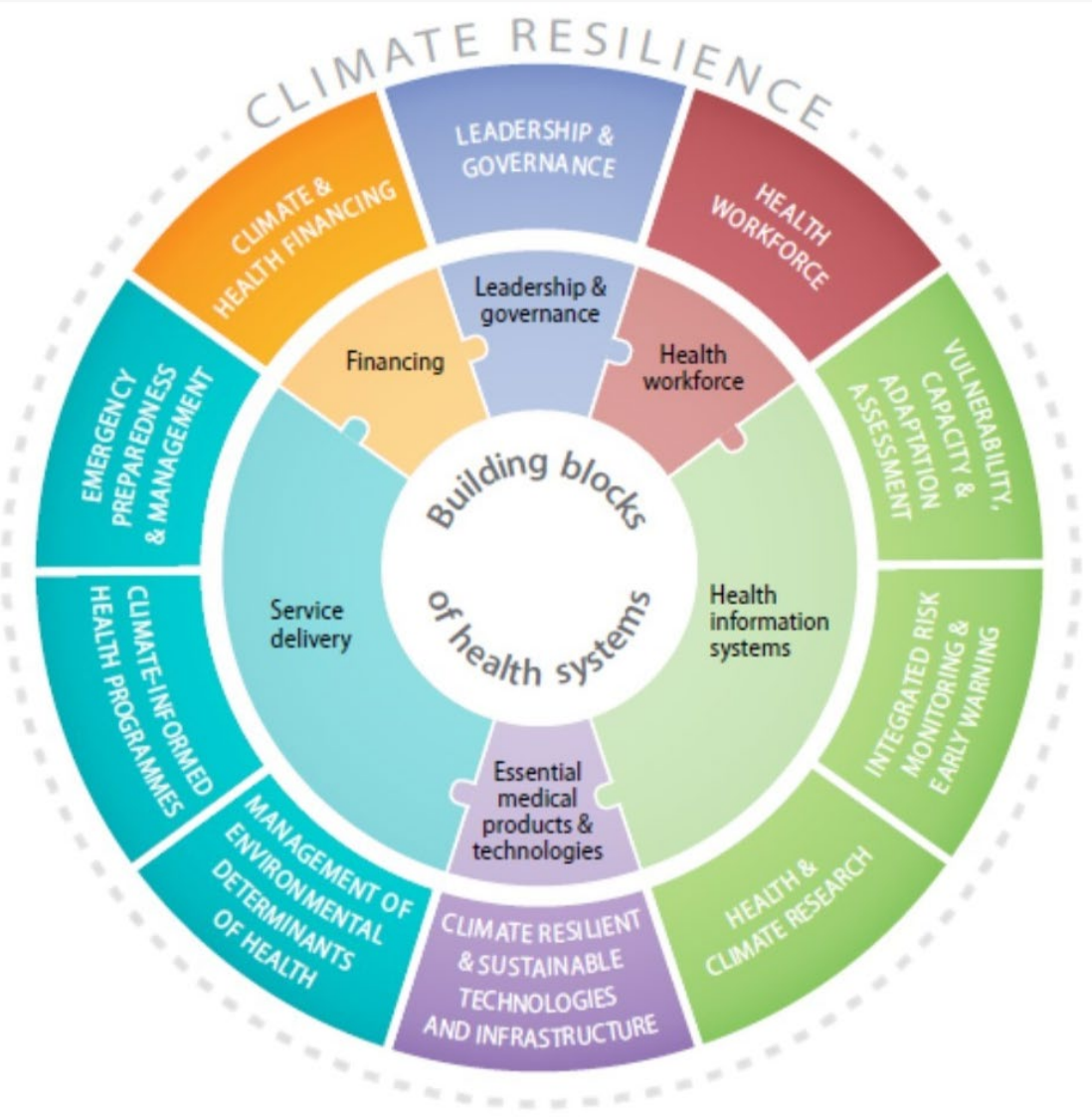
https://www.ncei.noaa.gov/access/billions/time-series


EXTREME HEAT
SAVE POWER 4-9PM
STAY COOL

WHO's Operational Framework for Building Climate Resilient Health Systems

- A climate-resilient health system is "capable to anticipate, respond to, cope with, recover from, and adapt to climate-related shocks and stress, so as to bring sustained improvements in population health, despite an unstable climate."

https://bit.ly/3IqBJPP

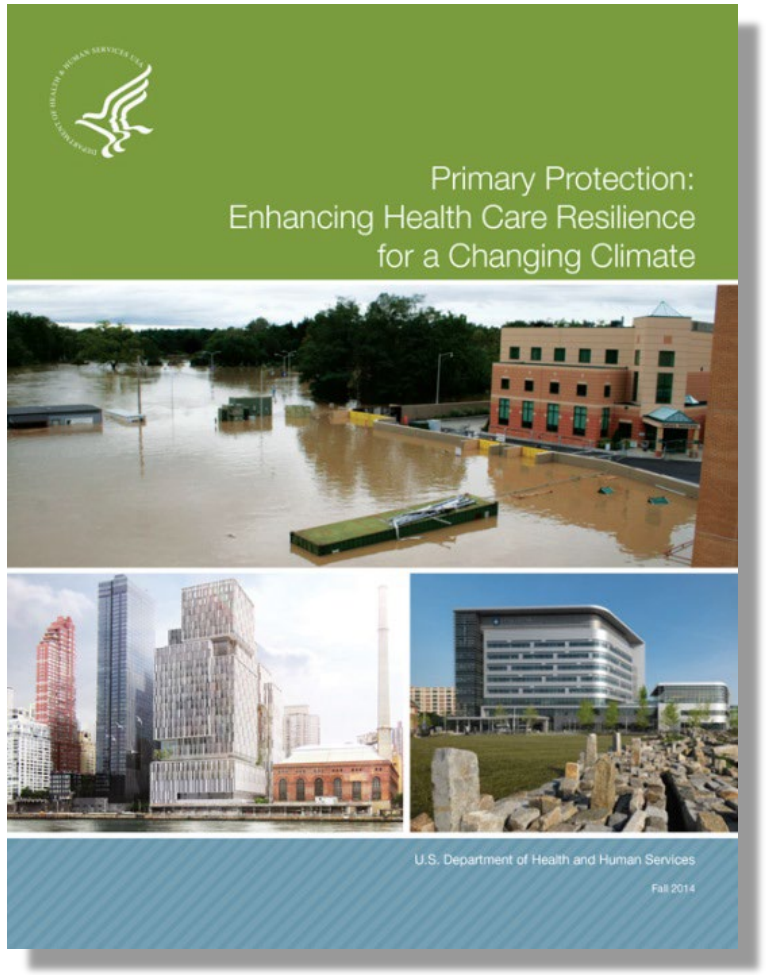


Key Elements of a Healthcare Climate Resilience Plan

1. Prospective risk assessment
2. Health equity and community engagement
3. Assessment and remediation of vulnerabilities in infrastructure and operations
4. Collaboration between healthcare organizations
5. Interdisciplinary planning, oversight, and evaluation

Climate Resilience for Health Care (CR4HC): Updated Toolkit

- Update to “Sustainable & Climate Resilient Healthcare Facilities Toolkit”
- Planned fall 2024 publication
- Alignment with other HHS emergency preparedness tools and guidance
- Primary audience: healthcare emergency management professionals
- More modular, user-friendly content
- Updated case studies, reflecting a diversity of facility types
- Housed within NOAA Climate Resilience Toolkit site



CR4HC Toolkit Structure


OASH | Office of Climate Change and Health Equity

Impact of Extreme Heat on Health Care Facilities

1. Prospective Risk Assessment

Extreme heat risk assessments in emergency management plan
traditionally retrospective. Adding forward-facing climate projec
the risk assessment can help healthcare organizations plan for
exposures and vulnerabilities, such as more frequent, severe, an
heat waves. For example, a study found that New York City's de
2008 to lower its threshold for activating the local heat emerger
was subsequently associated with a daily reduction of 0.8 heat
hospital admissions among patients over 65 years (Benmarhnia et al., 2019).

Climate Resilience Actions

Tools and resources relevant to these actions can be found at:
HEAT: Element 1: Prospective Risk Assessment Tools and Resources

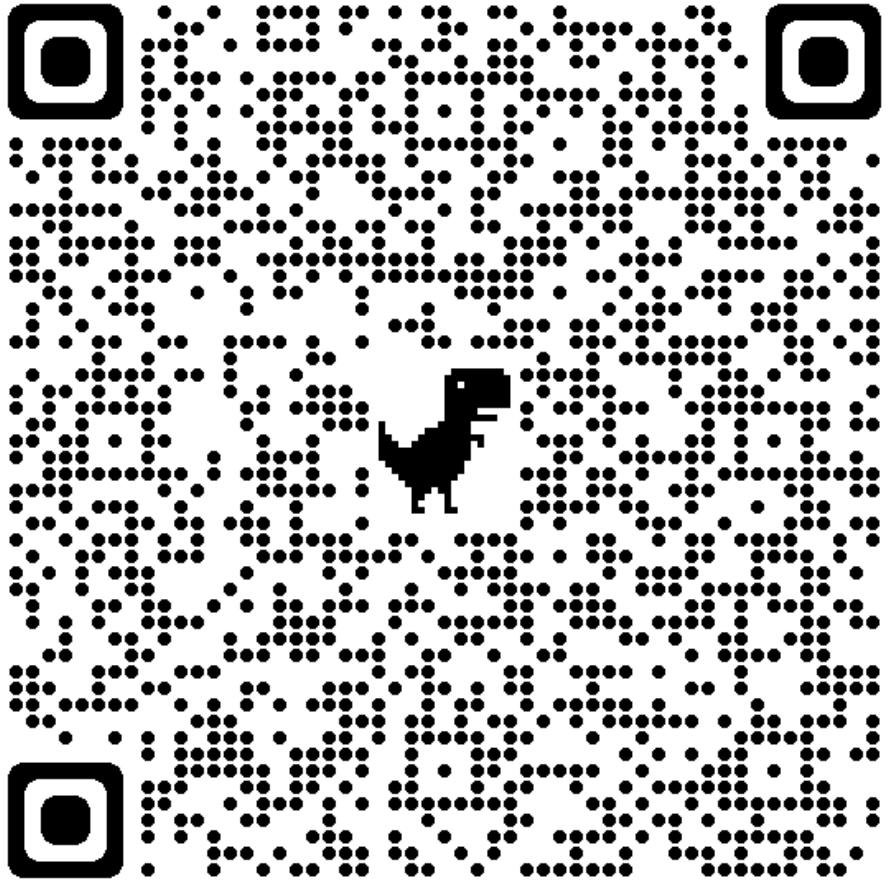
- Collaboration with ASPR to align with updated Risk Identification and Site Criticality (RISC) Toolkit
- Can be navigated online or in downloadable PDFs
- Intro/ resilience strategies + links to tools & resources/ case studies
- Resilience strategies organized around key elements
- All-hazards approach – but content organized around climate-related hazards named in RISC toolkit

Quickfinder for Leveraging the IRA for the Health Sector

1. Background on climate change and health equity

2. Overview of investments and actions potentially facilitated by the IRA

3. Summaries of relevant IRA programs



OASH | Office of Climate Change and Health Equity

Thank you!

Contact us: OCCHE@hhs.gov

Visit us online and sign up for our listserv at www.hhs.gov/ocche

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HEALTHCARE EMERGENCY PREPAREDNESS INFORMATION GATEWAY

Jenna Agins, MBA, MS
Energy & Sustainability Assistant Director
NYU Langone Health

ASPR
ADMINISTRATION FOR STRATEGIC PREPAREDNESS AND RESPONSE

Our Expanding Footprint

NYU Langone Health

13.5M	Square Feet
6	Inpatient Facilities
2,073	Beds
$12B	In Hospital Revenue
49,000	Employees
1,300+	Faculty Researchers
544	MD Candidates

CONNECTICUT
FAIRFIELD
WESTCHESTER
BERGEN
NEW YORK
THE BRONX
MANHATTAN
QUEENS
NASSAU
SUFFOLK
NEW JERSEY
BROOKLYN
STATEN ISLAND
NYU Langone Hospital–Brooklyn
NYU Langone Hospital–Long Island
Long Island Community Hospital (affiliate)

300+ Locations

As of April 2024

Key Achievements

1st

Campus in the world to achieve both USGBC PEER & LEED Platinum certification

1st

NYC-based member of the US Health Care Climate Council

Joined in 2020

TOP 25

Hospital for sustainable practices

2022 Practice Greenhealth award

TOP 10

Circles of Excellence – Green Buildings

2024 Practice Greenhealth award

Commitments

National & International

- US Department of Human & Health Services Health Sector Pledge
- US Health Care Climate Council
- Health Care Climate Challenge
- National Academy of Medicine's "Accelerating the National Climate and Health Movement"

City & State

- NYC Carbon Challenge
- Clean Air NY
- NY State Clean Green Campuses

Goals

50% carbon emissions reduction by 2030

Achieve carbon neutrality by 2050

Core Values

“Our experience during Hurricane Sandy and its aftermath prompted us to reimagine resilient and sustainable design”

- Paul Schwabacher, P.E. Senior Vice President, Facilities Management, NYU Langone Health

- Embrace opportunities to change
- Support resiliency and climate preparedness beyond industry standards in healthcare & required by regulation/government/FEMA
- Use a collaborative master planning & design process
- Conduct annual hazard vulnerability assessments that take climate change into account
- Expand commitment to energy efficiency and carbon reduction
- Build a culture of resiliency
- Focus on emergency preparedness and business continuity planning

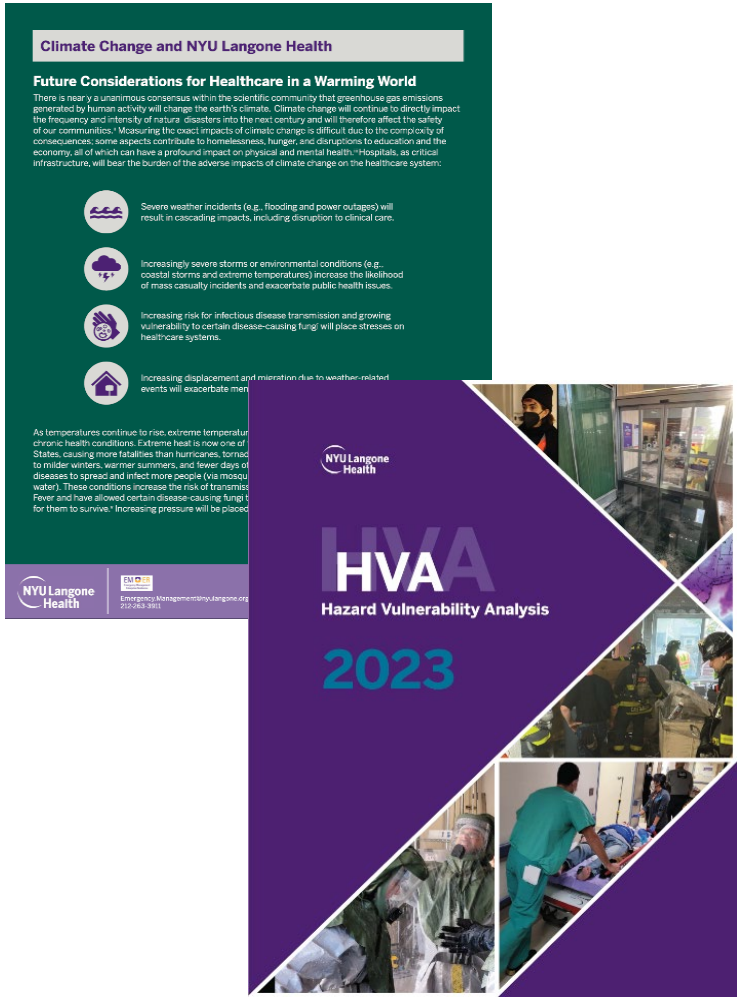
NYU Langone Health

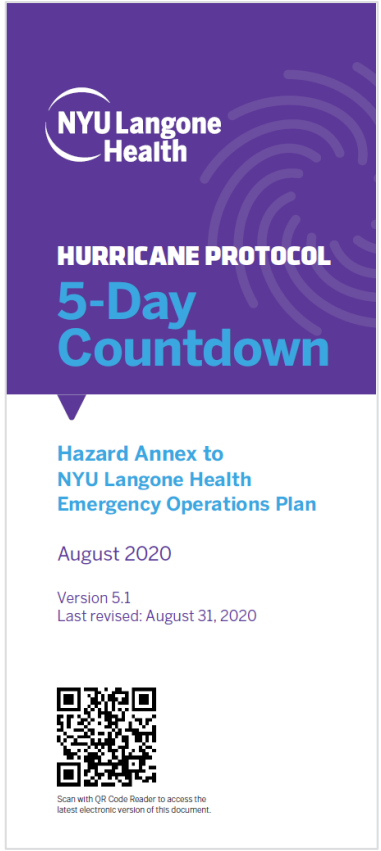
Approach to Design for Resiliency and Sustainability

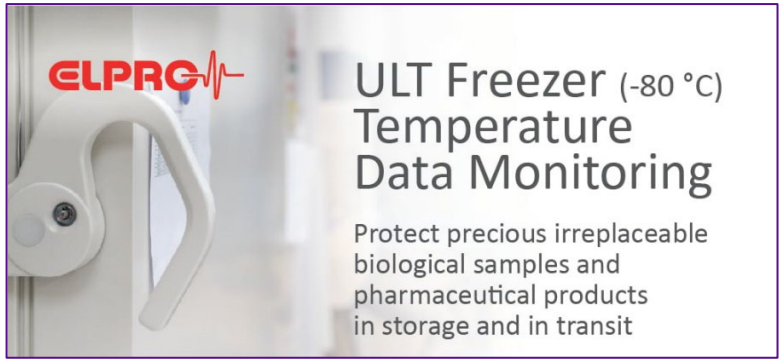
- Evidence-based design decisions using forward looking climate projections
- Major investment in infrastructure for resiliency, sustainability and energy efficiency
- Focus on energy conservation, long-term decarbonization, and beneficial electrification
- Elevate critical infrastructure, patient care, research, communications and support functions and add capacity and redundancy
- Explore microgrids with varied DERs like geothermal, cogeneration and renewables + battery
- Increase demand management capabilities with cleaner backup generation
- Harden campuses and protect the perimeter
- Design sustainable, LEED buildings & install green infrastructure
- Plan for flexibility and future requirements for spaces
- Design for emergency management + enterprise resiliency for natural and human based disasters (resilient operations)

NYU Langone Health

Resilient Operations







NYU Langone Health

East River Campus Case Study

3.5 million ft^2 with 10 interconnected buildings

Energy Independent

- 13 MW of cogeneration systems, most dual fuel
- >25 MW diesel backup emergency generation
- 2 backup boilers
- Enhanced black start capabilities
- 6 redundant high tension electrical services with power fed from two different utility substations

Campus Design

- Raised critical infrastructure, IT, programs, & communications above designed flood elevation
- Redundant data centers connected to all buildings
- Building containment & compartmentalization
- Extensive flood protection, walls, gates & doors
- Passive measures like “up-and-over” stairs
- Deployable pumping + permanent piping
- Elevator protection and programming
- Green roofs & green spaces to manage stormwater
- Exterior-accessible, elevated emergency fuel refilling locations

Operations

- Enhanced demand management capabilities
- Automatic emergency operation modes
- Continuous commissioning of systems
- Infrastructure and flood mitigation measure testing
- Staff training, communications and drills

NYU Langone Health


PEER
PLATINUM
Performance Excellence in Electricity Renewal
12,000 SF GREEN ROOF
SCIENCE BUILDING GREY WATER RECYCLING SYSTEM
IN PROGRESS
SOUTH DATA CENTER
NORTH DATA CENTER
Con Ed Utility Service
Cogeneration System & Backup Boilers
Emergency Generators & Switchgear
Linear Accelerators
NYULH DFE (Sandy + 2 feet)
New FEMA 500-Year Elevation
Sandy High Water Level
LOADING DOCK DEPLOYABLE FLOOD GATE

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HEALTHCARE EMERGENCY PREPAREDNESS INFORMATION GATEWAY

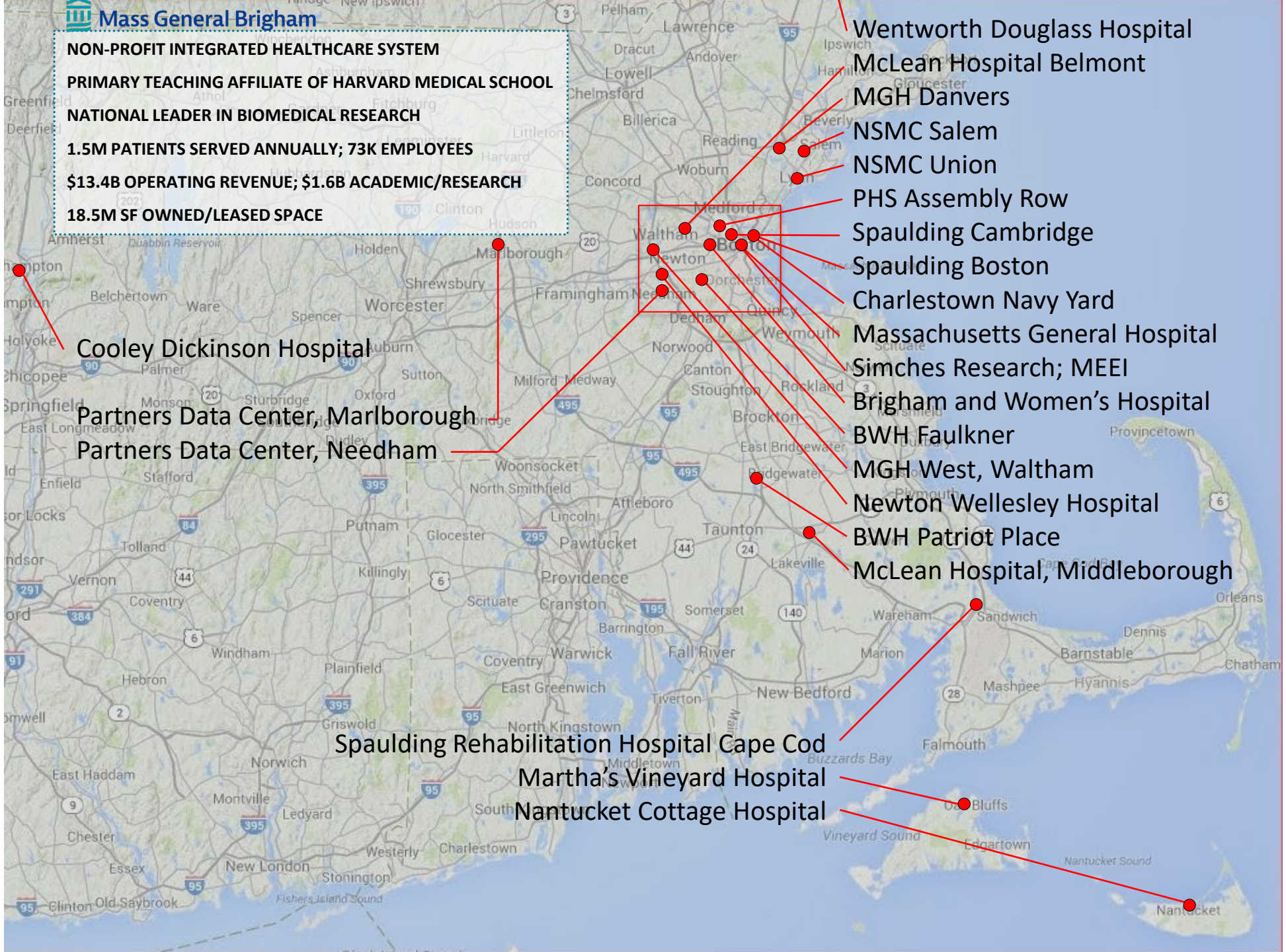
David Burson, AIA, NCARB

Senior Project Manager, Real Estate and Facilities

Mass General Brigham

ASPR

ADMINISTRATION FOR STRATEGIC PREPAREDNESS AND RESPONSE


Mass General Brigham
NON-PROFIT INTEGRATED HEALTHCARE SYSTEM
PRIMARY TEACHING AFFILIATE OF HARVARD MEDICAL SCHOOL
NATIONAL LEADER IN BIOMEDICAL RESEARCH
1.5M PATIENTS SERVED ANNUALLY; 73K EMPLOYEES
$13.4B OPERATING REVENUE; $1.6B ACADEMIC/RESEARCH
18.5M SF OWNED/LEASED SPACE
Wentworth Douglass Hospital
McLean Hospital Belmont
MGH Danvers
NSMC Salem
NSMC Union
PHS Assembly Row
Spaulding Cambridge
Spaulding Boston
Charlestown Navy Yard
Massachusetts General Hospital
Simches Research; MEEI
Brigham and Women's Hospital
BWH Faulkner
MGH West, Waltham
Newton Wellesley Hospital
BWH Patriot Place
McLean Hospital, Middleborough
Cooley Dickinson Hospital
Partners Data Center, Marlborough
Partners Data Center, Needham
Spaulding Rehabilitation Hospital Cape Cod
Martha's Vineyard Hospital
Nantucket Cottage Hospital

MASS GENERAL BRIGHAM SUSTAINABLE INITIATIVES
Leadership and Public Health

To support Mass General Brigham in becoming a leader for promoting a **healthy environment**, optimizing the **care of our patients** and the **well-being of our employees** while **conserving the resources we expend**.

Mass General Brigham cannot be viewed as contributing to the health problems manifested in the patients we are treating.

Resilient Design - Spaulding Rehabilitation Hospital

SPAULDING REHABILITATION HOSPITAL

Statistics

- 378,000 s.f. Rehabilitation Hospital
  - 261,300 s.f. above grade
  - 117,000 s.f. below grade [primarily parking]
- 9 Floors above grade, including Mechanical Penthouse
- 132 Acute Rehab Beds
- Outpatient Clinics & Therapy
- Research and Teaching Hospital
- Opened April 2013
- LEED v2.2 Gold Certification

from Krieger, Cobb, Turner: *Mapping Boston*, 1999

NEW ORLEANS HOSPITALS: HURRICANE KATRINA 2005

- New Orleans hospitals including the VA, Charity, and Mercy hospitals were **evacuated** due to loss of emergency power, water, sewage treatment and critical infrastructure. **Dozens of deaths** were related to **post storm conditions** in the hospitals.
- The new **Southeast Louisiana Veterans Health Care Service** (SLVHCS) was designed to **"Defend in Place"** for 7 days.
  - Floor **elevations** and **critical functions** set to **withstand future levee breaks**
  - **Provisions** and **accommodations** for up to **1,000 patients and staff**
  - Energy Plant stores **320,000 gallons of fuel**
  - Storage of over **1,000,000 gallons** of captured **rainwater** and **on-site sewage treatment plant**
  - **Warehouse** for food & emergency supplies

BUILDING RESILIENCY STRATEGIES

- **Design and construct** (or renovate) **buildings** to handle severe storms, flooding, wildfire, and other **impacts** that are expected to result from a **warming climate**.
- Locate **critical systems** to withstand flooding and extreme weather events.
- Create buildings that will **maintain livable conditions in the event of extended loss of power** or heating fuel through **energy load reductions** and reliance on **passive heating and cooling strategies**. (**passive survivability**)
- **Reduce dependence** on **complex building controls** and systems. Provide **manual overrides** in case of malfunction or temporary power outages.
- Rely on ***vernacular design*** practices that were prevalent before the advent of air conditioning and central heating. Combine these with **modern materials** to optimize **resilient design**.

Damage at St. John's Regional Medical Center caused by the May 22, 2011, tornado.

Mercy Hospital Joplin, which opened in March 2015. The new hospital is a "storm-hardened" facility with a precast concrete shell, windows that can withstand high winds, and partially buried generators for backup power in an emergency.

Excerpted from a list created by the Resilient Design Institute.

PASSIVE SURVIVABILITY

- The decision to **“Shelter in Place”** during extended periods of power outages call for measures to extend critical conditioning systems through emergency power hookups and/ or **passive measures to extend habitable temperatures** for longer periods of time.
- **Enhanced building enclosures** to reduce solar gain or heat loss depending on the exterior conditions to maintain thermal comfort.
- **Daylighting** so that during the day spaces are habitable without electric lights.
- **Operable windows** to mitigate overheating in the event a building remains occupied while patients are awaiting evacuation.
- **Provisions for potable water and water for sewage conveyance** are needed. Hospitals should place a high priority on developing independent, high quality reliable water supplies.

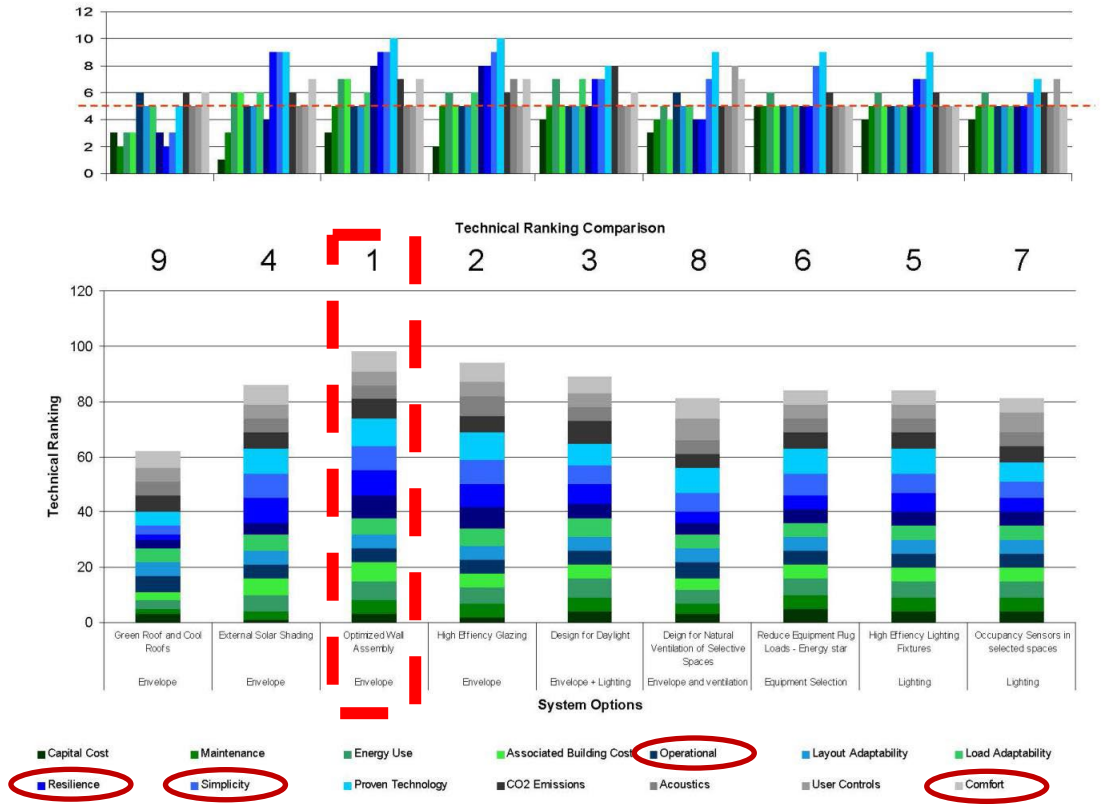
Superdome New Orleans w/ evacuees during Hurricane Katrina

Therapy Gym at Spaulding Rehabilitation Hospital

SPAULDING REHABILTATION HOSPITAL
Sustainability/ Resiliency Decision-making Process

- Establish **criteria** by which strategies would be evaluated:
  - Capital Cost
  - Maintenance
  - Energy Use
  - Associated Building Cost
  - **Operational**
  - Layout Adaptability
  - Load Adaptability
  - **Resilience**
  - **Simplicity**
  - Proven Technology
  - CO 2 Emissions
  - Acoustics
  - User Controls
  - **Comfort**
- **Optimized Wall Assembly** ranked **#1**

Envelope/Lighting



Study and graphics by Buro Happold Inc.
Courtesy of Mass General Brigham

SPAULDING REHABILITATION HOSPITAL

Resiliency Measures

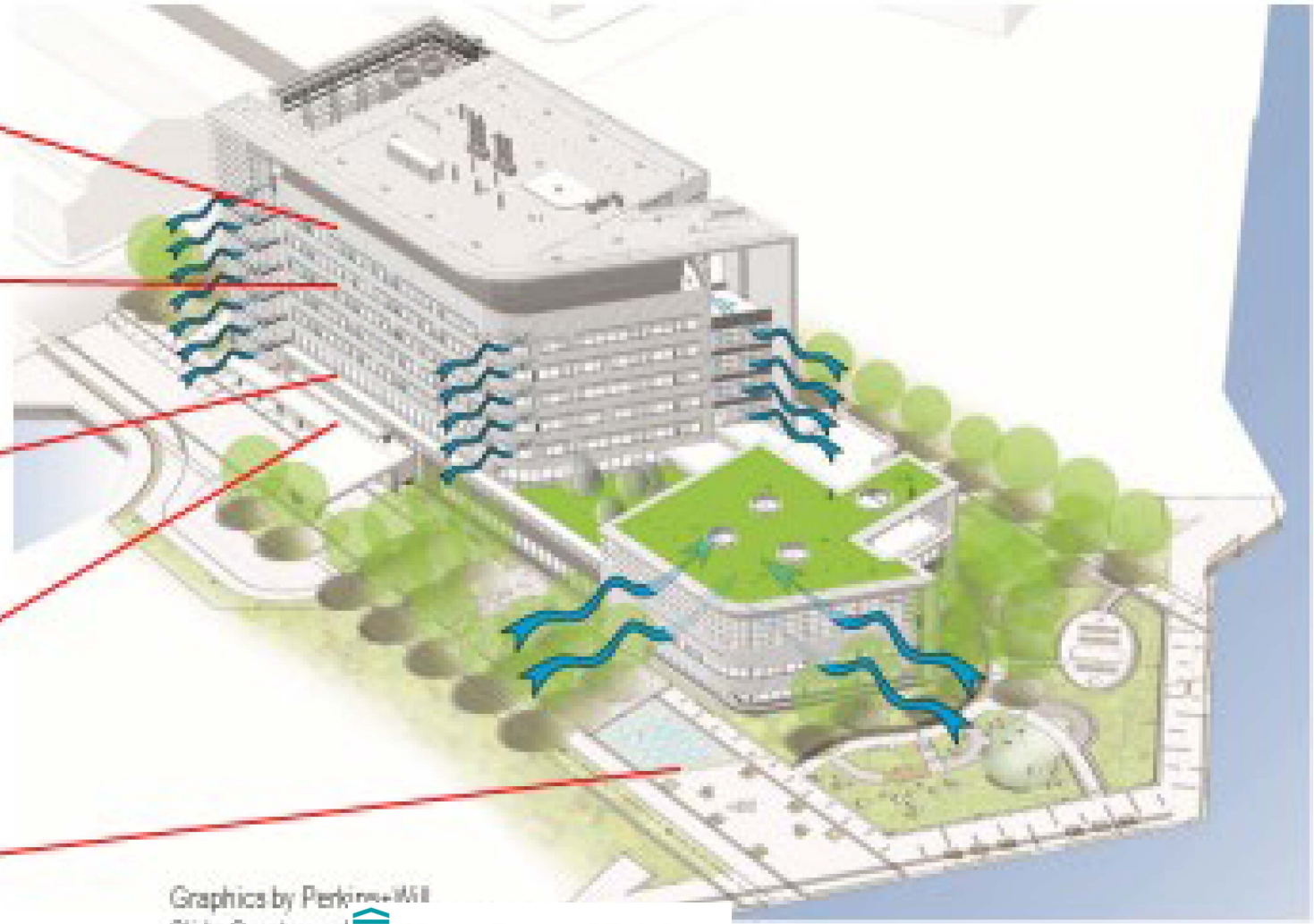
Mechanical, electrical, & emergency generators in penthouse to avoid flooding issues.

Operable windows in Patient Rooms keyed open in event of systems failure.

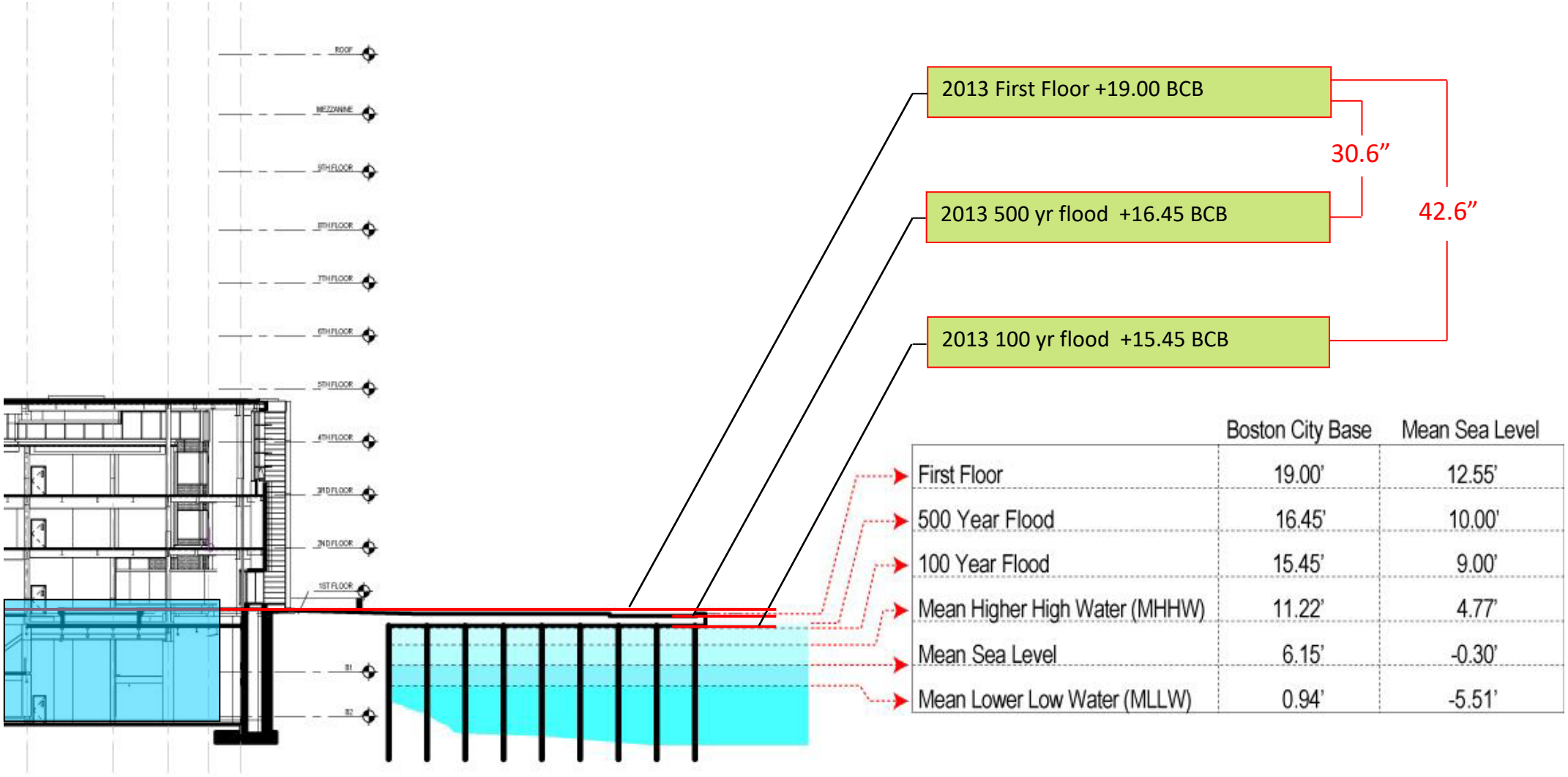
Critical patient programs located above the ground floor.

Ground floor and top of parking ramp set 30" above current 500-year flood level.

Berms, retaining walls & plantings act as protective barriers to storm surge.



Graphics by Perkins+Will
Slide Courtesy of Mass General Brigham



	Boston City Base	Mean Sea Level
First Floor	19.00’	12.55’
500 Year Flood	16.45’	10.00’
100 Year Flood	15.45’	9.00’
Mean Higher High Water (MHHW)	11.22’	4.77’
Mean Sea Level	6.15’	-0.30’
Mean Lower Low Water (MLLW)	0.94’	-5.51’

Spaulding Rehabilitation Hospital, Charlestown Navy Yard, Boston

Architect: Perkins + Will Civil engineer VHB Analytical diagrams P+W / Mass General Brigham

SPAULDING REHABILITATION HOSPITAL
Lessons Learned

Mass General Brigham

- **Staff** must be **trained** in operational procedures in order **to realize** the **design intent** e.g., use of operable windows for patient satisfaction and energy savings as well as passive survivability.
- **Location** of the main **Kitchen** and **food supplies** on the Ground Floor were **driven by other considerations than resiliency**.
- **Rainwater/ other clean water capture not implemented**. **ROI** proved to be **too long** to be economically feasible.
- **Integration** of the **site** and **ground floor** with the **neighborhood** has **enabled Spaulding** to act as a **catalyst** for community **social resilience** as a means to address adaptation to climate change.


10/29/2012

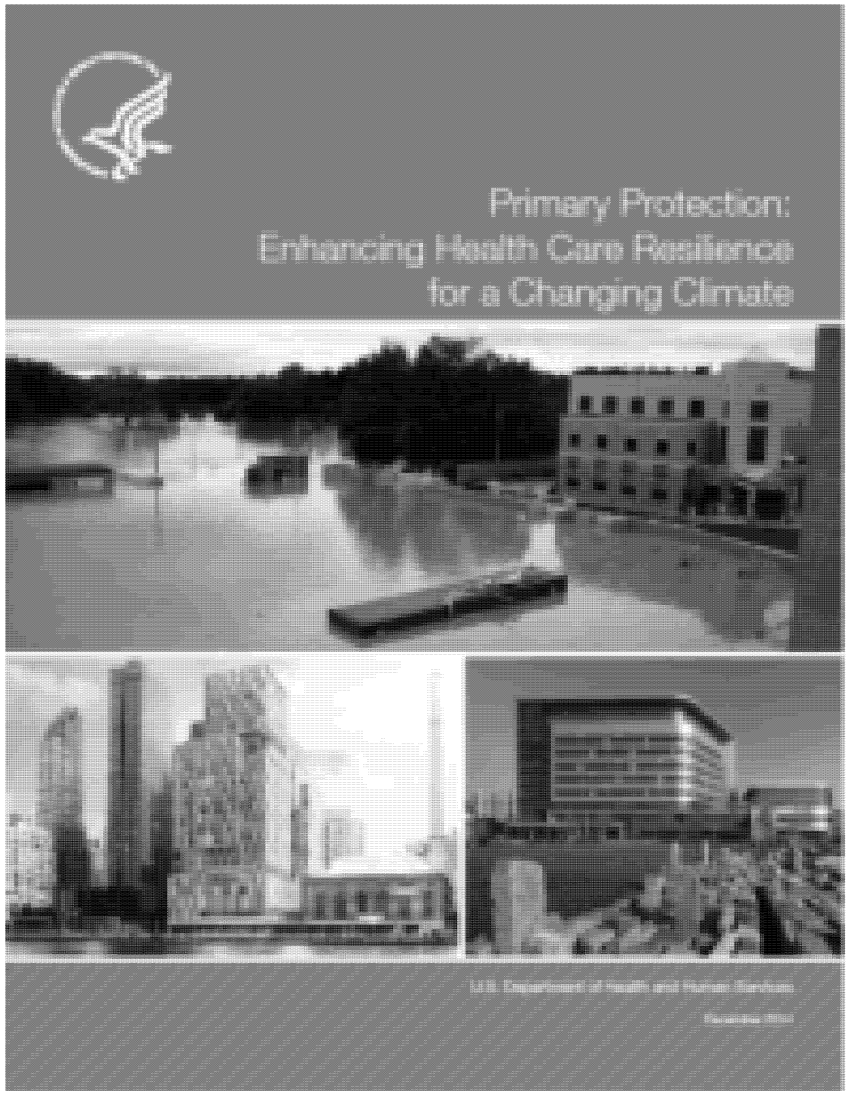
SPAULDING REHABILITATION HOSPITAL

The Business Case for Resiliency

- The **premium** for **resiliency measures** was roughly $1.5 million out of a construction cost of $160 million. Utility rebates paid for roughly half of these additional costs.
- Investments in the high performance building enclosure and energy efficiency measures have a **5 – 8 year payback**.
- Many of the **resiliency measures** also provide **direct benefits to patients**, for example the landscape design which helps to mitigate storm surge is part of a therapy garden. This has **increased demand** for **Spaulding's services**.

FOUNDATIONAL CONCEPTS OF HEALTHCARE RESILIENCE

1. A **network of coordinated health care services** must remain **operational** during and following extreme weather events.
2. Public Policymakers and healthcare providers must work together to determine the **minimum and recommended infrastructure requirements** for all healthcare delivery settings.
3. Climate change is introducing new threats and **new building design threshold conditions**.
4. Health care organizations play a **key role** in **community resilience**.
5. **Resilient health care organizations must anticipate extreme weather risks** and transcend limitations of regional public policy, local development vulnerabilities, and community infrastructure challenges as they site, construct, and retrofit health care facilities.
6. **Community engagement** is a key element of health care system resilience.

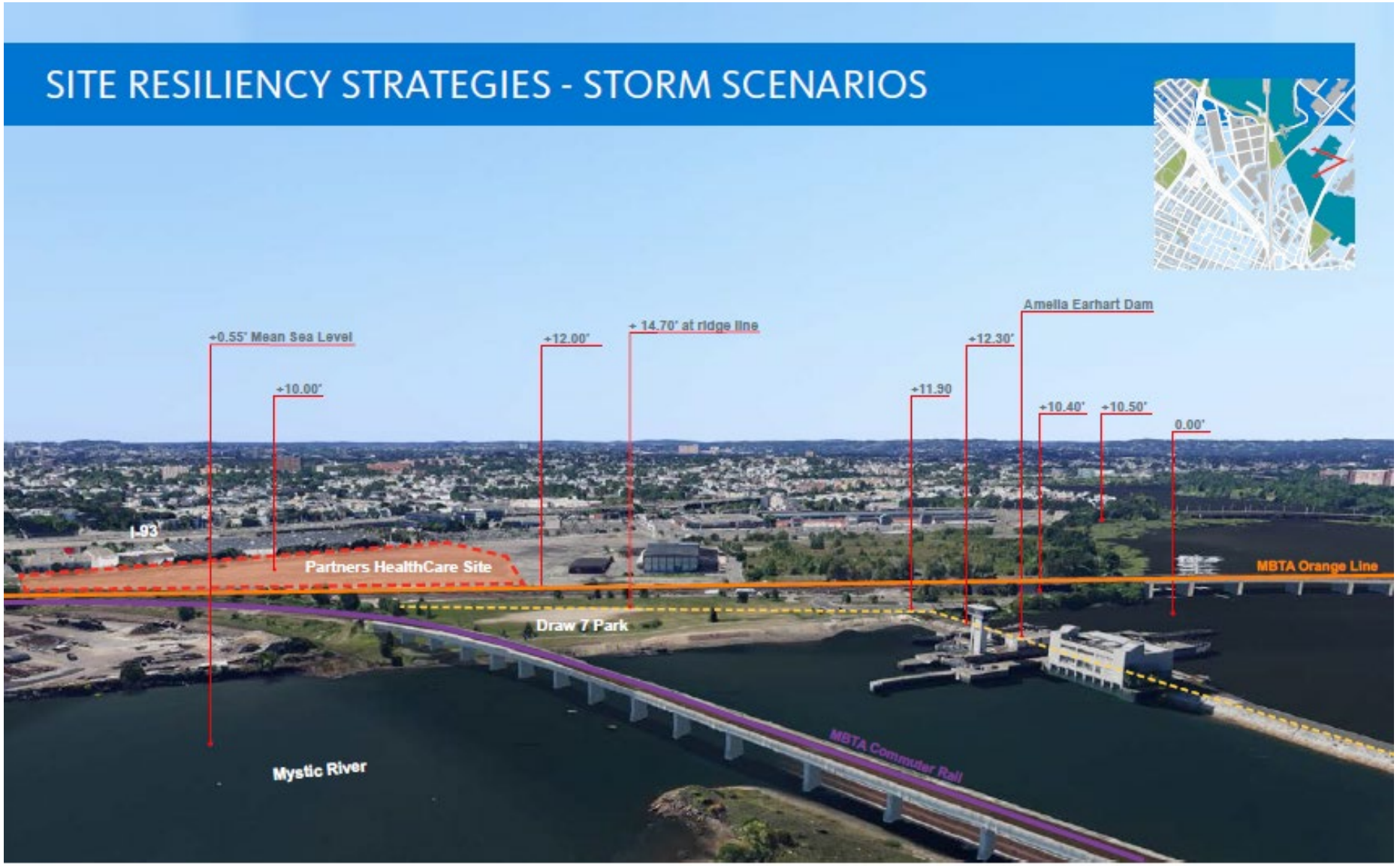


Resilient Design

Mass General Brigham Administrative Campus, Somerville, MA

Resilient Design

Mass General Brigham Corporate HQ, Somerville, MA



Resilient Design

Mass General Brigham Corporate HQ, Somerville, MA

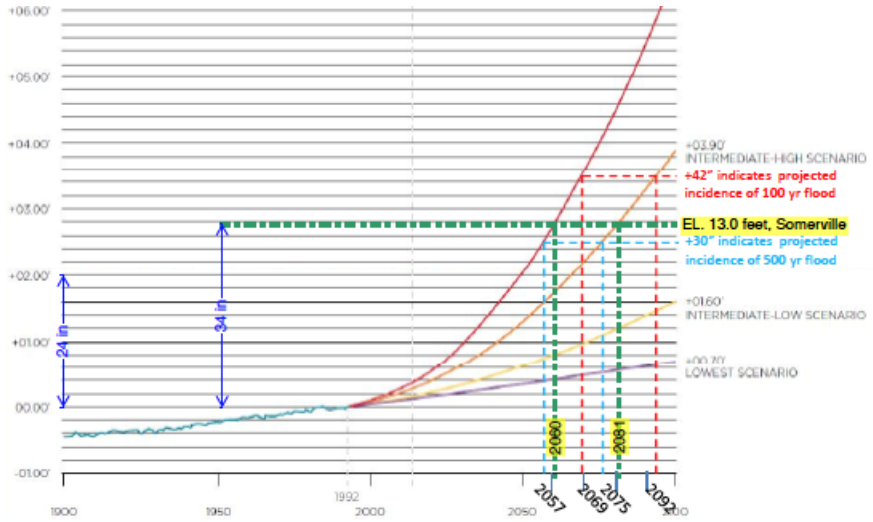
Mass General Brigham

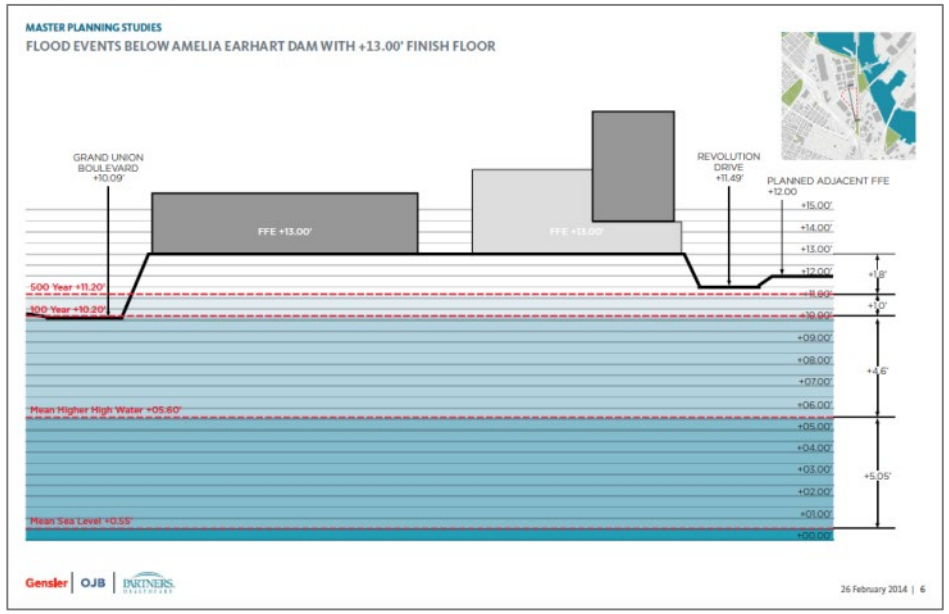
Riverine flooding from Mystic River – above the dam

Ocean flooding from SLR below the dam

- Site datum set 34” above current HHT
- High/intermediate high scenarios
- 500-yr flood vulnerability 2050’s – 2070’s
- 100-yr flood vulnerability 2060’s – 2090’s

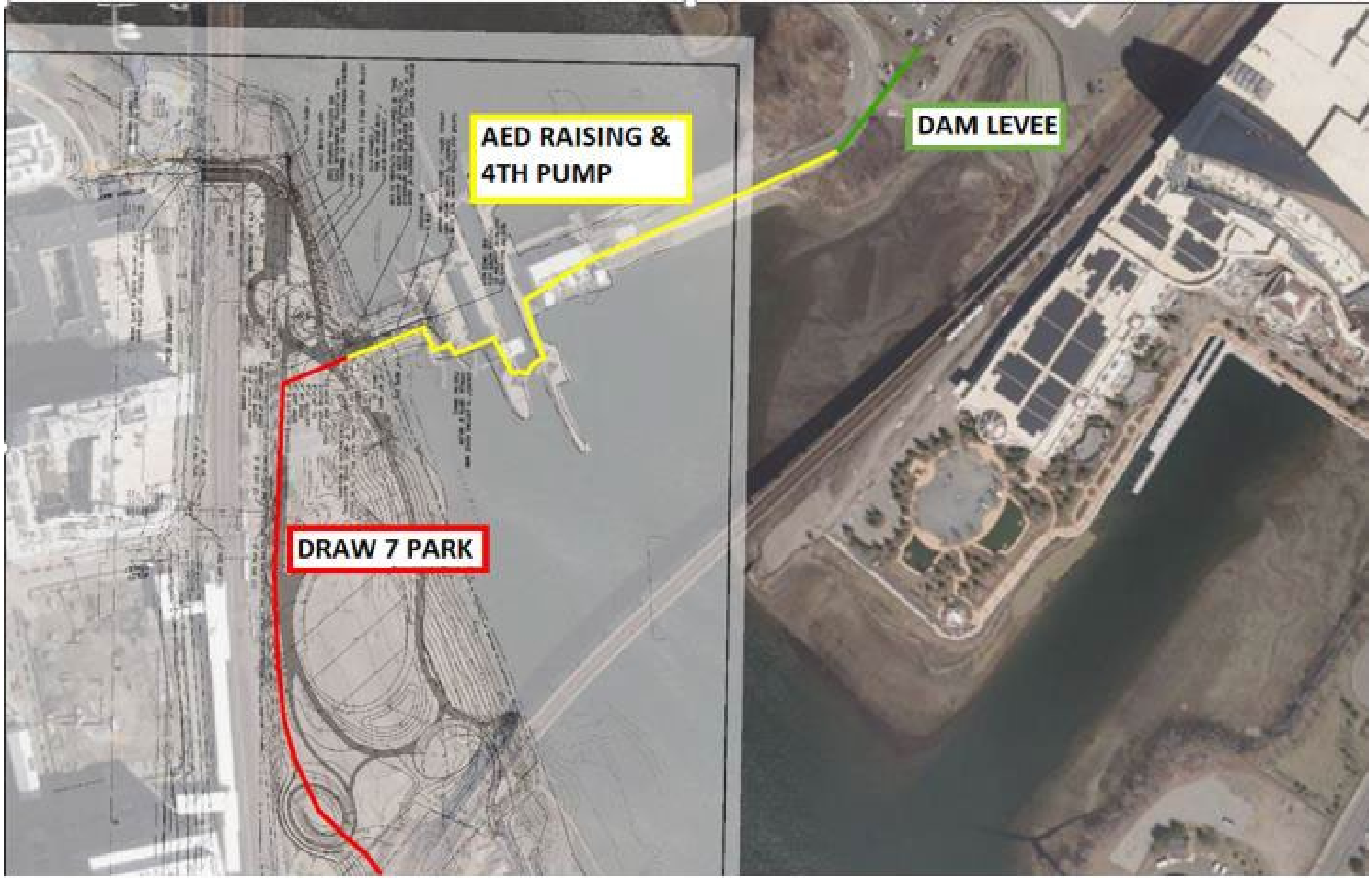
Redundancies for surrounding infrastructure





Flood events above dam (river flooding)

Draw 7 Park, Somerville
March 2, 2018 11:30 am (high tide)


AED RAISING &
4TH PUMP
DAM LEVEE
DRAW 7 PARK

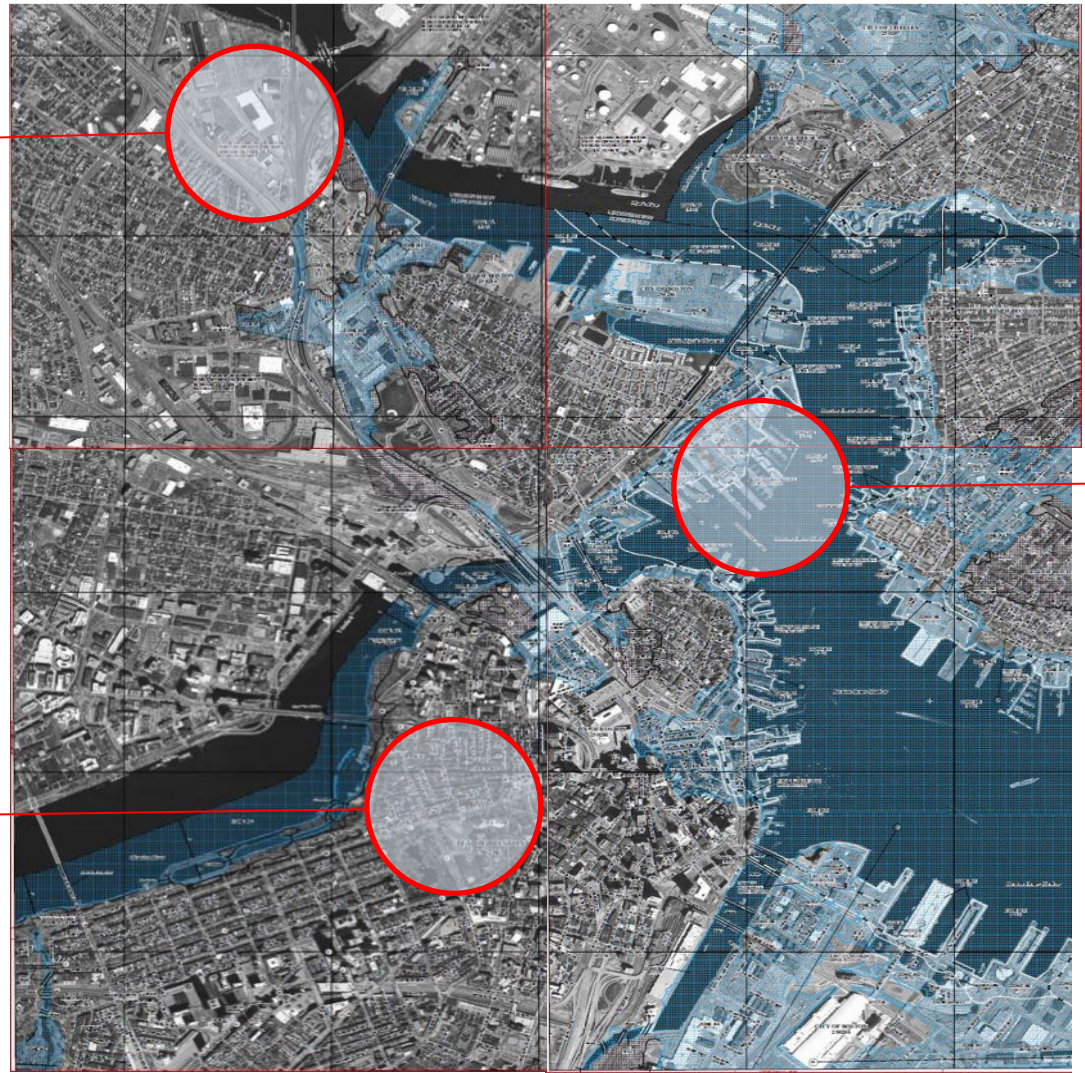

AMELIA EARHART DAM
MBTA COMMUTER RAIL BRIDGE
ALFORD STREET CONNECTION
RIP RAP BERM
EXISTING FISHING PIER
PRESENT MHW EL. 4.78'
2050 MHW EL. 7.5'
2070 MHW EL. 9.4'
LIVING SHORELINE
LIVING SHORELINE MIGRATION ZONE
LAWN/ SEATING AREA
LIVING SHORELINE
MIDLAND PLANTING
LOWLAND PLANTINGS
100-YR STORM EL. 12.4'
200-YR STORM EL. 13.9'
2040
2050
2070
200-YR STORM EL. 14.5'
OPEN LAWN
DFE EL. 15.2'
AED STAFF PARKING
EXISTING UTILITY
RAISED TRANSFORMER PLATFORM
BOARDWALK/ RAISED PATHS
LOOKOUT/ PICNIC AREA
LOOKOUT/ HIGHLAND
ENTRY PLAZA
PARKING (14 SPACES)
AED ACCESS ROAD
MBTA YARD ACCESS


1%-annual-chance storm 2070.
MYSTIC MALL, MARKET BASKET, STOP & SHOP
REGIONAL FBI HEADQUARTERS
ADDISON ORANGE NEIGHBORHOOD (EJ)
EVERETT COMMERCIAL TRIANGLE
FHWA CRITICAL URBAN FREIGHT CORRIDORS SUPPORTING PORT AND DISTRIBUTION ACTIVITIES
REGIONALLY CRITICAL FOOD PRODUCTION, STORAGE, AND DISTRIBUTION INDUSTRY (ENTIRE EAST WEST FLOOD EXTENT)
MBTA COMMUTER RAIL & SILVERLINE STATION, RAMPS TO US RT 1, REVERE BEACH PARKWAY
MASS GENERAL HOSPITAL CHELSEA
MASS INFORMATION TECHNOLOGY CENTER
CHELSEA WILLIAMS MIDDLE SCHOOL

Vulnerabilities and Risk Management

Mass General Brigham
Assembly Row
1,087,500SF
Administrative
Campus

MGH Main Campus
4,309,811SF
1051 beds
70 OR's
Simches Research
Research Labs
405,900SF

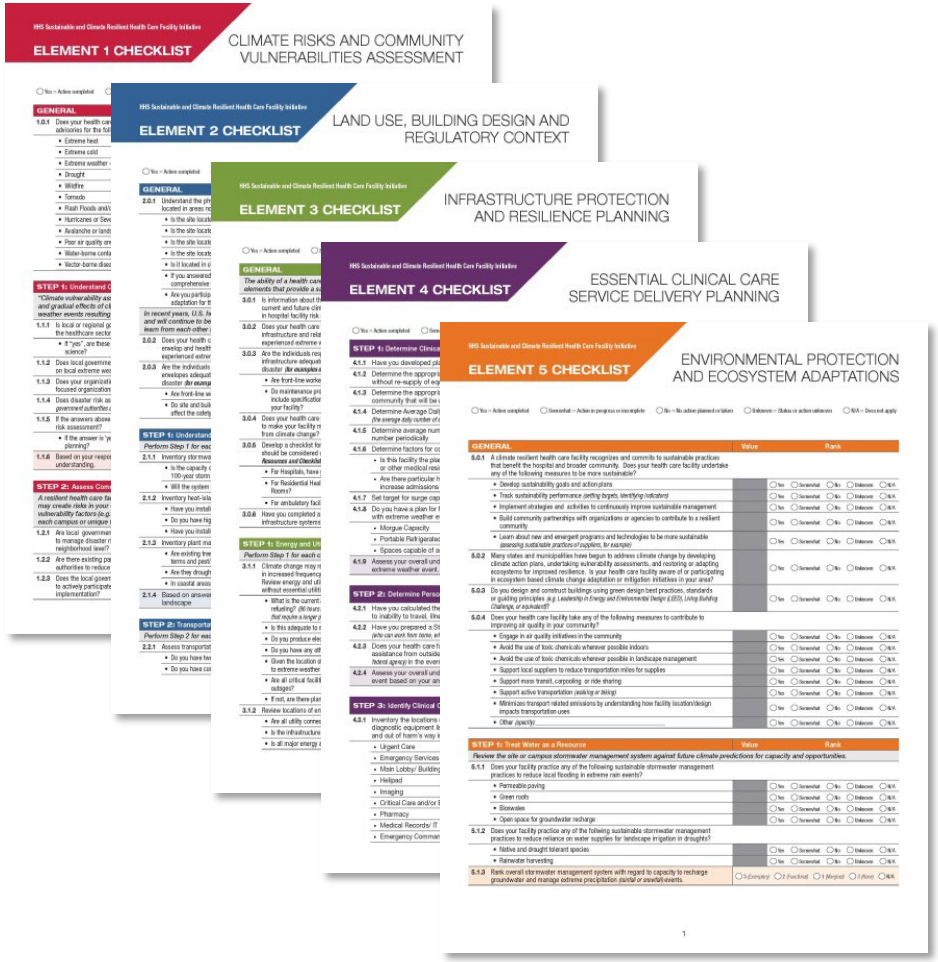


Spaulding Boston
220,339SF
132 beds
Charlestown Navy Yard
Research labs
991,170SF

SUSTAINABLE CLIMATE RESILIENT HEALTHCARE FACILITIES TOOLKIT

FRAMEWORK FOR RESILIENT HEALTHCARE SETTINGS

- ELEMENT 1: Climate Risks and Community Vulnerability Assessment
- ELEMENT 2: Land Use, Building Design, and Regulatory Context
- ELEMENT 3: Infrastructure Protection and Resilience Planning
- ELEMENT 4: Essential Clinical Care Service Delivery Planning
- ELEMENT 5: Environmental Protection and Ecosystem Adaptations



Vulnerabilities and Risk Management

Mass General Brigham Strategic Climate Resiliency Plan

Mass General Brigham

ARUP

PHASE 1

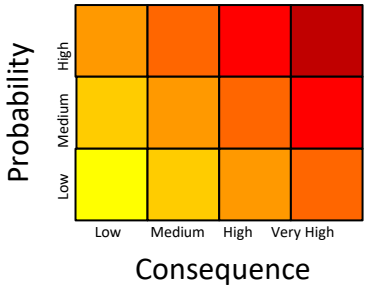
Climate Scenarios Hazard Assessment

Climate analysis
Hazard priorities

- SLR / Storm Surge
- Precipitation
- Temperature
- Wind
- *Seismic*

PHASE 2

Vulnerability Assessment



- Critical Facilities and Operations
- 5 Elements Checklist Risk Assessment
- Prioritize Needs Across System

PHASE 3

Implementation

- Facility Resilience
- Capital Prioritization
- Operations enhancement
- Long-term Adaptation

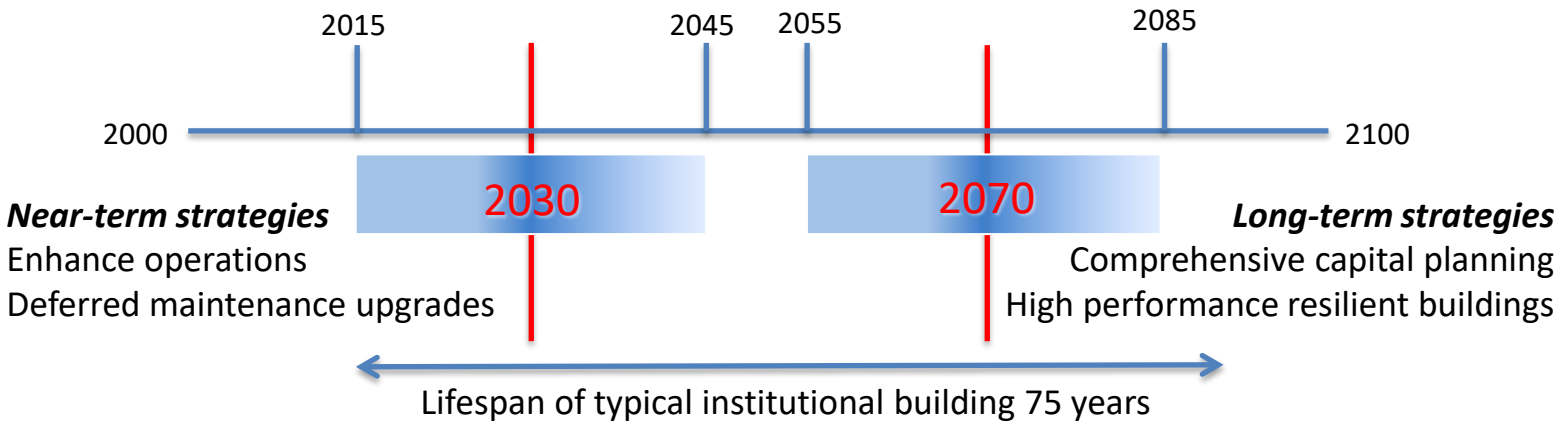
Vulnerabilities and risk management
Mass General Brigham Strategic Climate Resiliency Plan

Mass General Brigham

ARUP

Climate analysis projections

Value of long view vs. quality of data



Risk = Probability x Consequence

Where to place the emphasis?

Probability based

Informs capital investment cycle

10 year	10%
100 year	1%*
500 year	0.2%
1000 year	0.1%

Consequence based

'Worst case scenario' for emergency operations management. Based on 5 storm models.

* 1% probability of an event occurring in any one year
= 26% in 30 years
= 39% in 50 years

Risk Management - A Systemwide Strategy

Mass General Brigham

ARUP

Deliverables

- **Individualized Climate Scenarios** for 30 campuses
  SLR, Storm Surge, Precipitation, Temperature, Wind and Seismic
- **Standardized Vulnerability Assessment**
  Alignment with current risk criteria informed by lessons learned
- **Compilation of Vulnerabilities** per campus/building
- **System-wide Risk Assessment**
  Identification of key vulnerabilities and need for redundancy
  Impact on critical functions and business continuity
- Identification of **key external dependencies**
  Strategies for addressing operational dependencies
- **Insurance implications** and preliminary recommendation on incentives

ARUP

Risk Management - A Systemwide Strategy

Hazards analyzed per campus

Location Name	City / Town	SLR	Surge	Precip	Temp	Wind	Seismic
BWH Faulkner Main Campus	Boston						
BWH Main Campus	Boston						
BWH CHC Brookside	Boston						
BWH CHC Southern Jamaica Plain	Boston						
BWH/MGH ACC Patriot Place	Foxborough						
Cooley Dickinson Hospital	Northampton						
McLean Main Campus	Belmont						
MGH Main Campus	Boston						
MGH 125 Nashua Street	Boston						
MGH Simches Research Center	Boston						
MGH West ACC	Waltham						
MGH CHC Charlestown	Boston						
MGH CHC Chelsea	Chelsea						
MGH CHC Everett	Everett						
MGH CHC Revere	Revere						

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Project prioritization

Priority	Type of Service	Facility Type
1	• Core Inpatient Services • Emergency Department • Dialysis • Infusion • Primate/Transgenic Animal Facility • Irreplaceable Research Samples • Data Center Services	• Hospital/Inpatient Building • Data Center
2	• Elective Inpatient Services • Core Outpatient Services • Rodent/Other Animal Facility	• Community Health Center/ACC • Research Building
3	• All Other Clinical • All Other Research/Lab Equipment	• Medical Office Building • Administrative Building
4	• Administrative Services • Parking & Site Impacts	

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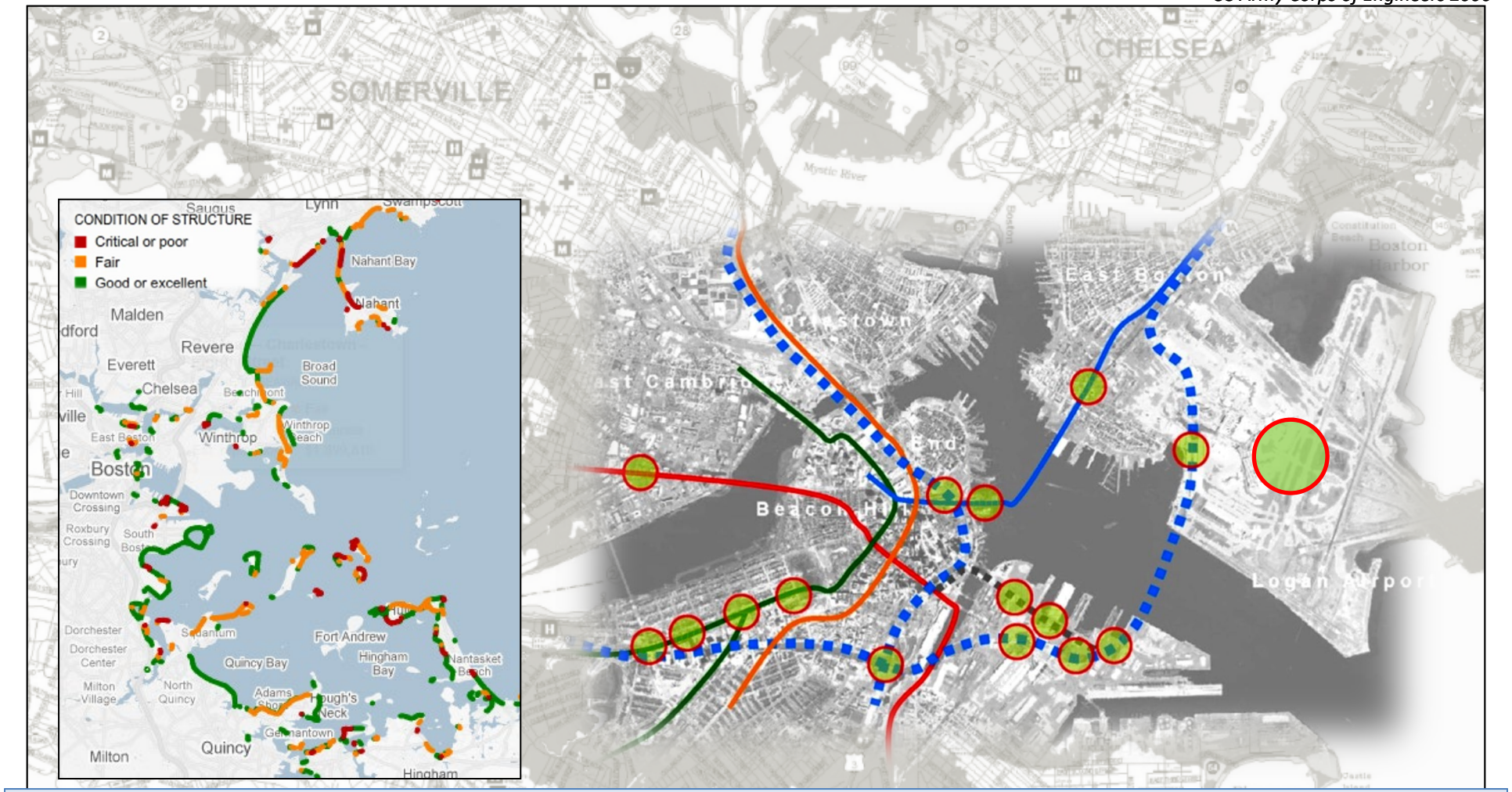
System Vulnerabilities

Urban and regional dependencies

US Army Corps of Engineers 2000



Capacity	Redundancy (85-90% occupancy)	Equivalence (ICU vs. Rehab.)
Access	Roads - interstate and local	Tunnels and Subways
Infrastructure	Power / Gas / Water / Sewers etc.	Shoreline protection

Mass General Brigham

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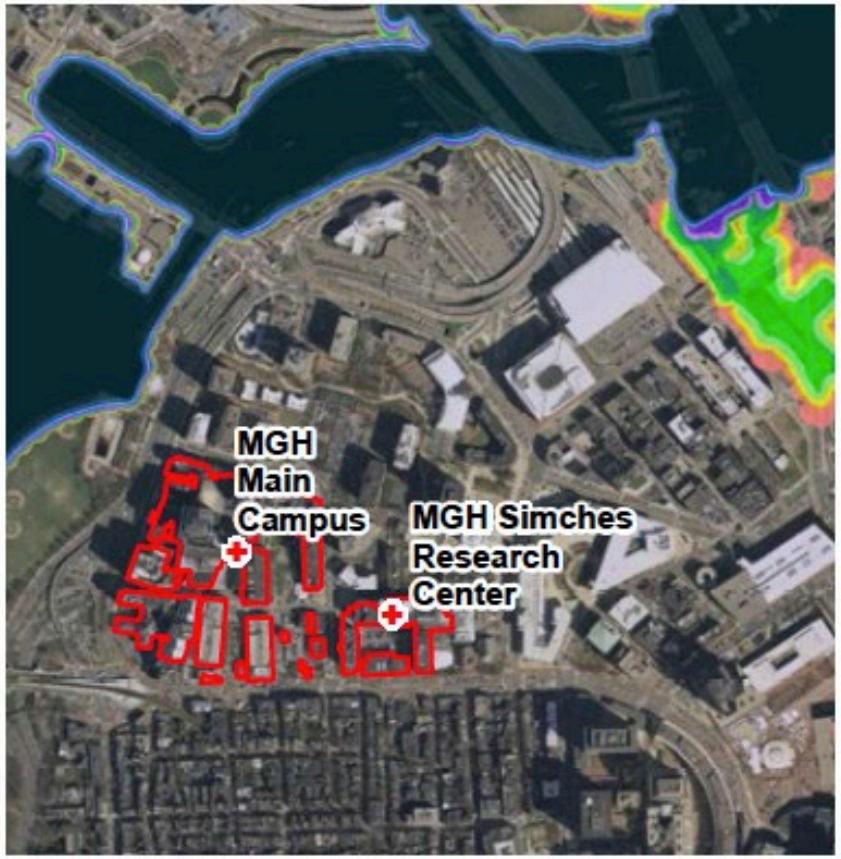
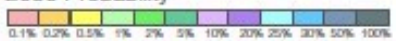
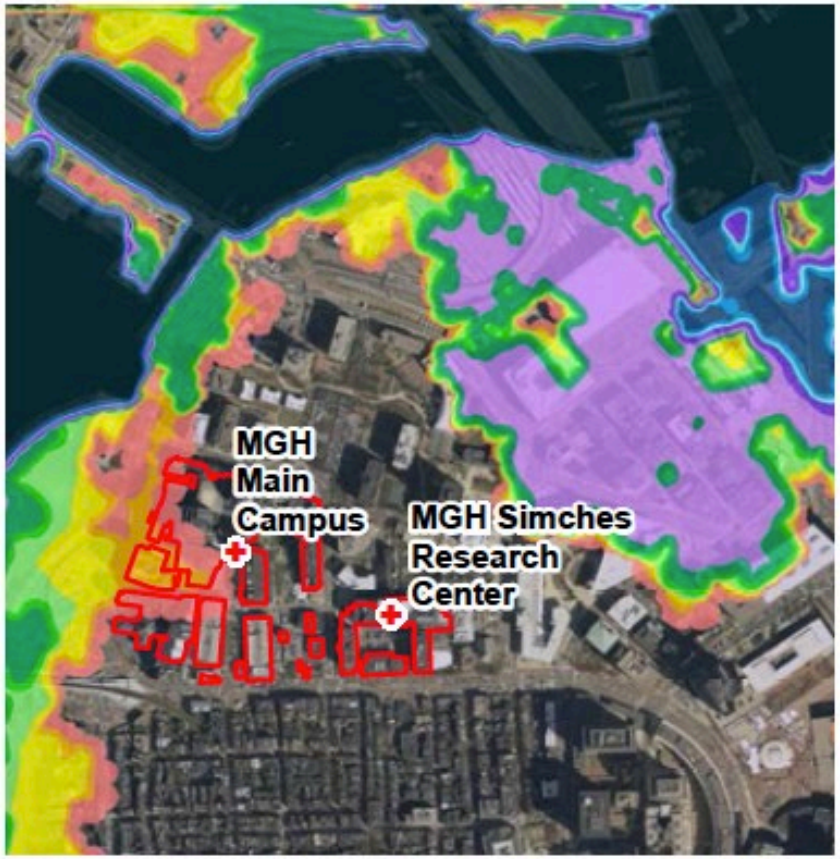
Sea Level Rise and Storm Surge

Probability-based Flooding

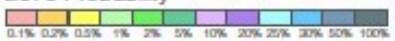


2030 Probability





2070 Probability



MGH Main Campus | Boston MA 02114 Lobby Elevations: White Bldg: 24.0' | Yawkey ACC: 19.8' | Wang ACC: 13.0' Latitude/Longitude: 42.36/-71.07

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MGH CAMPUS EXPANSION

- 18 mo. permitting
- 2020 construction start
- 1M GSF; 12 stories
- 6 floors inpatient; 450 beds
- New campus services center
- 6 levels underground parking

MGH CAMPUS RESILIENCY PROJECT

- Place of refuge for patients and staff across campus
- Capacity to shelter in place for up to four days
- Flood-proofing existing buildings and infrastructure

TRACIE

HEALTHCARE EMERGENCY PREPAREDNESS INFORMATION GATEWAY

Panel Roundtable

ASPR

Administration for Strategic Preparedness and Response

Question & Answer

asprtracie.hhs.gov

1-844-5-TRACIE

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