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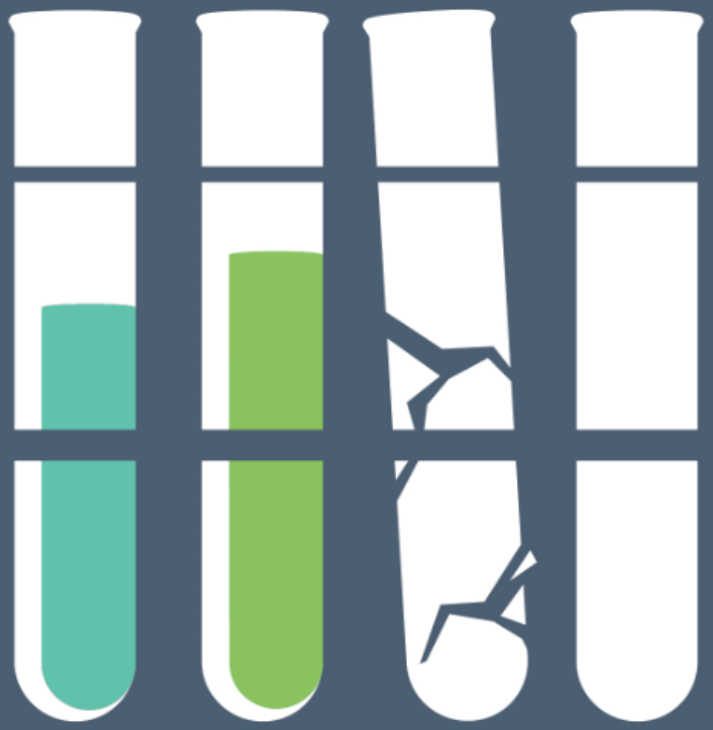
Strengthening the Disaster Resilience of the Academic Biomedical Research Community

Protecting the Nation's Investment



Committee on Strengthening the Disaster Resilience of Academic Research Communities

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- **JOHN BENITEZ,** Medical Director, Emergency Preparedness, Tennessee Department of Health
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- **PRESCOTT DEININGER,** Director, Tulane Cancer Center, Tulane University
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- **NEIL RAMBO,** Director, Health Science Library and Knowledge Informatics, Ehrman Medical Library, New York University School of Medicine Langone Medical Center
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- **LEONARD TAYLOR, JR.,** Senior Vice President, Operations and Support Services, University of Maryland Medical Center
- **CATHERINE VOGELWEID,** Clinical Professor, Department of Veterinary Pathology, College of Veterinary Medicine, University of Missouri

Study Sponsors

- Alfred P. Sloan Foundation
- Doris Duke Charitable Foundation
- Howard Hughes Medical Institute
- National Institutes of Health

Charge to the Committee

- Describe the **extent of the impact of prior disasters** on the academic research community (i.e., biological and biomedical);
- Provide **guidance for individual researchers, research institutions, and sponsors** regarding potential actions to mitigate the impact of future disasters; and
- Specifically,
  - Review challenges that researchers, institutions, and sponsors have had in minimizing the impact of disasters
  - Identify key elements of disaster plans for researchers, institutions, and sponsors
  - Develop resources that can be utilized by stakeholders, including:
    - Guidance for individual researchers to employ to minimize the impact of disasters;
    - Templates for research institutions to use to develop hazard-based mitigation plans; and
    - Potential policies that could be established by sponsors to ensure that appropriate mitigation practices are implemented by researchers and research institutions.

Key Report Terminology

- **Academic Biomedical Research Community**

  Broadly encompasses those research sponsors, academic research institutions and their research enterprise, and researchers who conduct biomedical and biological research.

- **Disaster**

  A serious disruption of the functioning of the community involving human, material, economic, or environmental losses and impacts and which exceeds the ability of the community to cope using its own resources. Using this definition, disasters can range from a laboratory fire that destroys a researcher's work to a federal disaster declaration that impacts the broader community.

- **Resilience**

  The ability to prepare and plan for, absorb, recover from, and more successfully adapt to adverse events. Using this definition, resilience can range from the ability of the researcher to the ability of the academic research institution to prepare and plan for, absorb, recover from, and more successfully adapt to adverse events.

Study Background

The Academic Biomedical Research Community – Vital to the Nation

- **The Imperative**
  - Hub of employment, economic productivity, and scientific progress, and provides essential services that underpin American society, especially with respect to addressing emerging public health issues
  - Federal and other research sponsors invest about $27 billion annually in life sciences research at academic research institutions

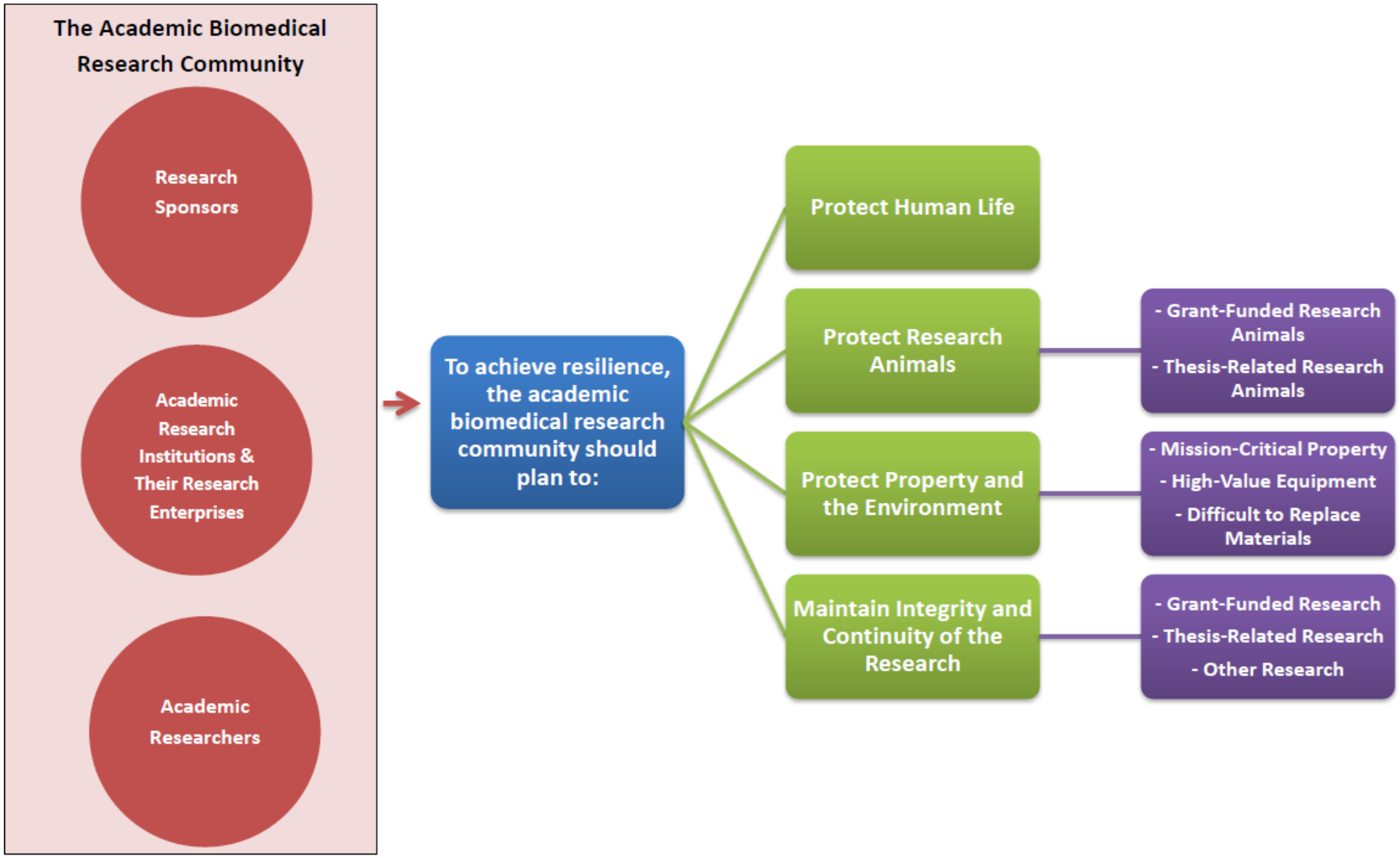
- **The Urgency**
  - Consequences of recent disasters have shown that the investments in research are not uniformly secure
  - Protection of research as a critical national resource and economic driver has been less of a priority than promoting the research itself

Impacts of Prior Disasters

- **Research faculty, staff, and students**
  - Impacts on safety and well-being of humans, personal and psychological impacts, loss of employment, career impacts
- **Academic research institutions**
  - Damage to research facilities, impacts on research animals, damage to data, samples, reagents, and equipment, impacts to utilities, critical infrastructure, and IT, interruptions to supply chains and critical services, loss of human capital, monetary costs, legal implications
- **Research sponsors**
  - Redirection of research, administrative burden, financial burden
- **Communities, states, and the nation**
  - Impacts to employment, economic productivity, and biomedical progress, interruption to health services, education, and research capacity
- **The science**
  - Delayed or arrested discoveries are a likely consequence

With the power out in the wake of Hurricane Sandy, NYU Langone lab members struggle to preserve scientific samples with dry ice, hauling it up multiple flights of stairs one bin at a time.

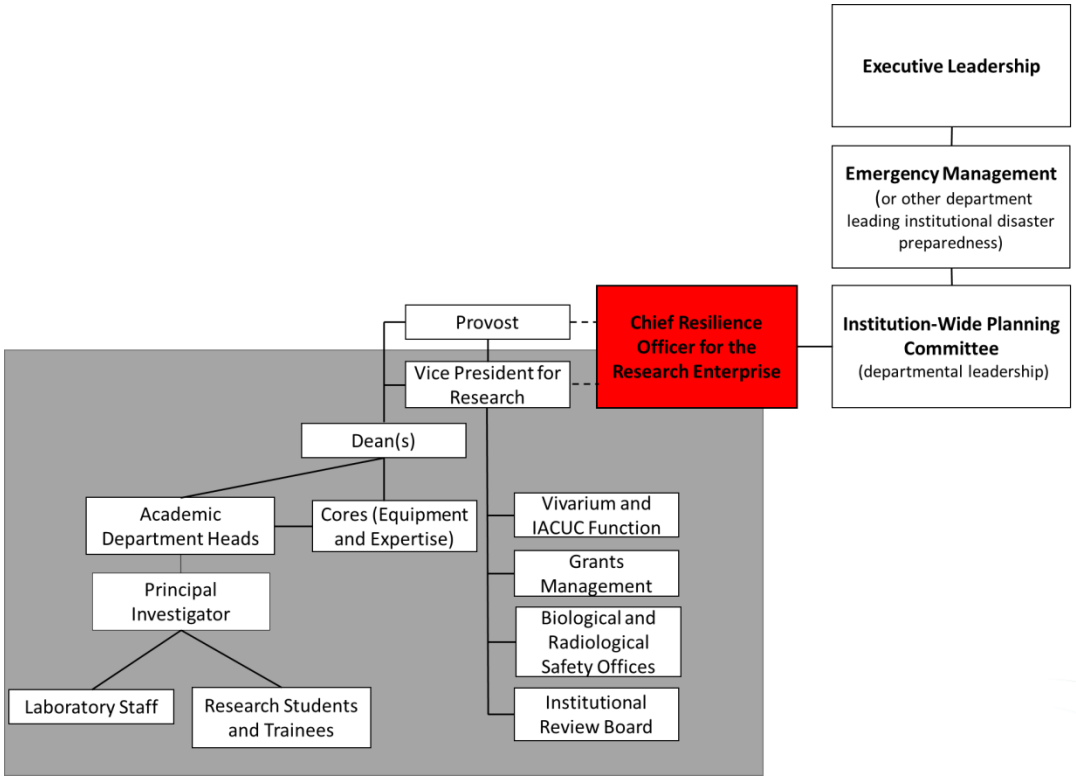
The Vision: Protect the Nation's Biomedical Research Investment



The Role of Institutional Research Leadership

Rec. 1: The Chief Resilience Officer for the Research Enterprise

- Support for disaster resilience should come from a high level within institutional research leadership: **chief resilience officer for the research enterprise**
- The **chief resilience officer for the research enterprise** should be integrated within the framework for institutional disaster preparedness:



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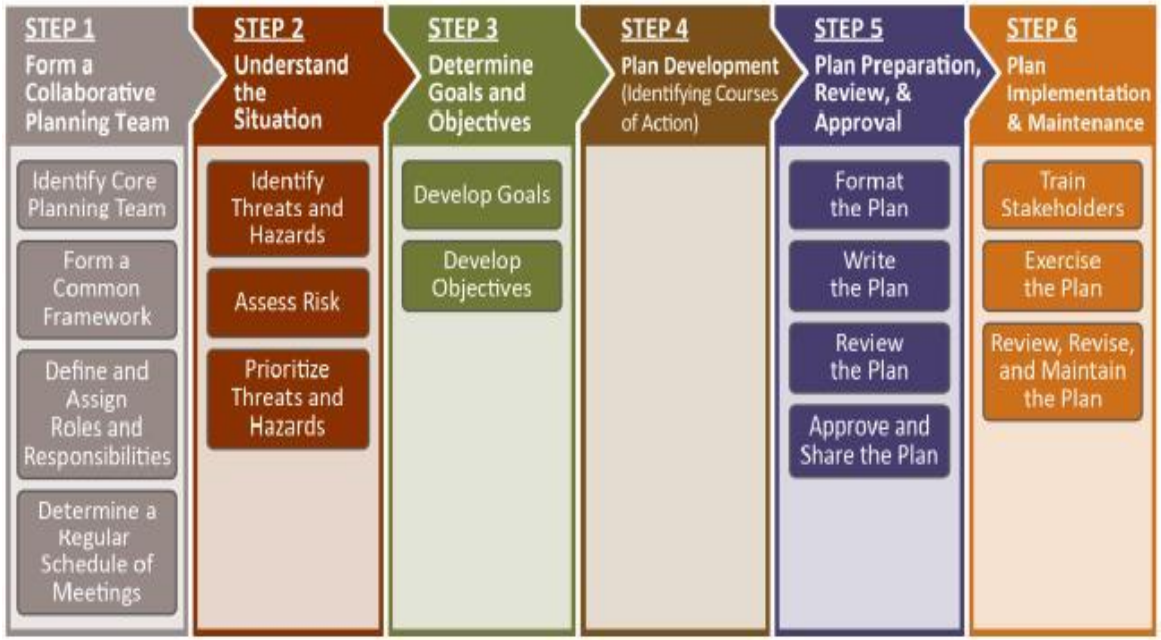
Rec. 2: Implement Comprehensive and Integrative Disaster Resilience Planning Efforts

- The **chief resilience officer for the research enterprise** should oversee a research enterprise planning committee and, in coordination with the institution-wide planning committee, should assess the unique characteristics of the institution's research enterprise, determine resilience goals and objectives, and develop and implement a **"family of plans"**



Steps in a common planning process

Advancing Disaster Resilience Through Application of the National Preparedness System

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Rec 3. Develop, Enhance, and Leverage Local, State, and National Partnerships

- "Family of plans" should encompass **prevention**, **protection**, **mitigation, response, and recovery**
- Plans should align with the **National Preparedness System;** which is used by local, state, and federal agencies
- Institutions should **actively engage with key local, state, and federal agencies** to establish mutual understanding of the unique disaster resilience efforts
- Institutions should **develop strong community partnerships** to facilitate planning, information sharing, and mutual assistance

<table>
<tr><th>Prevention</th><th>Protection</th><th>Mitigation</th><th>Response</th><th>Recovery</th></tr>
<tr><td colspan="5">Planning</td></tr>
<tr><td colspan="5">Public Information and Warning</td></tr>
<tr><td colspan="5">Operational Coordination</td></tr>
<tr><td colspan="2">Intelligence and Information Sharing</td><td rowspan="4">Community Resilience
Long-term Vulnerability Reduction
Risk and Disaster Resilience Assessment
Threats and Hazards Identification</td><td colspan="2">Infrastructure Systems</td></tr>
<tr><td colspan="2">Interdiction and Disruption</td><td rowspan="3">Critical Transportation
Environmental Response/Health and Safety
Fatality Management Services
Fire Management and Suppression
Logistics and Supply Chain Management
Mass Care Services
Mass Search and Rescue Operations
On-scene Security, Protection, and Law Enforcement
Operational Communications
Public Health, Healthcare, and Emergency Medical Services
Situational Assessment</td><td rowspan="3">Economic Recovery
Health and Social Services
Housing
Natural and Cultural Resources</td></tr>
<tr><td colspan="2">Screening, Search, and Detection</td></tr>
<tr><td rowspan="2">Forensics and Attribution</td><td rowspan="2">Access Control and Identity Verification
Cybersecurity
Physical Protective Measures
Risk Management for Protection Programs and Activities
Supply Chain Integrity and Security</td></tr>
<tr><td colspan="2">Mission areas and core capabilities of the National Preparedness System</td></tr>
</table>

Prevention, Protection, and Mitigation Planning

- **Prevention:** Capabilities necessary to avoid, prevent, or stop a threatened or actual act of terrorism
  - Information-sharing and operational coordination with law enforcement agencies, situational awareness of threat environment, prevention of acquisition and transfer of CBRNE materials
- **Protection:** Capabilities necessary to secure against acts of terrorism and manmade/natural disasters
  - Information exchange with community coordinating structures, cybersecurity risk management, data preservation, controlling admittance to critical locations and systems, physical protective measures and education and training for disaster resilient work practices, MAAs/MOUs for supply chain resiliency
- **Mitigation:** Capabilities necessary to reduce loss of life and property by lessening the impact of disasters
  - Hazard mitigation planning, enterprise risk management, business continuity planning

Response and Recovery Planning

- **Response:** Capabilities necessary to save lives, protect property and the environment, and meet basic human needs after an incident
  - Emergency operations plans, ICS structure, crisis communications, essential functions and personnel, assessment of the life safety and environmental health conditions, life-sustaining services
- **Recovery:** Capabilities necessary to restore and rebuild following a disaster
  - Activate recovery operations, financial and operational support, engagement with external agencies, assess damage, research program relocation, rebuild infrastructure, evaluate status of research projects, preserve research-related assets from further damage, information-sharing with insurance and research sponsors

The Role of the Individual Researcher

Rec. 4: Preserve Research Data, Samples, and Reagents

- Laboratory safety contributes to disaster resilience
- Important to maintain a **culture of compliance and safe work practices**
- PIs should have business continuity procedures in place for protecting critical documents and electronic data, critical samples and reagents, freezers, and specialized research equipment

WHAT WOULD YOU DO IN AN EMERGENCY AT A MOMENT'S NOTICE?

Assuming lab members have a few minutes, without putting lives at risk, what immediate actions would the lab take to safeguard people, equipment, and research in a moment's notice? Ensure answers provide the following guidelines:

- **Actionable**
- **Lab-specific**
- **In priority order**
- **Use the lab hazards/vulnerabilities listed above**
- **Focus on not returning to the lab for longer than 24 hours (or reasonable time frames)**
- **Remind labs to move items off from the floor.**

1. Turn off all flammable gas that is currently in use.
2. Return the mice to their cages.
3. Turn off all non-essential machines that are not in use
4. Turn off computers and electronic equipment
5. Dispose of biological samples in appropriate disposal sites.
6. Ensure that there is no blockage of walkways.
7. Leave the facility via the stairs and do not return until after it is safe

Lab resilience assessment at NYU Langone

Rec. 5: Implement Mandatory Training and Education

- Mandatory disaster resilience education and training programs should be implemented and **integrated within the broader safety, ethics, and compliance training** programs for research students, staff, and faculty.
- Actions to consider:
  - Educating and training new researchers in disaster resilience upon hiring or enrollment
  - Involving research students
  - Training of the key responders at the institution in ICS

Animal Research

Rec. 6: Improve the Disaster Resilience of Animal Research Programs

- An ethical imperative to conduct disaster resilience efforts to preserve the lives and prevent the suffering of research animals
- Current guidelines (the *Guide*) to guide disaster planning activities in the animal research community **are incomplete and do not align** with effective planning principles in the National Preparedness System
- **Communicating best practices** could be used to improve many plans

Swine carried down stairs at the University of Texas Medical Branch illuminated by lantern for transport to Houston as a result of Hurricane Ike.

Fail-Safe Design for Vivaria

- Animal research professionals at institutions must play a key role in defining and communicating to the architects and engineers the **level of protection necessary for the vivarium**
- Essential facilities are required to be designed to maintain their operations during and following a disaster
- Institutions should consider their vivaria as essential facilities and **incorporate fail-safe design criteria**

The Built Environment

Holistic Resilience Planning for the Built Environment

- Institutions and researchers may not clearly understand the impact of **building code requirements** on their research operations
- Institutions control the space and the infrastructure support systems they own but **remain dependent on external utility providers**
- The 2016 NIH *Design Requirements Manual* contains specific provisions for resilience by requiring a project-by-project risk assessment that considers the consequence of system failures and develops mitigation actions
- While the new NIH requirement for a project-by-project risk assessment is a major step in the right direction, **a more holistic approach is advised**

Rec. 7: Develop Performance-Based Standards for Research Facilities

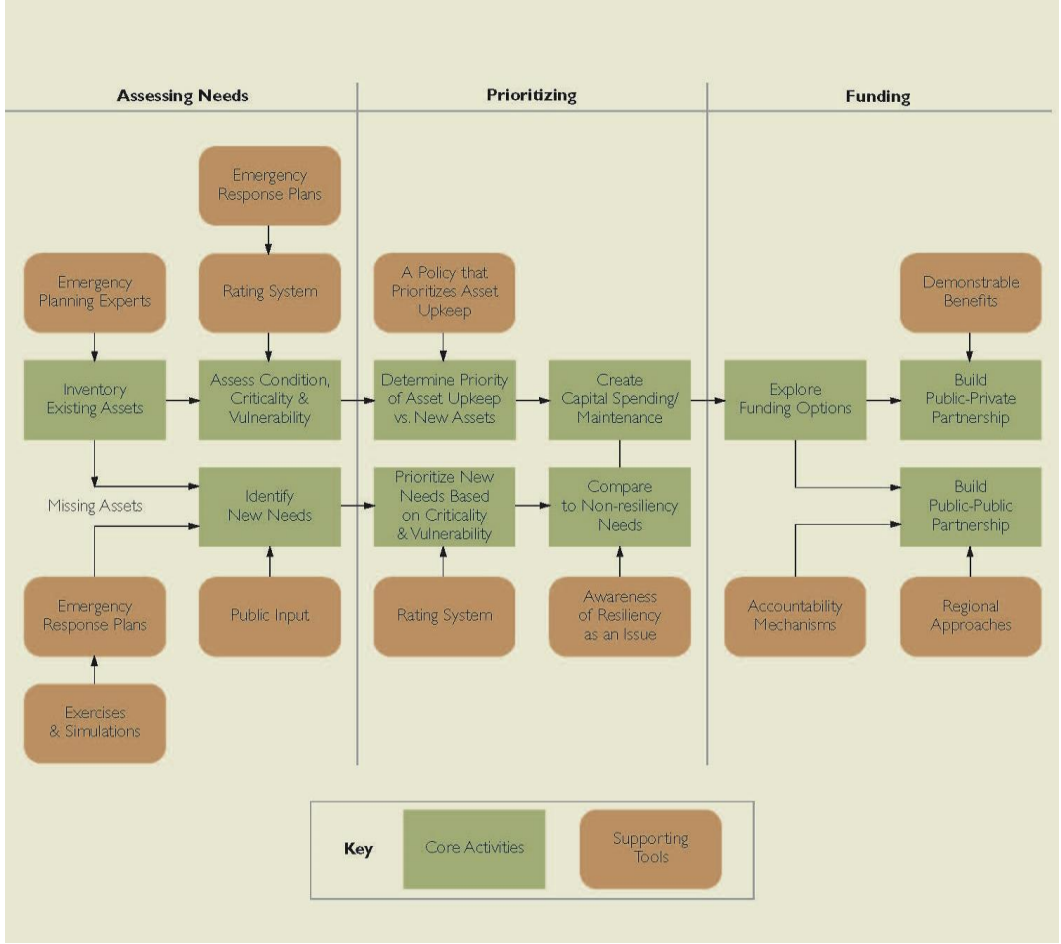
- Institutions should work with key stakeholders to develop **performance-based standards** for facilities and critical infrastructure that support their research enterprise
- Actions to consider:
  - Aligning the resilience plan and performance-based standards with the VA Standard H-18-80 and the NIST Community Resilience Planning Guide for Buildings and Infrastructure Systems
  - Ensuring that disaster-resistant construction is an explicit design requirement for all new research buildings

Funding a Resilient Mission

Financial Considerations for Institutions

- Research about how institutions are identifying and securing funding instruments available pre-disaster may provide guidance in developing best practices for financial management post-disaster
- Actions to consider may include:
  - Assessing and securing applicable, robust **insurance policies**
  - Implementing a strategic tool, such as **enterprise risk management**
  - Establishing **readily accessible cash reserves**
  - Developing and adopting clear policies to continue **payroll obligations**
  - Adopting **capital planning processes** that support business continuity and ensure that other research enterprise performance outcomes are achieved
  - **Investing in the built environment**
  - Identifying and dedicating **institutional use of local/state funds**
  - Developing **partnerships** to leverage planning activities and financial investments

Rec. 8: Develop an Institutional Financial Investment Strategy



The resiliency capital planning process: Tools and core activities to support financial planning for enhanced resilient outcomes.

- Institutions should develop an institutional **financial investment strategy** based upon comprehensive and integrated resilience planning activities for their research enterprise

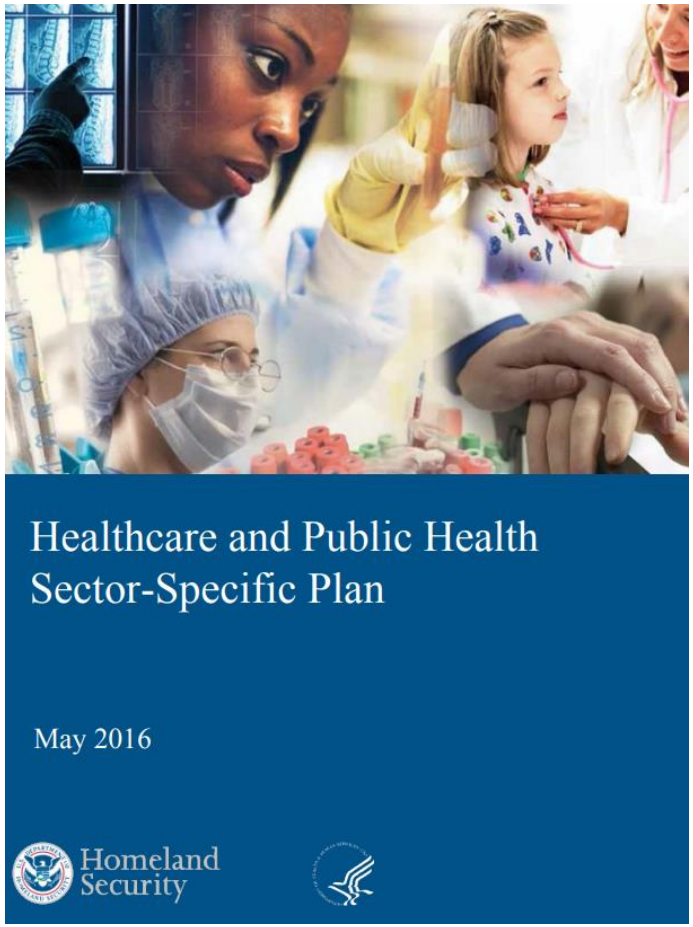
The Essential Role of Research Sponsors

Rec. 9: Convene a Consortium to Discuss Efforts to Enhance the Disaster Resilience

- Research sponsors have not prioritized the inclusion of resilience principles and practices into the research enterprises they fund
- Research sponsors should take a more assertive role
- NIH should convene a consortium of research sponsors, academic research institutions, professional associations, and private sector stakeholders to **jointly discuss efforts that research sponsors can take to enhance disaster resilience**
- Key federal agencies that support biomedical research should each identify within their respective agencies a **locus of responsibility and authority to lead and coordinate efforts**

A Way Forward

Rec. 10: Recognize the Academic Biomedical Research Community as a Subsector of the HPH Sector



HPH Sector-Specific Plan

- Provides **essential healthcare and public health services** that underpin American society
- HHS should explicitly recognize the academic biomedical research community as a subsector of the **Healthcare and Public Health Critical Infrastructure Sector** and actively engage the community in sector-specific activities
- Working to develop and implement risk-based protective programs and resilience strategies for infrastructure will enhance the nation's resilience and **protect the nation's biomedical research investment**

Thank You!

- **Free PDF** of the report is available at:
  - nationalacademies.org/DisasterResilientLabs
- **Summary materials** available online:
  - 4-page Report Brief
  - Recommendation List
  - Slide set
- For more information about the study, **please contact**:
  - Lisa Brown, Study Director, lbrown@nas.edu, 202-334-2487