Mitigation Saves: Observations and Next Steps

KAMM Conference, 2018
about me....
What will we talk about?

Estimating the ‘value’ of mitigation – 2005 to 2018

How to incentivize mitigation
The cost of disaster

• The U.S. sustained **233** weather and climate disasters between 1980 and July 2018
• The total cost of these 233 events exceeds **$1.5 trillion***
• As of July 9, 2018, there had been 6 weather and climate disaster events with losses exceeding **$1 billion** each across the United States.

**Source:** NOAA National Centers for Environmental Information (NCEI); U.S. Billion-Dollar Weather and Climate Disasters (2018). [https://www.ncdc.noaa.gov/billions/] *CPI adjusted to 2018
Who is working on resilience?

The Natural Hazards Mitigation Association identifies nearly 350 organizations working on resilience and sustainability issues.

Natural Hazards Mitigation Association - http://nhma.info/
[in 1974] Congress directed the Institute to “exercise its functions and responsibilities in four general areas.........”

- Develop and maintain performance criteria for maintenance of life, safety, health, and public welfare for the built environment
- Evaluate and prequalify building technology and products
- Conduct related and needed investigations
- Assemble, store, and disseminate technical data and related information
Industry Leadership and Advocacy

- Consultative Council
- Coordinating Council
- Commercial Workforce Credentialing Council
- Council on Finance, Insurance and Real Estate
- National Council on Building Codes and Standards
- Off-Site Construction Council
- Science, Technology, Engineering & Mathematics Education Program
- Low Vision Design Committee
- Academy for Healthcare Infrastructure

Security and Disaster Preparedness Programs

- Building Seismic Safety Council
- Integrated Resilient Design Program
- Multihazard Mitigation Council

Facility Performance and Sustainability Programs

- Building Enclosure Technology and Environment Council
- Building Enclosure Council National
- National Mechanical Insulation Committee
- Commissioning Industry Leaders Council
- Facility Maintenance and Operations Committee

Information Resources and Technologies Programs

- buildingSMART alliance®
- WBDG Whole Building Design Guide®
- ProjNetSM
- Building Research Information Knowledgebase

Security and Disaster Preparedness Programs

- Building Seismic Safety Council
- Integrated Resilient Design Program
- Multihazard Mitigation Council
“Money spent on reducing the risk of natural hazards is a sound investment. On average, a dollar spent by FEMA on hazard mitigation provides the nation about $4 in future benefits.”
A Valuable Contribution . . . But Questions Remained

Private Sector Initiatives

Building Codes

Lifelines
A Lot Has Happened Since 2005. . .

Source: NOAA National Centers for Environmental Information (NCEI)
https://www.ncdc.noaa.gov/billions/

Statistics valid as of July 9, 2018.
A Lot Has Happened Since 2005...

1980-2018 Year-to-Date United States Billion-Dollar Disaster Event Cost (CPI-Adjusted)
Event statistics are added according to the date on which they ended.

Source: NOAA National Centers for Environmental Information (NCEI)
https://www.ncdc.noaa.gov/billions/

Statistics valid as of July 9, 2018.
Natural Hazard Mitigation Saves: 2017 Interim Report

Findings

• Federal grants: Explored impacts of 23 years of federal mitigation grants provided by the Federal Emergency Management Agency (FEMA), Economic Development Administration (EDA) and Department of Housing and Urban Development (HUD)

• Resulted in an average national benefit of 4:1 6:1
• **Exceed code requirements**: Explored costs and benefits of designing all new construction to exceed select provisions in the 2015 *International Building Code* (IBC) and the 2015 *International Residential Code* (IRC) and the implementation of the 2015 *International Wildland-Urban Interface Code* (IWUIC).

• Resulted in a national benefit of **$4 for every $1 invested**
## Benefit Cost Ratios by Hazard and Mitigation Measure

<table>
<thead>
<tr>
<th>Hazard and Mitigation Measure</th>
<th>National Benefit-Cost Ratio Per Peril</th>
<th>Federally Funded</th>
<th>Beyond Code Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall Hazard Benefit-Cost Ratio</td>
<td>6:1</td>
<td></td>
<td>4:1</td>
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<tr>
<td>Riverine Flood</td>
<td>7:1</td>
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<td>5:1</td>
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<tr>
<td>Hurricane Surge</td>
<td>5:1</td>
<td>Too few grants</td>
<td>7:1</td>
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<tr>
<td>Wind</td>
<td>5:1</td>
<td></td>
<td>5:1</td>
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<tr>
<td>Earthquake</td>
<td>3:1</td>
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<td>4:1</td>
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<tr>
<td>Wildland-Urban Interface Fire</td>
<td>3:1</td>
<td></td>
<td>4:1</td>
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</tbody>
</table>

*BCR numbers in this study have been rounded*
Federal Agency Grants and Mitigation Strategies Examined

<table>
<thead>
<tr>
<th>Agency</th>
<th>Program</th>
</tr>
</thead>
</table>
| Economic Development Administration | Disaster Mitigation Recovery  
Hurricane Floyd disaster 2001  
Other disasters using Floyd emergency fund 2001  
Norton Sound, Alaska 2001  
2008 Disaster Supplemental I, including Midwest Floods  
2008 Disaster Supplemental II, including Midwest Floods  
2010 Gulf Oil Spill Disaster Supplemental  
2010 Disaster Supplemental  
Federally declared disaster area  
Hurricane Katrina Disaster 2005  
Gulf Coast Disaster 2010  
Alaska Fisheries Disaster  
2012 Disaster Supplemental  
2010 Gulf Oil Spill Disaster Supplemental  
2008 Disaster Supplemental I  
2010 Disaster Supplemental  
2008 Disaster Supplemental II  
Global Climate Change Mitigation Incentive Fund |
| Federal Emergency Management Agency | Flood Mitigation Assistance Grant Program (FMA)  
Hazard Mitigation Grant Program (HMGP)  
Public Assistance Program (PA)  
Pre-Disaster Mitigation Grant Program (PDM) |
| Department of Housing and Urban Development | Community Development Block Grant Program (CDBG) |

- **Flood resistance**: acquire or demolish flood-prone buildings, specifically single-family homes, manufactured homes, and 2- to 4-family dwellings.
- **Wind resistance**: add hurricane shutters, tornado safe rooms, and other common measures.
- **Earthquake resistance**: strengthen various structural and nonstructural components.
- **Fire resistance**: replace roofs, manage vegetation to reduce fuels, and replace wooden water tanks.
Select Measures Examined in Exceeding 2015 I-Codes

• For flood resistance (to address riverine flooding and hurricane surge), build new homes higher above base flood elevation (BFE) than required by the 2015 IBC.

• For resistance to hurricane winds, build new homes to comply with the Insurance Institute for Business & Home Safety (IBHS) FORTIFIED Home Hurricane standards.

• For resistance to earthquakes, build new buildings stronger and stiffer than required by the 2015 IBC.

• For fire resistance in the wildland-urban interface, build new buildings to comply with the 2015 IWUIC.
Benefit Categories

Property loss

Business interruption

Deaths and injuries

PTSD

Emergency response; urban search and rescue

Environmental impact

Insurance overhead and profit

Not considered in MSV1
Some Benefits Cannot Be Estimated, so BCRs May Be Low
BCRs at the State & Local Level

Note: National-level maps for flood and tornado risk are not available, so state or local BCRs cannot be plotted.
Mitigation Measures in MSv2

• 1 - Overall framework and integration of subsequent modules

• 2A – Design and build new buildings to exceed code minima

• 2B – Adopt resilient codes where none is currently in force (Q4 ‘18)

• 3 - Retrofit of existing facilities (Q1 ‘19)

• 4 - Business continuity planning and disaster recovery

• 5 - Utility and transportation infrastructure mitigation (Q4 ‘18)

• 6A - Federal mitigation grants and loans (sole focus of MSv1)

• 6B – Non-building specific activities by federal agencies to mitigate hazard
## MSv2 Current Funding Levels

<table>
<thead>
<tr>
<th>Module</th>
<th>10%</th>
<th>20%</th>
<th>30%</th>
<th>40%</th>
<th>50%</th>
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<th>70%</th>
<th>80%</th>
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<tr>
<td>Module 1 - Aggregation</td>
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<td>Module 2A – Above-Code Design</td>
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<td>Module 2B – Up-To-Date Codes</td>
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<td>Module 3 – Retrofit</td>
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<td>Module 6A – Federal Grants</td>
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<td>Module 6B – Federal Activities</td>
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- **Funded**
- **Unfunded**
Unfunded or Partially Unfunded Tasks

• Module 2A – Design and build new buildings to exceed code minima to resist *tornadoes* and *floods* in *Coastal A Zones*

• Modules 3* and 5* – Many retrofit and infrastructure mitigation strategies

• Module 4 - Business continuity planning and disaster recovery

• Module 6B – Non-building activity funded by federal agencies to mitigate hazard, e.g., early warning systems and levees
# Module 3 Mitigation Measures Under Consideration

<table>
<thead>
<tr>
<th><strong>Retrofit</strong></th>
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</thead>
</table>
| **Flood** | • Building elevation  
• Buyout - clearance/demolition of floodplain buildings  
• Wet flood proofing  
• Dry flood proofing  
• Land-use planning – not locating within the floodplain  
• Site perimeter flood proofing |
| **Hurricane/Wind Storms** | • Manufactured housing engineered tie-down system (ETS)  
• FORTIFIED existing home - hurricane  
• FORTIFIED existing home – high wind  
• Stronger vents, soffits, and overhangs at gable end walls  
• Stronger connections of attached structures |
Module 3 Mitigation Measures Under Consideration

<table>
<thead>
<tr>
<th>Retrofit</th>
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<tbody>
<tr>
<td><strong>Earthquake</strong></td>
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<tr>
<td>• Furnishings, fixtures and equipment restraints</td>
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<tr>
<td>• Manufactured housing engineered tie-down system (ETS)</td>
</tr>
<tr>
<td>• Foundation anchors and stronger cripple walls in older wood structures</td>
</tr>
<tr>
<td>• Seismic shutoff valves</td>
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<tr>
<td>• Stronger unreinforced masonry bearing-wall (UMB) buildings</td>
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<tr>
<td>• Stronger roof-to-wall connections in older tilt-up and reinforced masonry buildings</td>
</tr>
<tr>
<td>• Steel frames or wood shear walls in soft-story multi-family dwellings</td>
</tr>
<tr>
<td><strong>Wildfire</strong></td>
</tr>
<tr>
<td>• Retrofit to approximate the WUI Fire code</td>
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</tbody>
</table>
Coming Soon!
Module 5 Report (Transportation & Infrastructure Mitigation)

Flood
- Elevate rail; road; water and wastewater equipment
- Elevate Relocate water and wastewater treatment plants out of floodplain
- Add berms (levees) around water and wastewater treatment plants
- Elevate electrical and telecommunication substation

Wind
- Underground electrical transmission lines

Earthquake
- Resilient grid for water supply (strengthens select large-diameter pipe within a distribution system)
- Resilient electrical grid (strengthen substations)
- Strength highway bridges

WUI fire
- Controlled burns to reduce turbidity

* Anticipated Q4 2018 report release.
Compelling Mitigation Action
All Stakeholders Benefit from Exceeding Select 2015 I-Code Provisions
Pre-Disaster Resilience Based on Public and Private Incentivization

The most cost-effective manner to achieve resilience is through a holistic and integrated set of public, private and hybrid incentivization programs including mortgages, insurance, finance, tax incentives and credits, and grants.
A Holistic Approach to Incentivizing Resilience

- Government (incentives & regulatory)
- Non-Profits & Foundations
- Insurance
- Finance
- Market Signals
- Business

Resilience
The Importance of Community-Level Resilience, Illustrated

Galveston Texas, Post-Ike  
NYC, Post-Sandy
Incentive Examples

Insurance

• Promote the adoption of enhanced codes and mitigation standards for resilience through premium discounts
  • e.g. Insurance Institute for Business and Home Safety (IBHS)’s FORTIFIED programs for residential and commercial buildings

Lenders

• Enhanced appraised values allow a borrower to leverage more mortgage financing for a given loan-to-value ratio.
Incentive Examples

• Utilities
  • Reduced insurance premiums to support the avoidance of interruption losses
  • Enhanced bond ratings for projects that incorporate resilience strategies

• Communities
  • Property tax reductions
  • Accelerated local permitting and inspection procedures for resilient properties
  • Zoning benefits, e.g. density bonuses
  • More-favorable developer agreements for the construction of resilient properties
Incentives Benefits
- The ‘Resilience Economy’ -

- **Resilient infrastructure and buildings** in our communities
- Increased **loan security** for lending institutions and enhanced financing opportunities for borrowers and investors in buildings and infrastructure.
- Heightened **stability** in the insurance and reinsurance industries.
- **Increased construction activity and jobs** associated with achieving resilience.
- Enhanced community abilities to **attract and retain quality developers and businesses**.
- Reduction in the amount of damaged and contaminated materials and contents after a disaster event
One size does not fit all!
Who has been listening?

- October ‘15 - White Paper (50 SMEs)
- January ‘16 - Symposium
- May ‘16 – House Subcommittee hearing
- August ‘16 – White House Summit
- September ‘16 – Addendum and White House Transportation Committee briefing
- 2017 – ongoing meetings with Congressional staff and other stakeholders
- 2018 – Resilience Mortgage work underway
Incentivization Strategy: Resilience Mortgage

- Incorporates financing for hazard mitigation into the primary mortgage, and features a positive benefit-cost ratio for both the borrower and lender supported by insurance, property tax and interest rate incentives.
- Supports financing to make homes more resilient to riverine and coastal flooding, hurricanes and wind storms, earthquakes and wildfires.
- Leverages lessons learned in energy efficiency programs.
- Engages Lenders, Appraisers, Insurers, Realtors, Homebuilders, Communities, Government.
- Seeking pilot communities.
Resilience Mortgage Steps

1. Originate a loan with a resilience feature (Borrower and Lender)
2. Prepare a home mitigation assessment (Risk Assessment Expert)
3. As part of home appraisal, determine additional mitigation strategy value (Risk Assessment Expert & an Appraiser)
4. Determine hazard insurance & premium reduction (Risk Assessment Expert, Insurance Company/State reduction)
5. Determine property tax reduction (Risk Assessment Expert & local community)
6. Modify qualifying standards for loan; determine interest rate reduction (Lender & Govt. Secondary Lender)
7. After closing, implement resilience strategies in home (Borrower, Mitigation Contractor & Independent Inspector)
Institutionalizing the Resilience Mortgage

- Organizations to provide certified resilience experts

- Standardized resilience strategies

- Mitigation assessment and benefit cost analysis for the resilience expert

- Hazard insurance with premium reductions for mitigation

- Home value studies based on mitigation

- Incorporating mitigation strategies and valuation into an appraisal

- Property tax reduction for increased values for mitigated homes

- Availability of the resilience mortgage
The Code Official Workforce Challenge

Age

- 55 to 64: 45.6%
- 35 to 44: 12.3%
- 45 to 54: 28.8%
- 18 to 24: 0.1%
- 25 to 34: 3.3%
- 75 or older: 0.9%

Retirement Plans

- 5 to 15 years
- <5 years
- >15 years

Department Size

- 1 to 4: 33.2%
- 5 to 9: 23.9%
- 10 to 14: 12.5%
- 15 to 24: 12.3%
- 25 to 49: 8.4%
- 50 or more: 9.7%

Community Size

- Less than 25,000: 31.2%
- 25,000 to 74,999: 28.4%
- 75,000 to 149,999: 14.1%
- 150,000 to 249,999: 14.1%
- 250,000 to 499,999: 7.8%
Institutionalizing the Resilience Mortgage

Major progress in 2019?
Parting Thoughts.

- Building Codes are the foundation for resilience (necessary, but not sufficient)
  - Adoption, enforcement, training and workforce essential
  - Above code programs offer additional strategies

- Resilience requires a coordinated approach across strategies and incentives

- A compelling message with actionable recommendations will drive results
Coming together is a beginning; keeping together is progress; working together is success.

Henry Ford
Mitigation Saves: Observations and Next Steps

Thank You

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KAMM Conference, 2018