Resilient Building Codes Toolkit

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LISC

Presenters

Jennifer Hylton Carpenter

Assistant Director of Policy

Terrance Ware

Disaster Recovery Specialist

Madeline Fraser Cook

Director, Government Investments & Technical Assistance

Lisa Churchill

Founder & Principal

Agenda

- Welcome
- How this fits with CDBG-DR funding and support
- Highlights of Making the Business Case
- The relevance of building codes to local economies
  - The return on investment for resilience
  - Business case aspects at the community level
- Hazard-specific business case considerations
- Summary and upcoming webinars

Learning objectives for this webinar

Participants will:

- Develop a common understanding of what building codes are and why they are important
- Understand how a non-resilient building stock could negatively impact the local tax base and economy
- Understand the role resilient building codes play in climate preparedness and community resilience
- Become familiar with the business case for climate resilient building codes

Welcome

Conduct a poll to understand who is in the room:

1. Elected official
2. Municipal employee
3. CDBG-DR grantee
4. HUD employee
5. Other public sector employee
6. Grant writer
7. Consultant
8. Other private sector

Welcome

Which area do you work in?

1. Northeast
2. Mid-Atlantic
3. Southeast
4. Midwest
5. Northwest
6. West coast
7. Southwest
8. Puerto Rico
9. Various locations
10. Nationally

Welcome

How many of you:

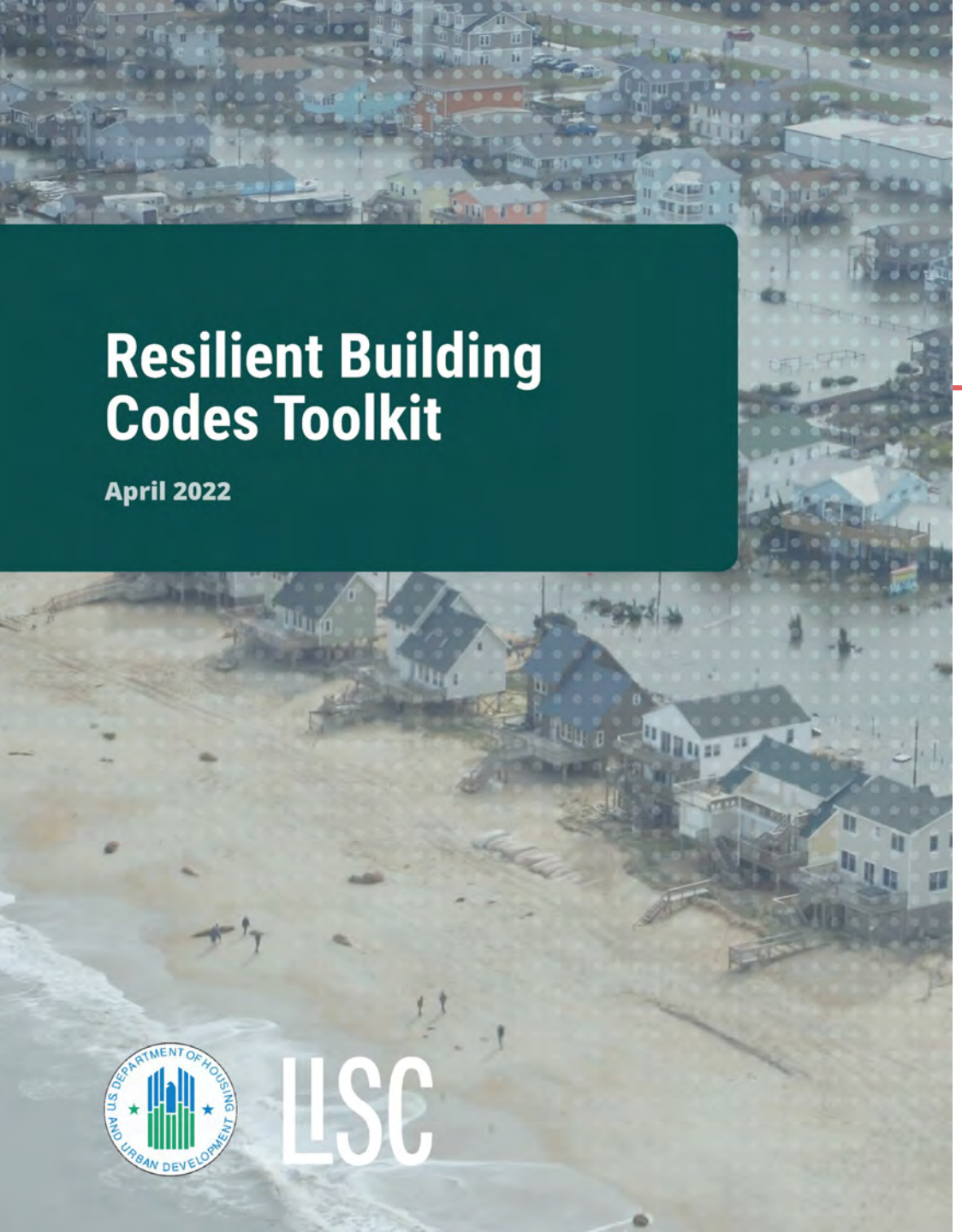
1. are a current or past-participant of CDBG-DR or CDBG-MIT grants?
2. are pursuing CDBG-DR and/or CDBG-MIT grants?
3. have experienced an extreme weather event in the past 5 years?

Resilience & mitigation requirements of the Consolidated Notice

As HUD CDBG-DR and CDBG-MIT grantees, it is important to understand the resilience and mitigation requirements of the Consolidated Notice.

Relevant sections include:

- Mitigation Measures **(II.A.2.b)**
- Resilience Performance Metrics **(II.A.2.c)**
- Green and Resilient Standard for New Construction and Reconstruction of Housing **(II.B.2.a)**
- Elevation standards for new construction, reconstruction, and rehabilitation of substantial damage, or rehabilitation resulting in substantial improvements **(II.B.2.c)**
- Elevation of nonresidential structure **(II.C.2)**
- Resilience Planning (Action Plan for Disaster Recovery Waiver and Alternative Requirement) **(III.C.1.i)**
- Alternative requirement for the elevation of structures when using CDBG–DR funds as the non-Federal match in a FEMA-funded project **(III.F.6.)**



Resilient Building Codes and CDBG-DR Funding

This Toolkit aims to help CDBG-DR and CDBG-MIT grantees understand the importance of rebuilding to more resilient codes and higher standards.

The Toolkit:

- makes the business case for resilient codes,
- outlines the local and state processes that grantees can expect to undertake to upgrade their codes, and
- delineates how resilient codes can address different natural hazards

Why focus on Building Codes?

- Building codes underpin the key health and safety aspects of our built environment
- They are a combination of operational expectations and physical requirements
- Climate change is a risk that is not commonly addressed in existing codes and standards
- The pace of code adoption may not meet the urgency required by climate change

What this Toolkit contains

1. BUSINESS CASE OVERVIEW
2. NARRATIVE
3. CHECKLIST
4. STATE-BY-STATE GOVERNANCE SUPPLEMENT
5. STATE-BY-STATE PROCESS SUPPLEMENT
6. TECHNICAL APPENDIX

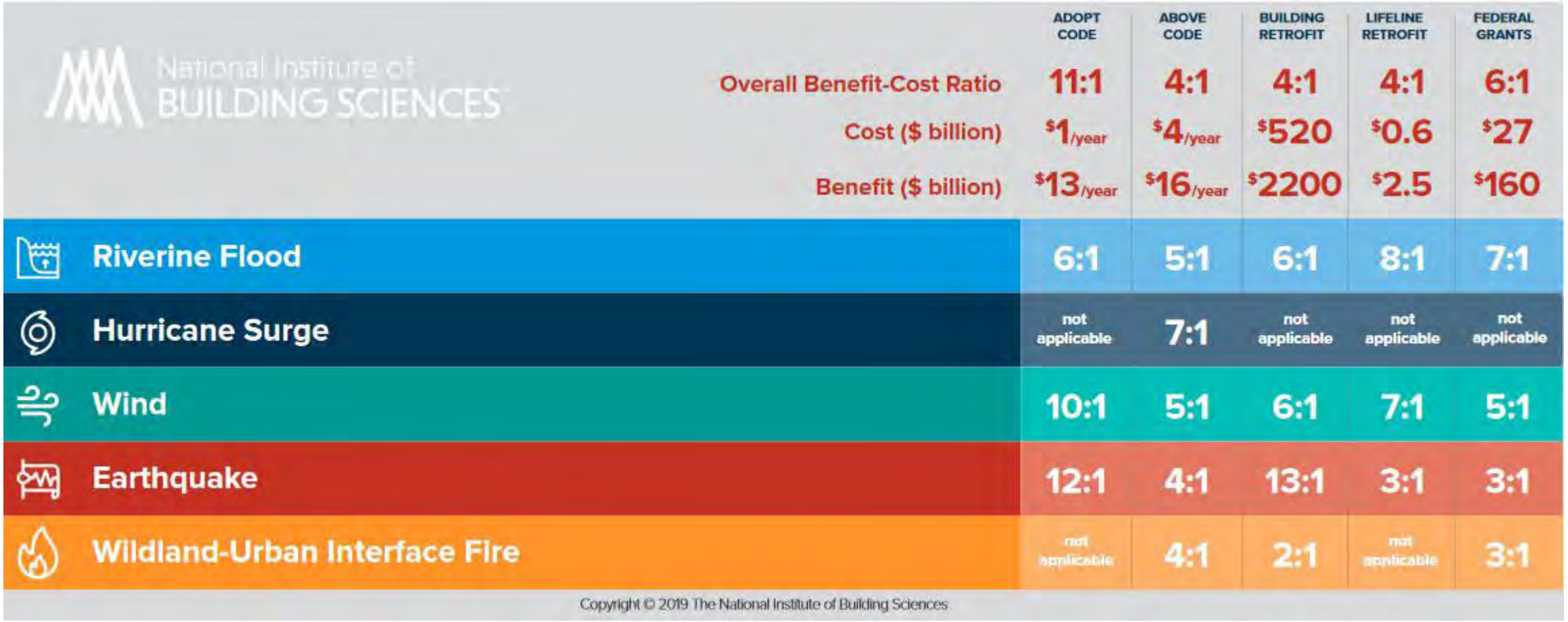
Building for resilience

A Children's Tale

Many of us remember the children's story of the three little pigs. One built their house out of straw, and it was immediately wiped out by the wolf. It was built fast, easily, and cheaply. One built their house out of sticks, and while it withstood the wolf at the door for a while, it eventually was destroyed. And the little pig who built his house to a higher standard and used more resilient building materials — bricks — withstood the wolf at the door. That house took more time and effort to build, but it kept him safe in the long-run. Imagine if all three little pigs had built to the higher standard. What is the moral of the story?

Children's stories aside, many communities face real devastating natural hazards, and adopting building codes that require building and rebuilding to higher standards that reflect the risks present for those particular communities is worth exploring.

The Return on Investment for Resilience

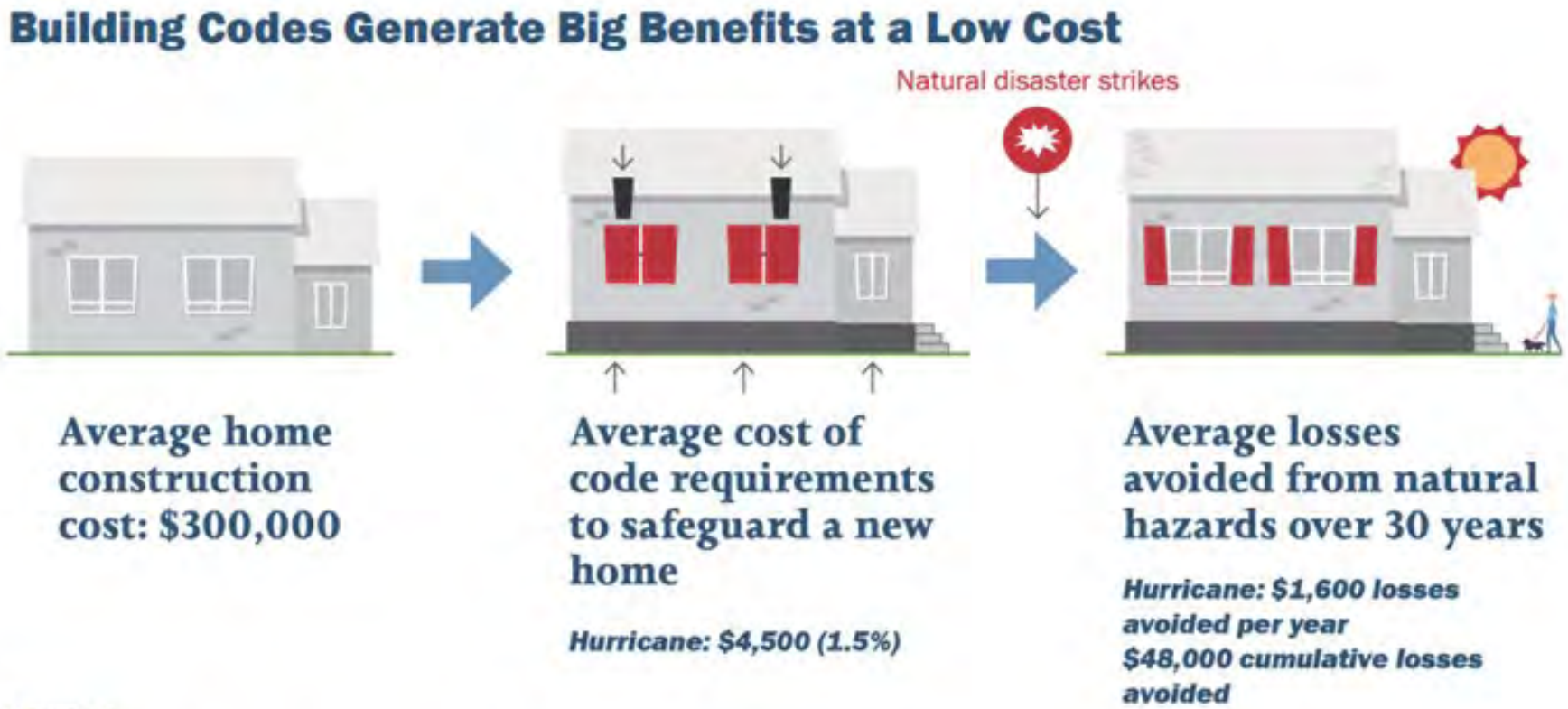


The Return on Investment for Resilience

	NUMBER OF POST-2000 STRUCTURES	MONEY SAVED (ANNUAL AVERAGE)
Flood	786,000	$484 million
Hurricane wind	2.4 million	$60 million
Earthquake	9.2 million	$1.1 billion

Source: Building Codes Save: A Nationwide Study of Loss Prevention, FEMA

The Return on Investment for Resilience

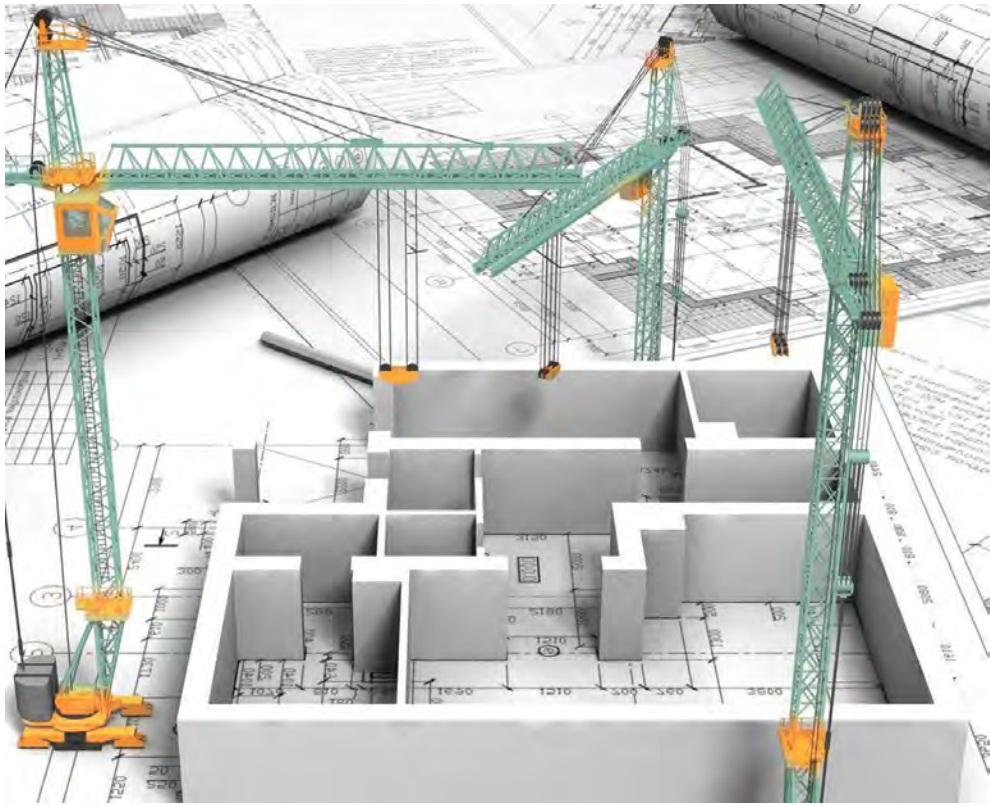


Source: Building Codes Save: A Nationwide Study of Loss Prevention, FEMA

An introduction to Building Codes

What are Building Codes?

- Regulations that establish minimum life safety requirements for the construction of new buildings and retrofits to existing
- Earliest known written code dates from 1758 BC
- Derived through a negotiated process that involves public- and private-sector input
- Model codes that form the basis of state and community-adopted codes are updated on a three-year basis
- Building standards translate these codes into more specific design criteria



Building Codes, design, and performance outcomes

Codes set minimum criteria for components and systems to achieve performance outcomes

APPLICABLE CODES

BUILDING COMPONENTS & SYSTEMS

- STRUCTURAL
- ENVELOPE
- INTERIOR
- MECHANICAL
- ELECTRICAL
- PLUMBING
- CIVIL SITE

BUILDING PERFORMANCE OUTCOMES

- LIFE SAFETY
- ENERGY EFFICIENCY
- WELLNESS
- RESILIENCE

AIR EXCHANGE / QUALITY
DELIVERIES & STORAGE
SHELTER FROM ELEMENTS
ACCESS & EGRESS
LIGHTING & ELECTRICITY
HEATING & COOLING
COMMUNICATIONS
WATER & WASTE

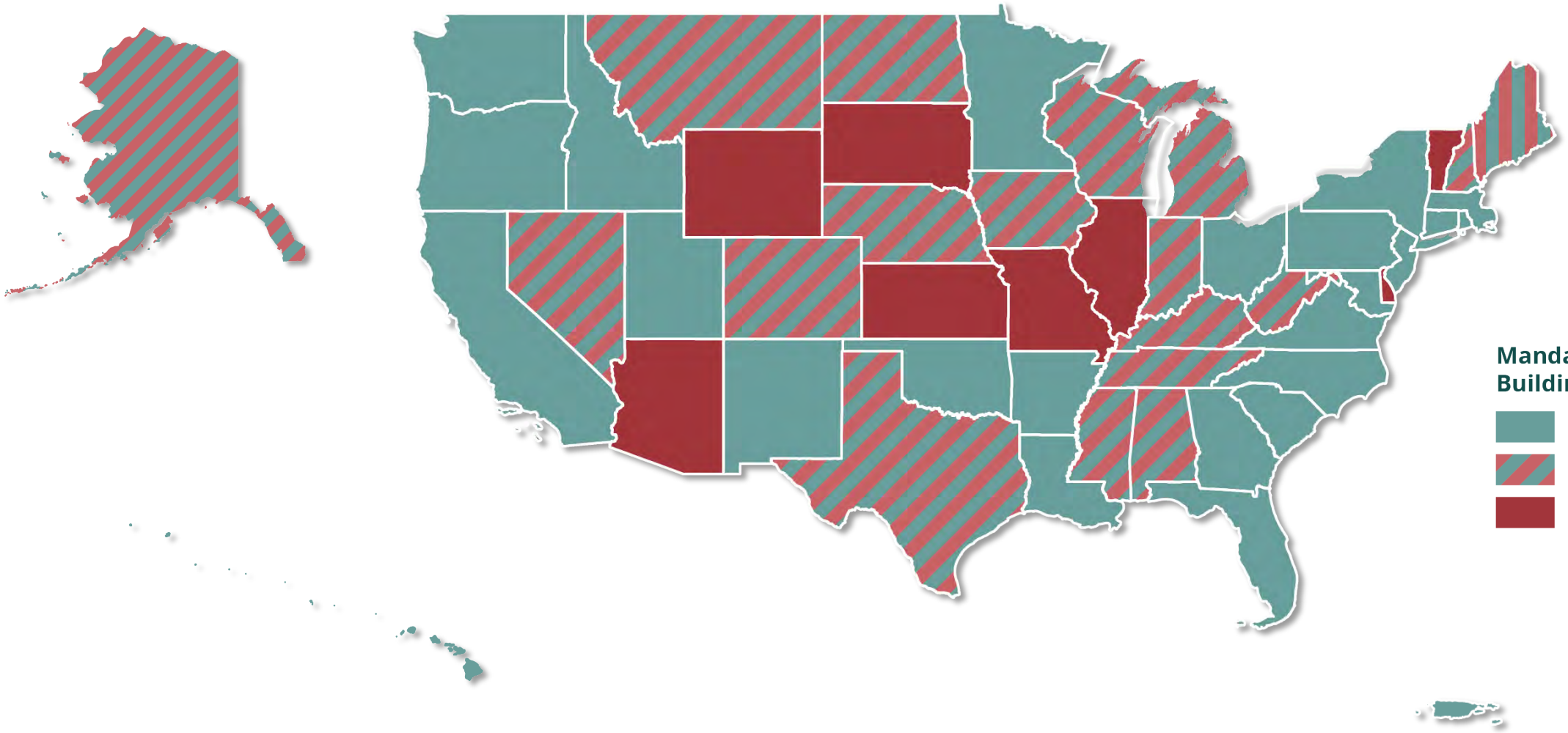
Performance expectations influence building system design and need to be accommodated in codes

Building Codes versus Land Use Regulations

Building codes focus on the **performance** of the building itself

Land use regulations reference the underlying parcel of land and allowable **uses** for the building

Which states have mandatory Building Codes?

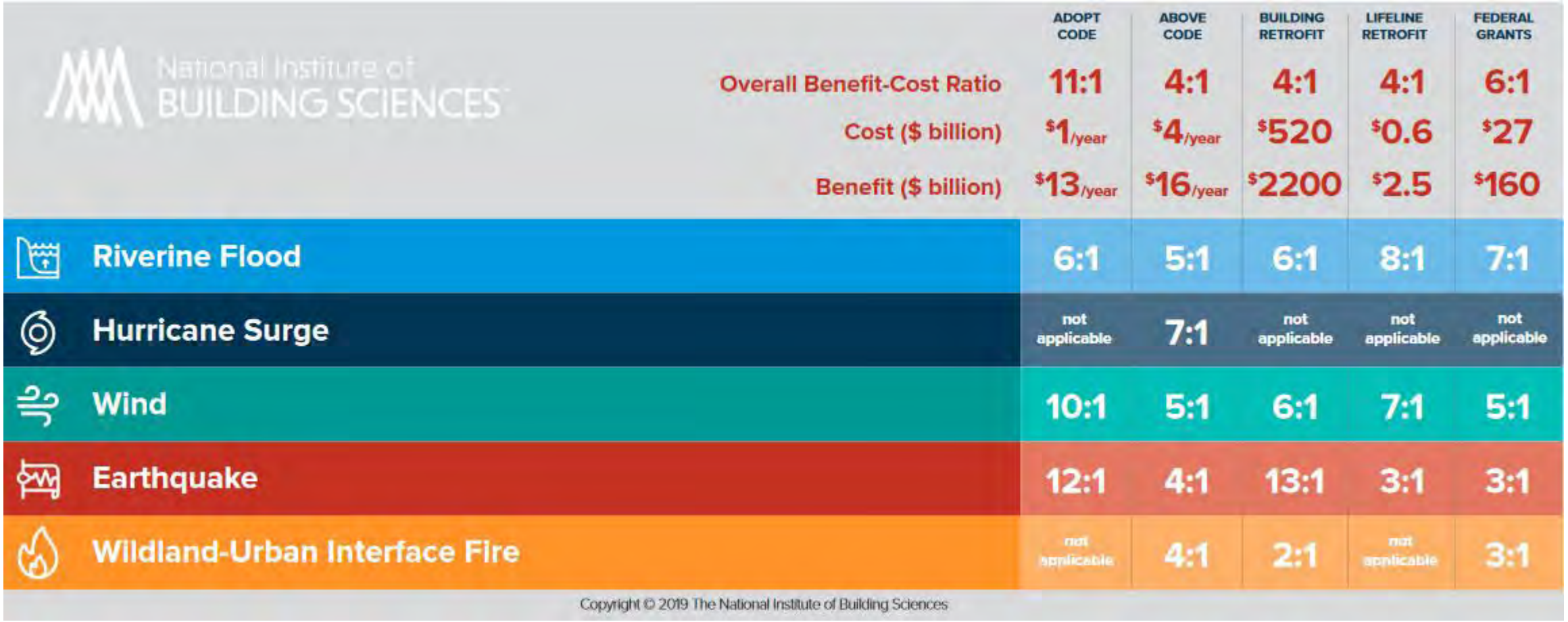


More than just Building Code considerations

State	Building Code	Residential Code	Existing Building	Plumbing code	Electrical Code (NEC)	Mechanical Code	Energy Code — Residential	Energy Code — Commercial (ASHRAE 90.1 or IECC)	Fire Code	Wildfire Code
Alabama	2015 IBC	2015 IRC	2015 IEBC	2015 IPC	2014 NEC	2015 IMC	2015 IECC	2013 90.1	2015 IFC	
Alaska	2012 IBC	no state-wide code	no state-wide code	2018 UPC	2017 NEC	2012 IMC	2018 IECC	no state-wide code	2012 IFC	
Arizona	2018 IBC	2018 IRC	no state-wide code	2018 IPC	no statewide code	2018 IMC	no state mandate	2004 90.1	2018 IFC	No codes at state level; several counties have adopted the model IWUI
Arkansas	2012 IBC	2012 IRC	no state-wide code	2018 IPC	2017 NEC	2009 IMC	2009 IECC	2013 90.1	2012 IFC	
California	2018 IBC	2018 IBC	no state-wide code	2018 IBC	2017 NEC	2018 UMC	2019 California Energy Code	2019 90.1	IFC 2018	Statewide WUI (Chapter 7A & Title 14)
Colorado	2021 IBC	2021 IRC	2021 IEBC	2021 IPC	2020 NEC	2021 IMC	2015 IECC	2015 IECC	2021 IFC	2021 IWUI
Connecticut	2015 IBC	2015 IRC	no state-wide code	2015 IPC	2017 NEC	2015 IMC	2021 IECC***	2021 IECC***	2015 IFC; 2015 NFPA 1	
Delaware	2015 IBC	no state-wide code	2015 IEBC	2018 IPC	2014 NEC	2018 IMC	2018 IECC	2016 90.1	2021 NFPA 1	
District of Columbia	2015 IBC	2015 IRC	2015 IEBC	2015 IPC	2014 NEC	2015 IMC	2015 IECC	2013 90.1	2015 IFC	
Florida	2018 IBC	2018 IRC	no state-wide code	2018 IPC	2017 NEC	2018 IMC	2018 IECC	2016 90.1	2018 NFPA 1	
Georgia	2018 IBC	2018 IRC	no state-wide code	2018 IPC	2017 NEC	2018 IMC	2016 IECC	2015 IECC	2018 IFC	12 jurisdications have adopted the model IWUI
Hawaii	2018 IBC	2018 IRC	no state-wide code	2018 UPC	2017 NEC	Admin Rules Title 11, Chapter 39 - Air Conditioning and Ventilating	2018 IECC	2018 IECC	2018 NFPA 1	

The relevance of Building Codes to local economies

The Return on Investment for Resilience — recap



Business case aspects at the community level

Mortgage defaults

Insurability considerations

Credit rating implications

Climate migration

Disaster funding availability

Business case aspects at the community level

Mortgage defaults

- Homes at risk for flooding are **overvalued by $34 billion** (Hino and Burke, 2021)
- **Unpriced flood costs** are already $520 billion today and could reach $643 billion by 2050 (Evans et al. 2022)
- **Sea level rise** being priced into house transactions at an estimated impact up to $3.71 per square foot per year. (McAlpine and Porter, 2018)
- Homes exposed to sea level rise were **selling at a 7% discount** in some areas of Florida (Bernstein et al., 2019)

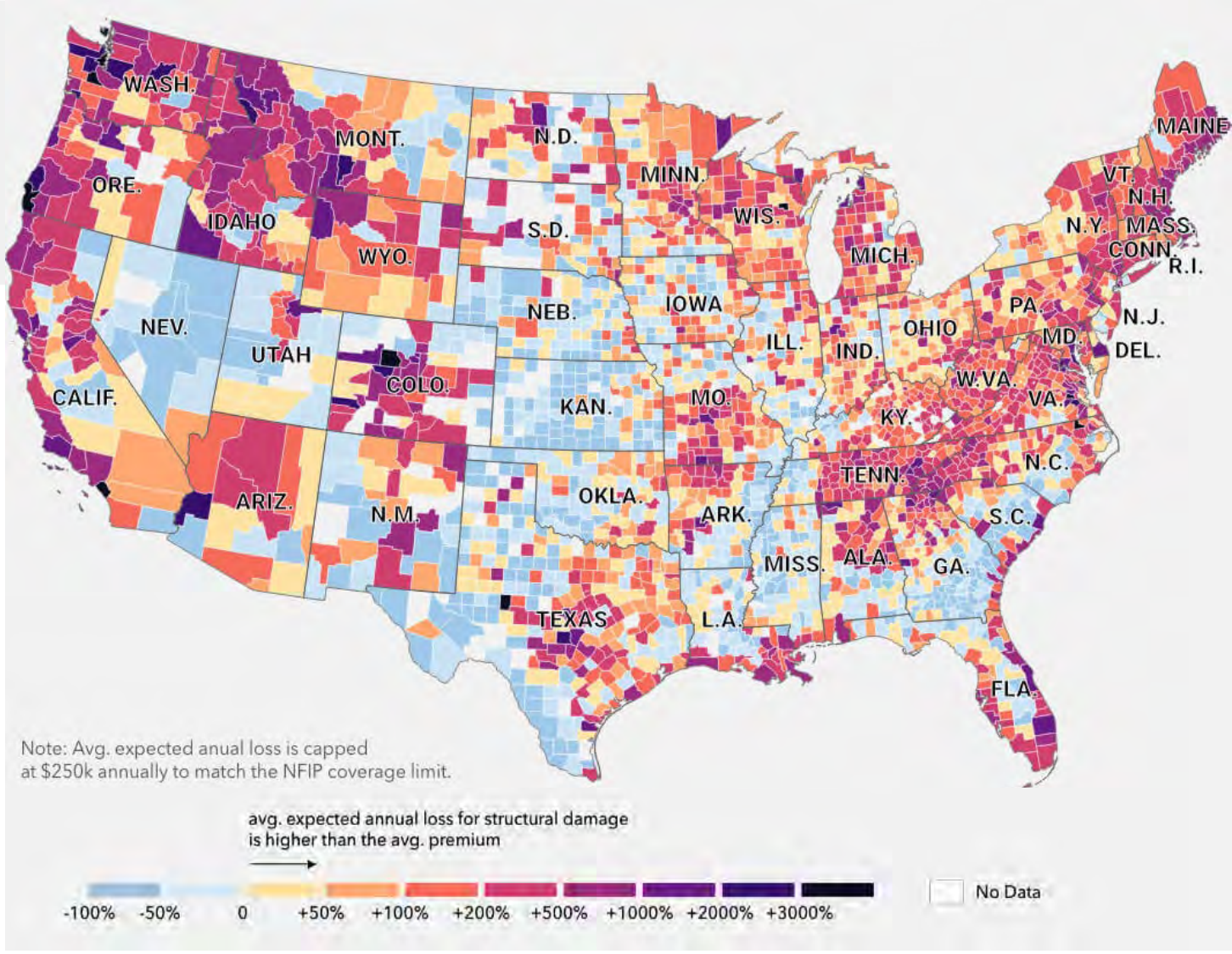
INSURANCE

Inadequate or unaffordable coverage

NFIP insurance premiums compared to economic risk for residential properties with substantial flood risk, 2021

Source: Over 4 Million Homes Face Annual Financial Losses 4.5 Times the Cost of Their Estimated NFIP Premiums. February 22, 2021. First Street Foundation.

Average annual loss (AAL) for residential properties alone was estimated to be $20 billion this year with an expected loss of more than $32 billion in 30 years, directly attributable to climate change impacts



INSURANCE

Inadequate or unaffordable coverage

Insurance products are issued on a yearly basis, often using historic data and with the ability to reprice products or exit markets

- The National Flood Insurance Program (NFIP) is currently $20 billion in debt even before taking additional climate burdens into account. (Congressional Research Service, 2021)
- "insurance companies currently cover only 44% of the damages in the US" (Special Committee on the Climate Crisis, 2020)
- "annual damages to residential real estate will be … 58% higher than the amount collected by insurers to cover it." (IBID)

"We are also aware of at least one insurance company which will not sell homeowners insurance to homes located next to a home with a wood roof in high-risk areas (Allstate Indemnity Company 2018)."

Source: Baylis and Boomhower, Mandated vs. Voluntary Adaptation to Natural Disasters: The Case of US Wildfires (December 2021) https://www.nber.org/papers/w29621

INSURANCE

Short-term focus

- Insurance offers year-to-year protection and can be modified, repriced, and withdrawn at the end of that year's offering.
- It is a not a guaranteed option for the life of the asset
- Risk resets each year, failing to capture the cumulative risk to a property

Annual flooding risk	Flooding risk over 30 years	Flooding risk over 50 years
1%	26%	39%
Current insurance underwriting	Not currently underwritten	Not currently underwritten

INSURANCE

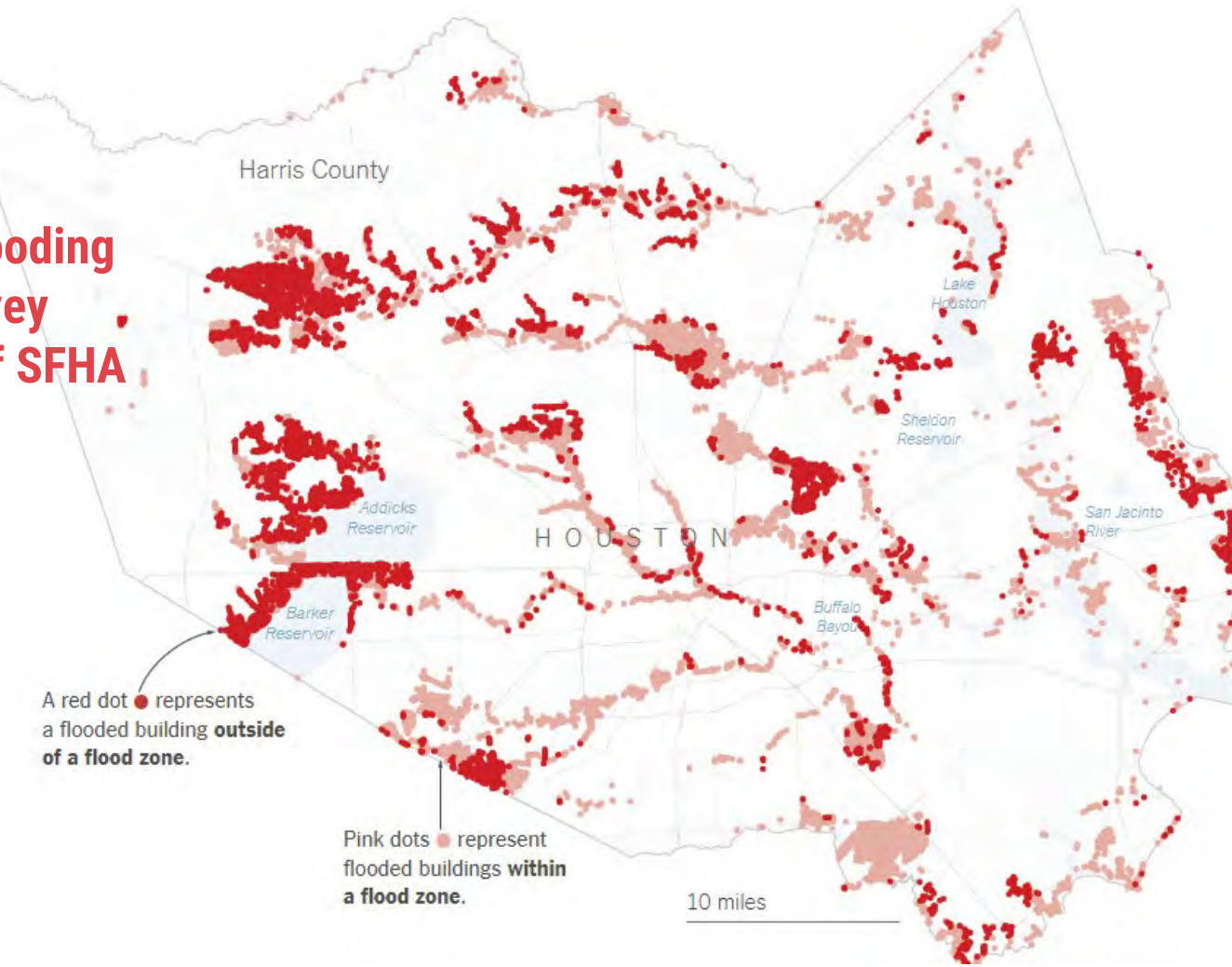
Homeowners unaware

Approximately **5.9 million properties sit outside of the SFHA** but still face a significant risk of flooding.

Similar challenges have been noted with wildfire risk.

Housing stock once located in relatively "safe" areas could become more exposed and less resilient with projected shifts in climate change.

50% of flooding from Harvey outside of SFHA



https://www.nytimes.com/interactive/2017/09/01/us/houston-damaged-buildings-in-fema-flood-zones.html

Business case aspects at the community level

Credit rating implications

- A municipality's and company's credit ratings are tied to their ability to repay debt.
- Acute and chronic climate impacts could impact a municipality's fiscal health.
- Investors are using the climate impact data to determine whether to shorten their investments to a 10-year hold
- Homeowners and businesses may choose not to rebuild following and event. This can result in significant reductions in the tax base.

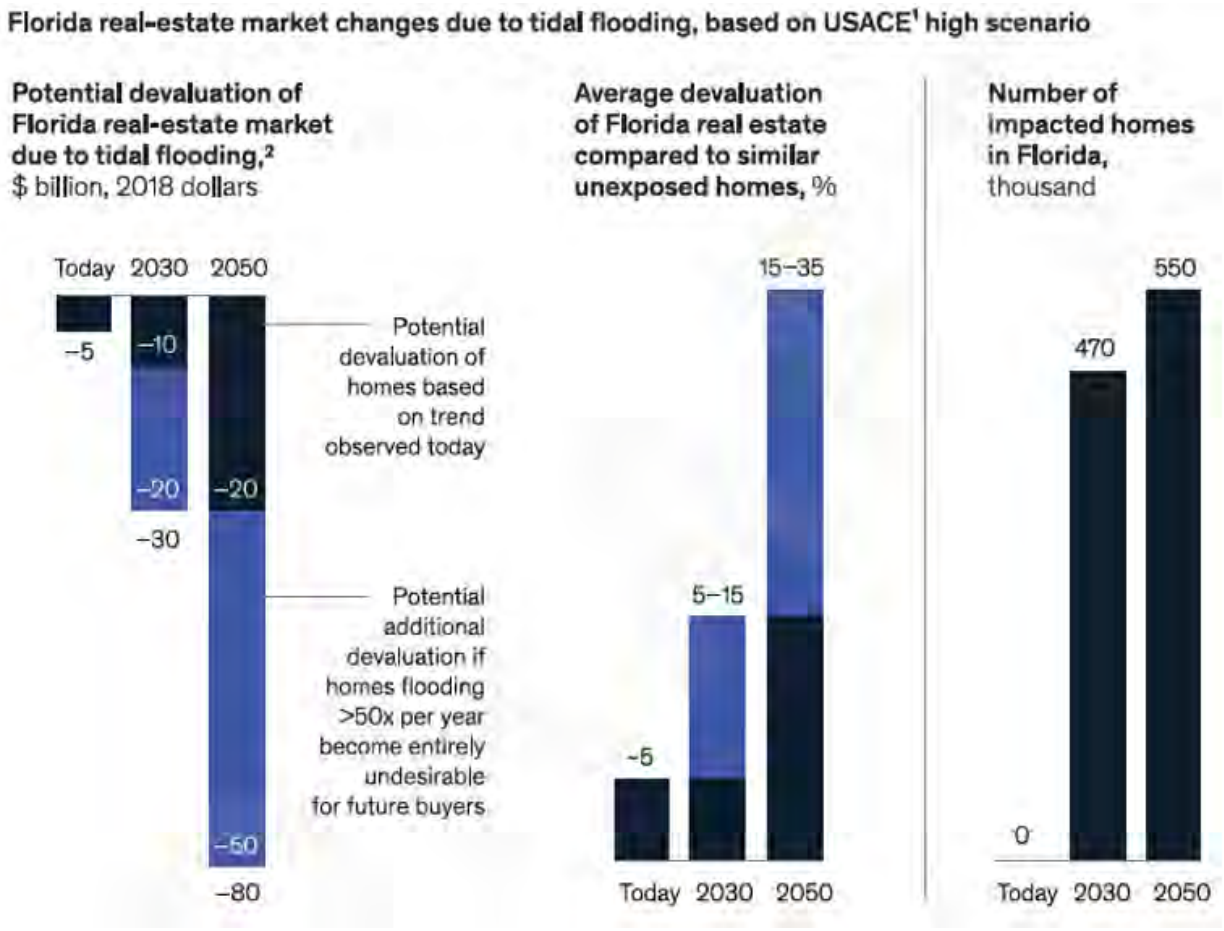
Following Hurricane Maria, Moody recast of Puerto Rico's general obligation bonds. (Kelly, 2017)

In response to Harvey, Standard and Poors revised their outlook on five Texas municipalities. (IBID)

14,000 homes were destroyed in Paradise, CA from wildfire in 2018, with fewer than 11,000 rebuilt as of November 2021. (Chico Enterprise Record, 2021)

Business case aspects at the community level

Credit rating implications



Devaluation of property can significantly impact local economies that are heavily depending on the real estate market.

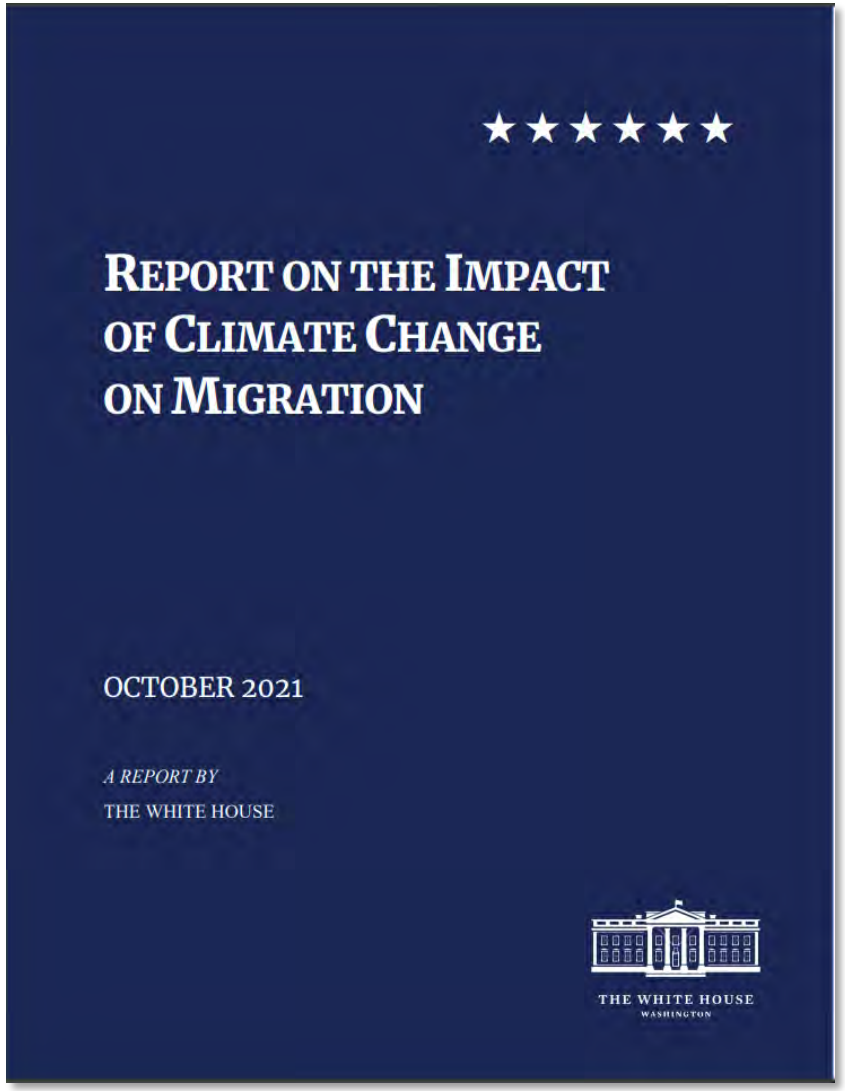
"Tidal flooding has caused an estimated $5 billion devaluation in real estate, which could grow to $30-80 billion by 2050."

(Woetzel et al. 2020)

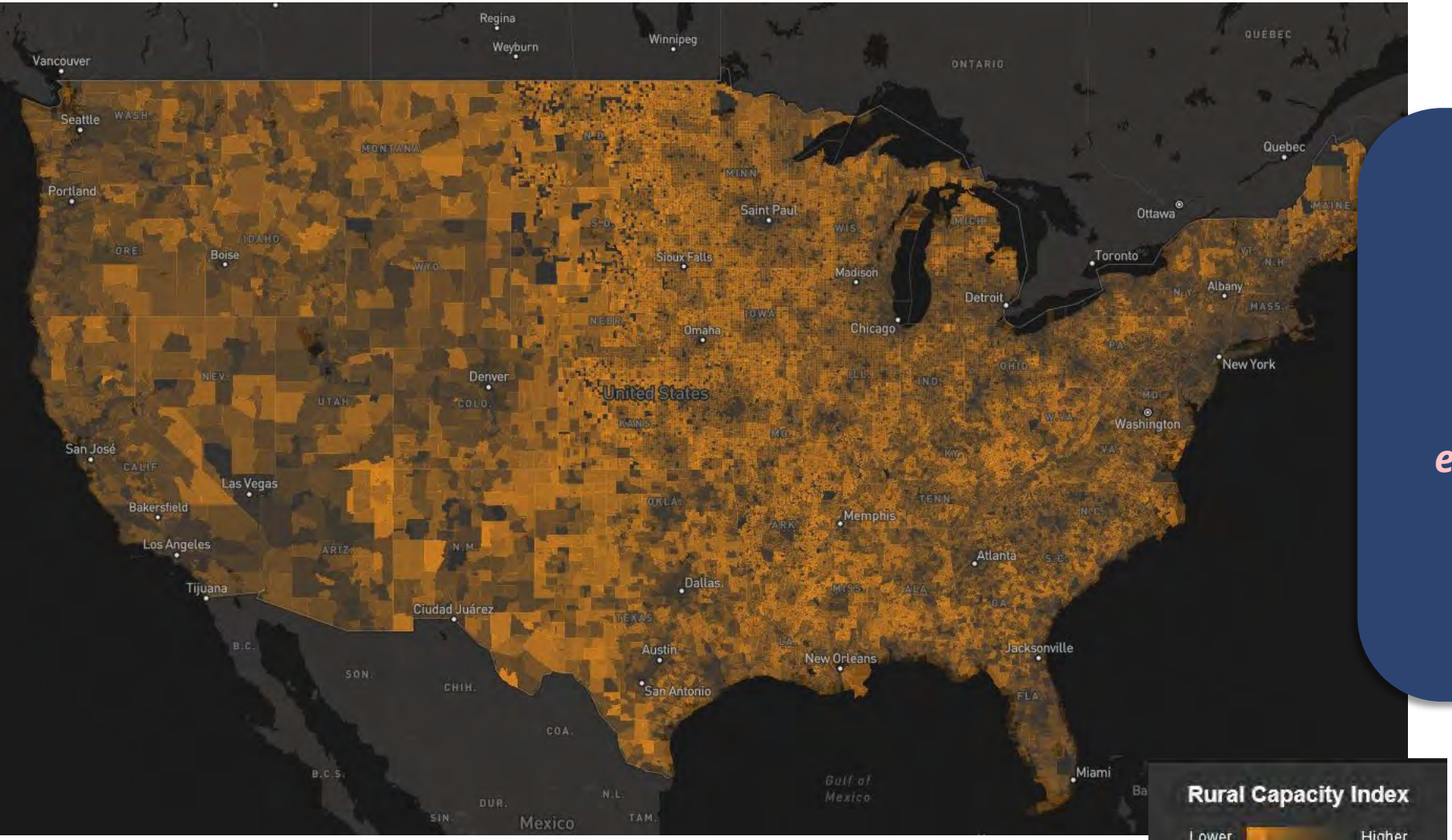
Business case aspects at the community level

Climate migration

- People may be forced to leave areas due to effects of a warming climate
- Some departures from a single event; others occurring more slowly in response to a variety of stressors
- Climate impacts even more challenging for smaller towns and under-resourced communities with limited resources, economic shortfalls, and an eroding tax base, particularly following disasters



Climate migration pressures in rural America



"Repeated shocks from hurricanes, fires and floods are pushing some rural communities, already struggling economically, to the brink of financial collapse."

Source: Flavelle, 2021

How investors track climate migration risk

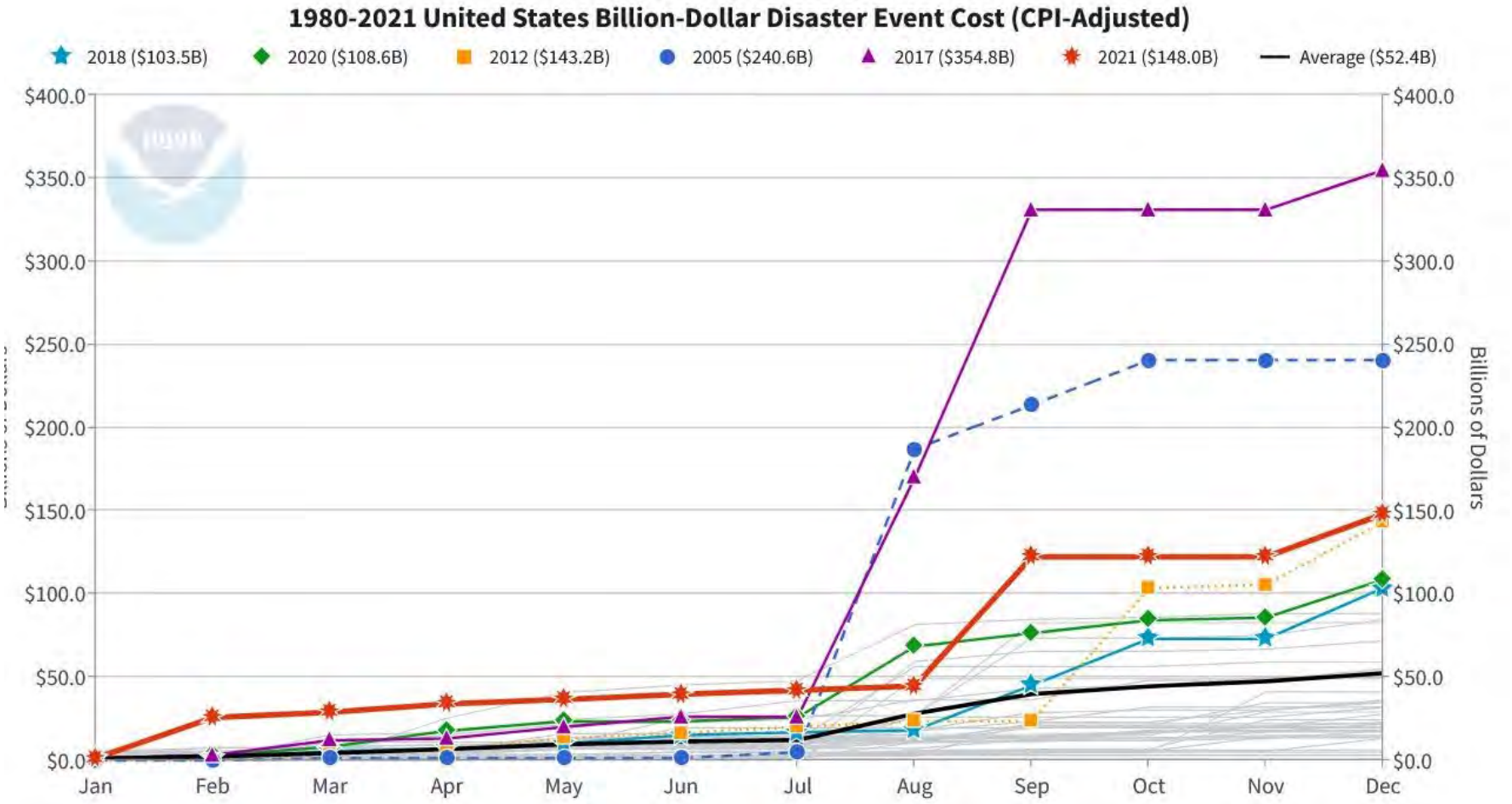
Criteria	Indicators
Economic fundamentals	• Levels of protection offered by existing infrastructure • Area median income; disposable income • GDP sectoral composition • Corporate and/or anchor institution presence • Inequality • Housing affordability
Physical risk exposure	• Exposure of assets and market, including value at risk
Transition risk exposure*	• Assets and primary tenants • Key economic sectors
Market-level adaptive capacity	• Credibility of resilience plans • Fiscal capacity of relevant public-sector agencies • Track record of local institutions addressing resilience

* Includes potential shifts in underwriting practices related to insurance and credit ratings, as well as energy burden considerations

Table based on ULI's Initial Market Screening tool for climate migration risk

Business case aspects at the community level

Disaster funding availability



Since 1980, 310 natural disaster events have occurred in the U.S., costing more than $2.155 trillion.

From 1980 to 2021, the average number of billion-dollar events was 7.4. per year. The average number of events in the last five years (2017-2021) is 17.2 events.

Hazard-Specific Business Case Considerations

Wind

FORTIFIED Wind standards require roofs to be structurally tied to the building in ways that minimize their likelihood of being lifted off and damaged during significant wind events.

Taken post-Hurricane Sally in Alabama, this photo illustrates the difference in resilience between the FORTIFIED roof and traditional builds.

At that time, Alabama had 16,000 IBHS FORTIFIED roofs, all of which withstood the winds of Hurricane Sally.

Source: "Alabama's nation-leading 16,000 Fortified roofs held up well to Hurricane Sally." September 27, 2020.

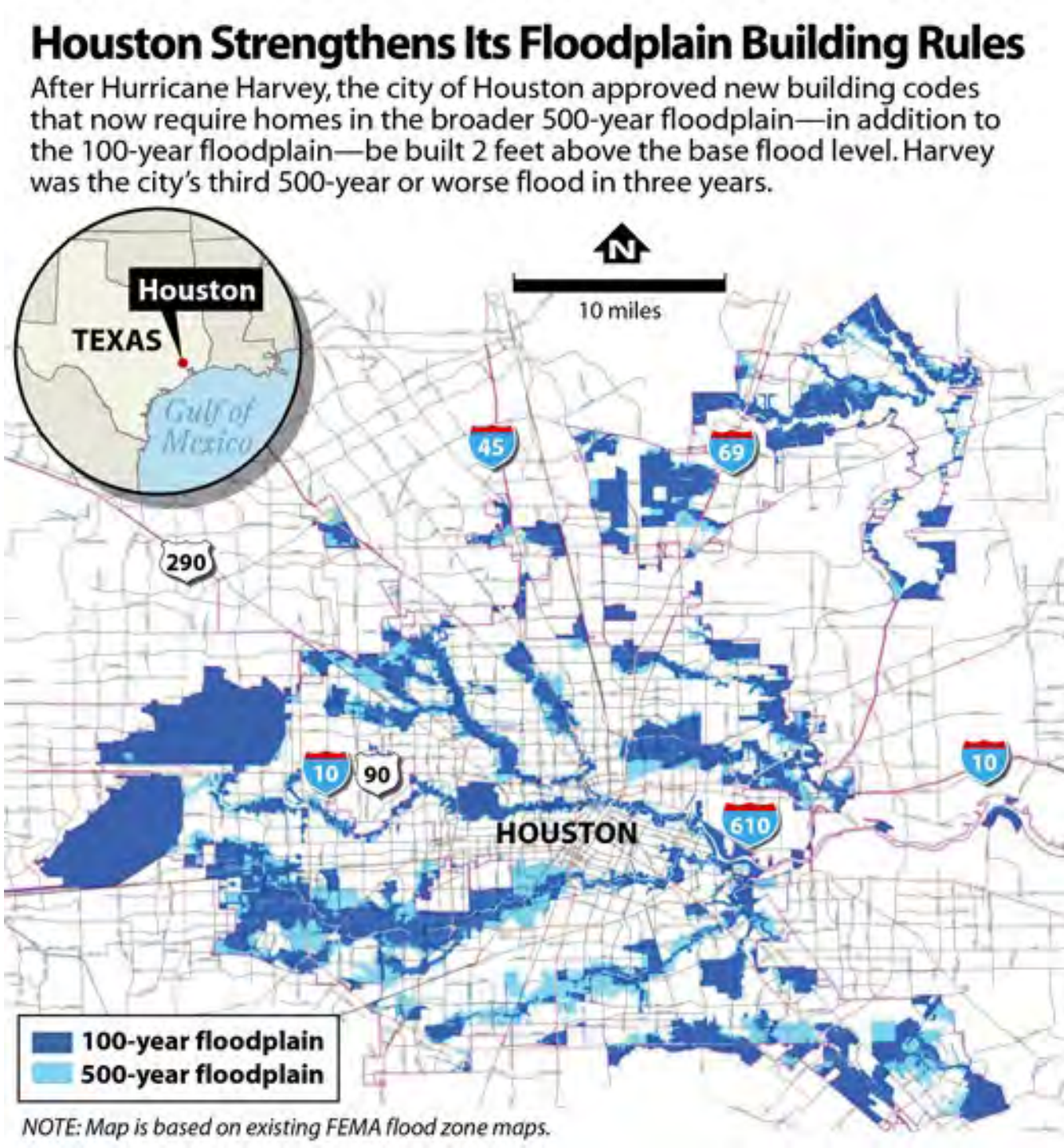
Flood

Representative adjacent single-family dwellings evaluated on concrete piles that survived the hurricane (Mexico Beach; unshaded Zone X)

Source: FEMA. Mitigation Assess Team Report. Hurricane Michael in Florida: Building Performance Observations, Recommendations, and Technical Guidance. February 2020.

Flood

An estimated 84 percent of properties that flooded during Harvey would not have flooded if built to new building code standards



Wildfire

House in Elkorn, OR
Representative example of fire-hardened home that **survived the Beachie Creek Fire** in Oregon. The home was built with concrete siding, a cement porch, metal roof with no gutter and air vents and vegetation had been cleared nearly the home.

A recent study showed that it could cost less money to build a wild-resilient home than a more conventional design.

Source: Headwater Economics, 2018 — Building a Wildfire Resistant Home: Codes and Costs

Extreme temperatures

Photo credit: Spectrum News, 2021

Photo credit: John Froshauer/AP

Summary

- Climate change and extreme weather events are already impacting municipalities economically and financially
- A resilient building stock is essential in creating a “safe haven” in the midst of these increasing disruptions, as well as continuing to both attract and retain viable residences and places of businesses
- Building codes provide both a technical and regulatory solution to ensure the resilience of the larger community, which includes maintaining a viable tax base and key municipal functions

Upcoming webinars

Webinar 2 **A Practitioner's Guide**
May 19, 2:00 p.m. ET

Participants will:

- Learn current building code requirements for each hazard (focus on coastal and inland flooding, extreme temperatures, wildfire and wind)
- Learn beyond-code best practices to account for climate risk
- Become familiar with common challenges and suggested solutions at the practitioner level

Webinar 3 **Action at the Community Level**
May 26, 2:00 p.m. ET

Participants will:

- Discover the role you can play at the local level to address resilience in the building codes
- Become familiar with building code governance at the national, state, and local levels
- Gain insights into how state-level code adoptions influence local actions
- Learn how communities can enhance resilience within building codes, including an outline of the steps involved

For more information, please email drsipolicyunit@hud.gov

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