National Institute of BUILDING SCIENCES™
Innovative Solutions for the Built Environment

Mitigation Saves:
Federal Grants Provide a $6 Benefit for Each $1 Invested

EVERY AMERICAN FACES NATURAL HAZARDS, AND THE RISK IS GROWING

U.S. disaster losses from wind, floods, earthquakes, and fires now average $100 billion per year, and in 2017 exceeded $300 billion—25% of the $1.3 trillion building value put in place that year. Fortunately, there are affordable and highly cost-effective strategies that policymakers, building owners, and the building industry can deploy to reduce these impacts. These strategies include adopting and strengthening building codes, upgrading existing buildings, and improving utilities and transportation systems. The benefits and costs associated with these mitigation measures have been identified through the most exhaustive benefit-cost analysis of natural hazard mitigation to date and documented in Natural Hazard Mitigation Saves. The study was funded by three federal agencies and four private-sector sponsors and produced by the National Institute of Building Sciences – the nation's Congressionally chartered convener of experts from the building professions, industry, labor, consumer interests, and government. For the report and accompanying fact sheets, see www.nibs.org/mitigationsaves. This fact sheet summarizes the study findings and significant savings associated with various mitigation measures.

- **Adopting the latest building code requirements is affordable and saves $11 per $1 invested.** Building codes have greatly improved society's disaster resilience, while adding only about 1% to construction costs relative to 1990 standards. The greatest benefits accrue to communities using the most recent code editions.
- **Above-code design could save $4 per $1 cost.** Building codes set minimum requirements to protect life safety. Stricter requirements can cost-effectively boost life safety and speed functional recovery.
- **Private-sector building retrofits could save $4 per $1 cost.** The country could efficiently invest over $500 billion to upgrade residences with 15 measures considered here, saving more than $2 trillion.
- **Lifeline retrofit saves $4 per $1 cost.** Society relies on telecommunications, roads, power, water, and other lifelines. Case studies show that upgrading lifelines to better resist disasters helps our economy and society.
- **Federal grants save $6 per $1 cost.** Public-sector investment in mitigation since 1995 by FEMA, EDA, and HUD cost the country $27 billion but will ultimately save $160 billion, meaning $6 saved per $1 invested.

National Institute of BUILDING SCIENCES™	ADOPT CODE	ABOVE CODE	BUILDING RETROFIT	LIFELINE RETROFIT	FEDERAL GRANTS
Overall Benefit-Cost Ratio	11:1	4:1	4:1	4:1	6:1
Cost ($ billion)	$1/year	$4/year	$520	$0.6	$27
Benefit ($ billion)	$13/year	$16/year	$2200	$2.5	$160
Riverine Flood	6:1	5:1	6:1	8:1	7:1
Hurricane Surge	not applicable	7:1	not applicable	not applicable	not applicable
Wind	10:1	5:1	6:1	7:1	5:1
Earthquake	12:1	4:1	13:1	3:1	3:1
Wildland-Urban Interface Fire	not applicable	4:1	2:1	not applicable	3:1

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TABLE 1. Nationwide average benefit-cost ratio by hazard and mitigation measure. BCRs can vary geographically and can be much higher in some places. Find more details in the report.

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RESULTS OF FEDERAL GRANT PROGRAMS

Considering the subtotal for the past 23 years of federally funded natural hazard mitigation, at the cost-of-borrowing discount rate, the analysis suggests that society will ultimately save $6 for every $1 spent on up-front mitigation cost. The past 23 years of federally funded natural hazard mitigation is estimated to prevent deaths, nonfatal injuries and PTSD worth $68 billion, equivalent to approximately 1 million nonfatal injuries, 600 deaths and 4,000 cases of PTSD. Table 1 provides benefit-cost ratios (BCRs) for each natural hazard the project team examined. Figure 1 shows the contributions to the calculation of these benefits.

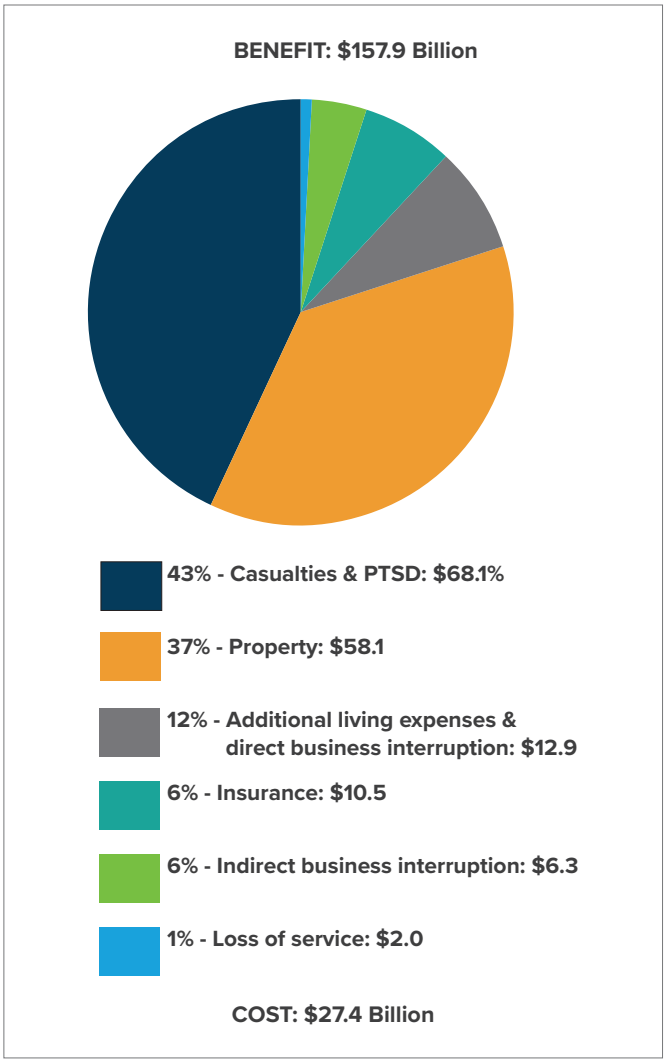

FIGURE 1. Total costs and benefits of 23 years of federal mitigation grants. measures: (left) soft-story retrofit, and (right) strap water heaters.

The federal agency strategies consider 23 years of public sector mitigation of buildings funded through FEMA programs including the Flood Mitigation Assistance Grant Program (FMA), Hazard Mitigation Grant Program (HMGP), Public Assistance Program (PA) and Pre-Disaster Mitigation Grant Program (PDM), plus the HUD Community Development Block Grant Program (CDBG) and several programs of the EDA. Barring identification of additional federal data sets or sources of federal mitigation grant and loan funding, these analyses represent essentially the complete picture of such mitigation measures. In the future, the project team might also look at mitigation measures directly implemented by federal agencies.1 Results represent an enhanced and updated analysis of the mitigation measures covered in the 2005 study. Public-sector mitigation strategies include:

- For flood resistance, acquire or demolish flood-prone buildings, especially single-family dwellings,manufactured homes and 2- to 4-family dwellings.
- For wind resistance, add shutters, safe rooms and other common measures.
- For earthquake resistance, strengthen various structural and nonstructural components.
- For fire resistance, replace roofs, manage vegetation to reduce fuels and replace wooden water tanks.

The national-level BCRs aggregate study findings across natural hazards and across state and local BCRs. The Interim Study examined four specific natural hazards: riverine and coastal flooding, hurricanes, earthquakes and fires at the wildland-urban interface (WUI). Discussion of each hazard and the associated BCRs are provided in separate summaries.

NATURAL HAZARD MITIGATION SAVES IN EVERY STATE

Every state in the contiguous United States is estimated to experience at least $10 million in benefits from federal grants to mitigate flood, wind, earthquake, or fire at the wildland-urban interface. The majority of states enjoy at least $1 billion in benefits. Four states—Louisiana, New Jersey, New York and Texas—enjoy at least $10 billion in benefits. See Figure 2.

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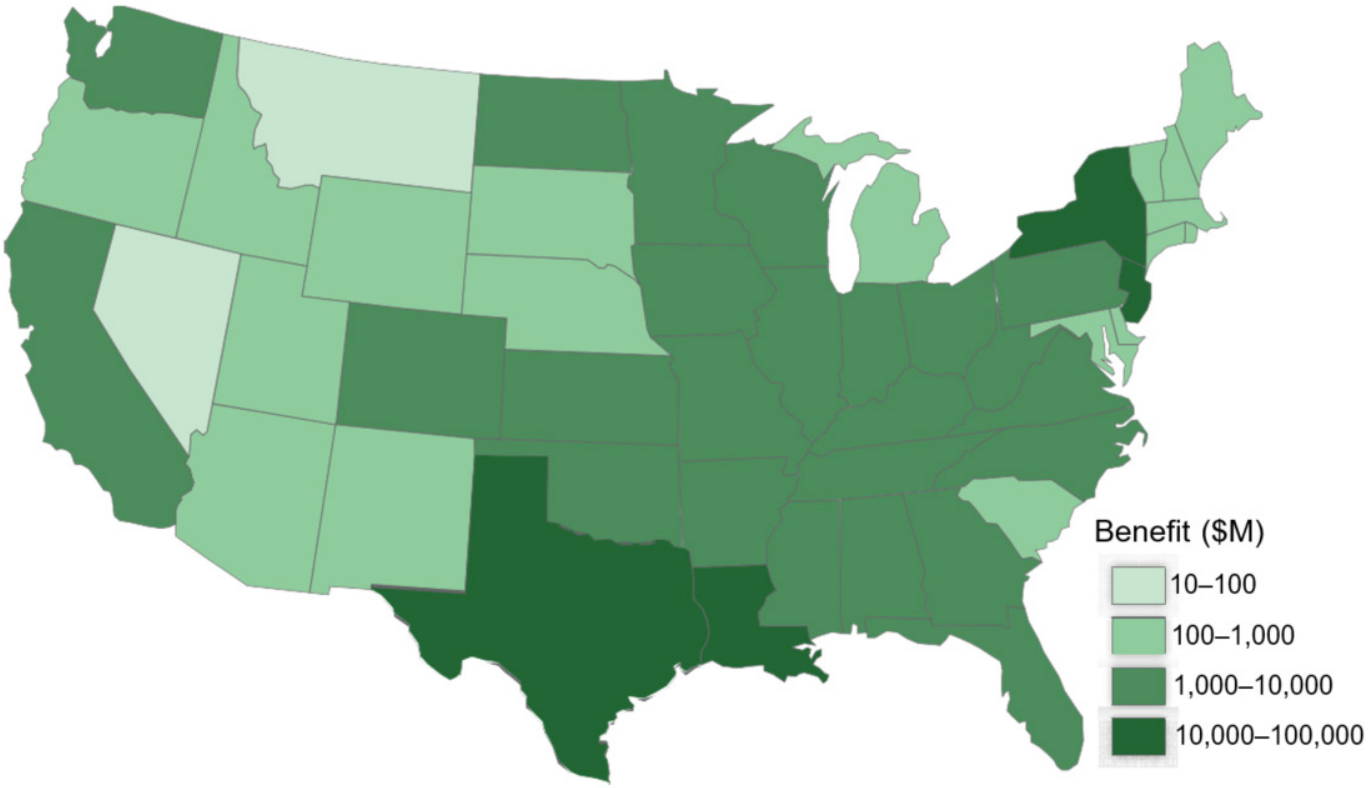

FIGURE 2. Aggregate benefit by state from federal grants for flood, wind, earthquake, and fire mitigation.

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