






# Mitigation Saves: Hurricane Requirements Save \$10 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](http://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
<b>Overall Benefit-Cost Ratio</b>		<b>11:1</b>	<b>4:1</b>	<b>4:1</b>	<b>4:1</b>	<b>6:1</b>
<b>Cost (\$ billion)</b>		<b>\$1<sub>/year</sub></b>	<b>\$4<sub>/year</sub></b>	<b>\$520</b>	<b>\$0.6</b>	<b>\$27</b>
<b>Benefit (\$ billion)</b>		<b>\$13<sub>/year</sub></b>	<b>\$16<sub>/year</sub></b>	<b>\$2200</b>	<b>\$2.5</b>	<b>\$160</b>
 <b>Riverine Flood</b>		<b>6:1</b>	<b>5:1</b>	<b>6:1</b>	<b>8:1</b>	<b>7:1</b>
 <b>Hurricane Surge</b>		not applicable	<b>7:1</b>	not applicable	not applicable	not applicable
 <b>Wind</b>		<b>10:1</b>	<b>5:1</b>	<b>6:1</b>	<b>7:1</b>	<b>5:1</b>
 <b>Earthquake</b>		<b>12:1</b>	<b>4:1</b>	<b>13:1</b>	<b>3:1</b>	<b>3:1</b>
 <b>Wildland-Urban Interface Fire</b>		not applicable	<b>4:1</b>	<b>2:1</b>	not applicable	<b>3:1</b>

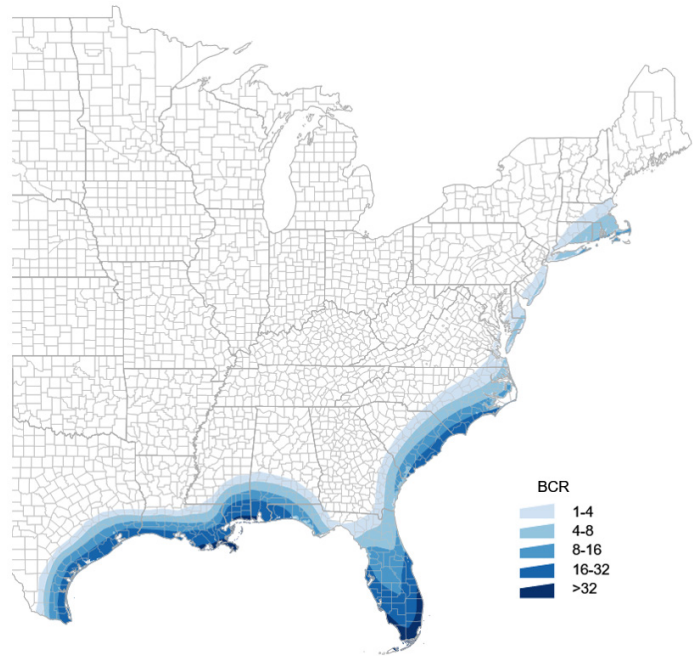
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**TABLE 1.** Nationwide average benefit-cost ratio by hazard and mitigation measure. BCRs can vary geographically and can be much higher in some places. Find more details in the report.

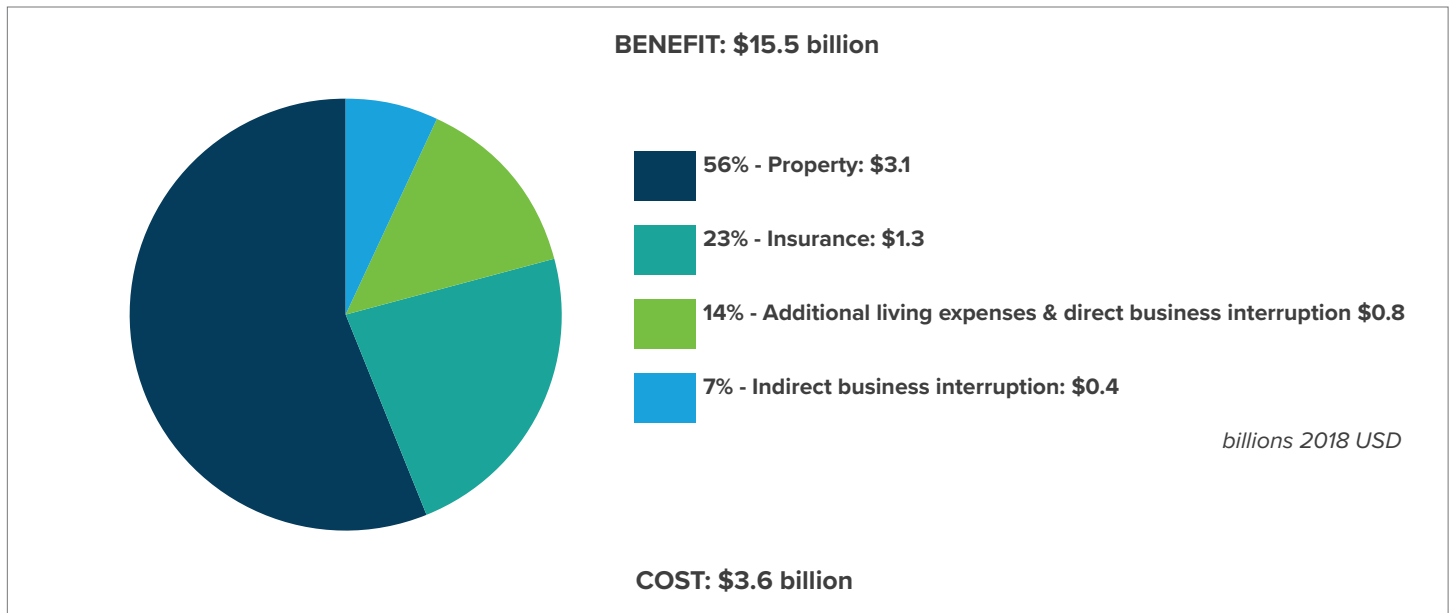
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### MEETING COMMON CODE REQUIREMENTS FOR HURRICANE

In 1990, just before Hurricane Andrew struck, new buildings built to the 1990 BOCA National Building Code or the 1991 Standard Building Code had several vulnerabilities when subjected to intense hurricane winds. Poor connections between roof and walls, loss of roof decking, increased internal pressures, and water intrusion from windborne debris penetrating the building envelope, amongst many other deficiencies, resulted in widespread hurricane wind damage. Substantive changes to building codes were applied to mitigate these deficiencies. Codes were further strengthened in successive editions based on lessons learned after later hurricanes. These aspects of the 2018 I-Codes save \$5.6 billion in the long term for every year of new buildings built to the code, at a cost of \$540 million, producing a benefit-cost ratio of 10:1. Figure 1 shows the sources of these benefits. Figure 2 shows that the benefit-cost ratio is highest at locations nearest the Gulf and Atlantic Coasts where hurricane winds are strongest and most frequent.



**FIGURE 2.** Stakeholder net benefits of new design to comply with 2018 IBC and IRC requirements, relative to 1990 requirements.



**FIGURE 1.** Total costs and benefits of new design to comply with 2018 I-Code requirements for hurricane, relative to 1990.