






# Mitigation Saves: For Hurricane Winds, Designing to Exceed 2015 Codes Provides \$5 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](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.

## Mitigation Saves:

# Hurricane Winds: Designing to Exceed 2015 Codes Provides \$5 Benefit for Each \$1 Invested

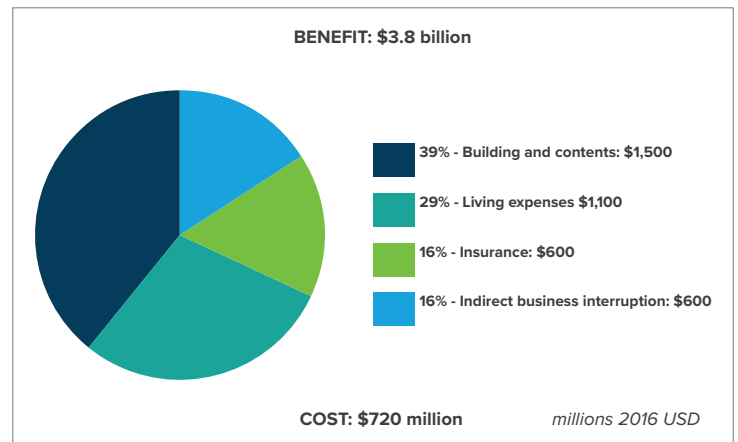
### RESULTS OF EXCEEDING CODE FOR HURRICANE WIND

If all new homes were built to the incrementally efficient maximum (IEMax) Insurance Institute for Business and Home Safety (IBHS) FORTIFIED Home program level for 1 year, it would cost approximately \$720 million extra and would produce approximately \$3.8 billion in avoided future losses. The aggregate benefit-cost ratio (BCR) (summing benefits and costs over all states) is approximately 5:1, e.g., \$5 saved for every \$1 spent to build new buildings better along the Gulf and Atlantic Coasts.

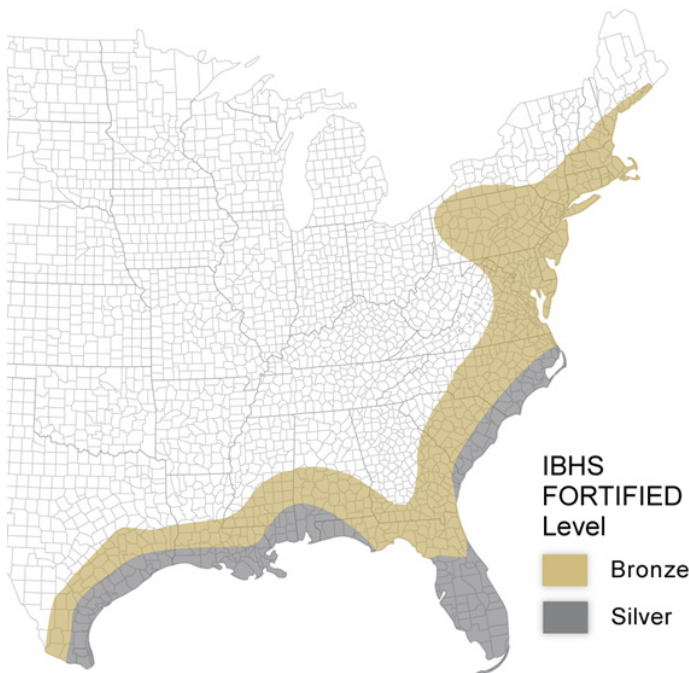
Table 1 provides BCRs for each natural hazard the project team examined. Figure 1 shows the overall ratio of costs to benefits for the design of new buildings to exceed hurricane related coastal flooding requirements of the 2015 IRC. Compliance with the IBHS FORTIFIED Home Hurricane program appears to be cost-effective everywhere along the Atlantic and Gulf Coast. The IEMax FORTIFIED level varies by state, as illustrated in Figure 2. The project team aggregated state and local BCRs to determine the national-level BCR. The costs reflect only the added cost relative to the 2015 IRC.

The stringency of codes adopted at the state and local level varies widely. The project team used the unamended 2015 IBC and IRC as the baseline minimum codes for this study. While minimum codes provide a significant level of safety, society can save more by designing some new buildings to exceed

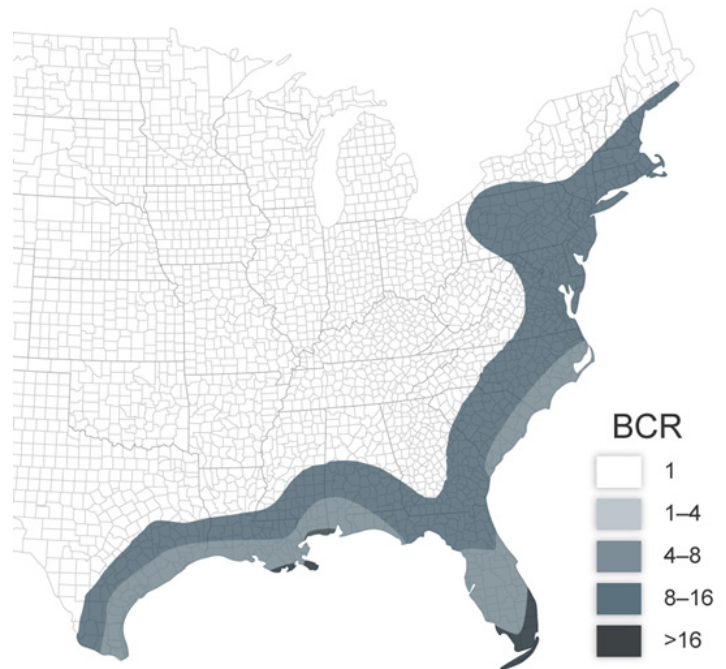
minimum requirements of the 2015 Codes. Where communities have an older code or no code in place, additional costs and benefits will accrue. If all new buildings built the year after were also designed to exceed select I-Code requirements, the benefits would be that much greater, in proportion to the quantity of new buildings.



**FIGURE 1.** Benefits and costs for 1 year of new construction at the IEMax IBHS FORTIFIED Home Hurricane levels.



**FIGURE 2.** Maximum level of the IBHS FORTIFIED Home Hurricane design for new construction where the incremental benefit remains cost-effective.



**FIGURE 3.** BCR of hurricane wind mitigation by building new homes under the FORTIFIED Home Hurricane Program (by wind band).