



Hurricane Requirements Save \$10 for Each \$1 Invested

Introduction

Natural hazards present significant risks to many communities across the United States. Fortunately, there are measures governments, building owners, developers, tenants, and others can take to reduce the impacts of such events. These measures—commonly called mitigation—can improve safety and prevent property loss and disruption of day-to-day life. The National Institute of Building Sciences Multihazard Mitigation Council undertook a multi-year study in 2017 to update and expand upon its 2005 *Mitigation Saves* study on the value of mitigation. In the *Mitigation Saves: 2018 Interim Report*, the project team estimated benefit-cost ratios for four kinds of mitigation and five perils, as shown in Table 1.

| | National Benefit-Cost Ratio Per Peril <small>*BCR numbers in this study have been rounded</small> | Exceed common code requirements | Meet common code requirements | Utilities and transportation | Federally funded |
|--|--|---------------------------------|-------------------------------|------------------------------|------------------|
| Overall Hazard Benefit-Cost Ratio | | 4:1 | 11:1 | 4:1 | 6:1 |
| Riverine Flood | | 5:1 | 6:1 | 8:1 | 7:1 |
| Hurricane Surge | | 7:1 | Not applicable | Not applicable | Too few grants |
| Wind | | 5:1 | 10:1 | 7:1 | 5:1 |
| Earthquake | | 4:1 | 12:1 | 3:1 | 3:1 |
| Wildland-Urban Interface Fire | | 4:1 | Not applicable | Not applicable | 3:1 |

Table 1. Benefit-cost ratio by hazard and mitigation measure.

- **Exceed common code requirements:** Most U.S. communities adopt recent editions of the *International Building Code* (IBC) and *International Residential Code* (IRC). Few adopt the *International Wildland-Urban Interface Code* (IWUIC). These codes set out minimum safety requirements, not maxima. Exceeding certain requirements of the commonly adopted codes and adopting the IWUIC can save \$4 per \$1 invested.
- **Meet common code requirements:** Modern building codes have improved society’s disaster resilience to hurricanes, floods, and earthquakes (among other improvements), and they have developed over time. Compared with a generation ago, code development in these areas saves an estimated \$11 per \$1 invested.
- **Retrofit utilities and transportation infrastructure:** Society relies on roads, highways, railways, electricity, telecommunications, water, wastewater, and other lifelines. Retrofitting these facilities to better resist disasters saves society \$4 per \$1 invested.
- **Federal grants:** The impacts of 23 years of grants made by the Federal Emergency Management Agency (FEMA), Economic Development Administration (EDA), and the Department of Housing and Urban Development (HUD) result in a national benefit of \$6 for every \$1 invested.

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.

Benefit: \$5.6 billion

56% – Property: \$3.1

23% – Insurance: \$1.3

14% – Additional living expenses and direct business interruption: \$0.8

7% – Indirect business interruption: \$0.4

Billions 2018 USD

Cost: \$0.54 billion

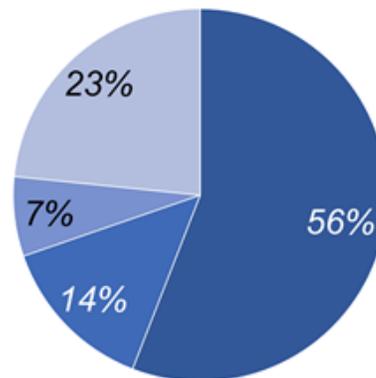


Figure 1. Total costs and benefits of new design to comply with 2018 I-Code requirements for hurricane, relative to 1990.

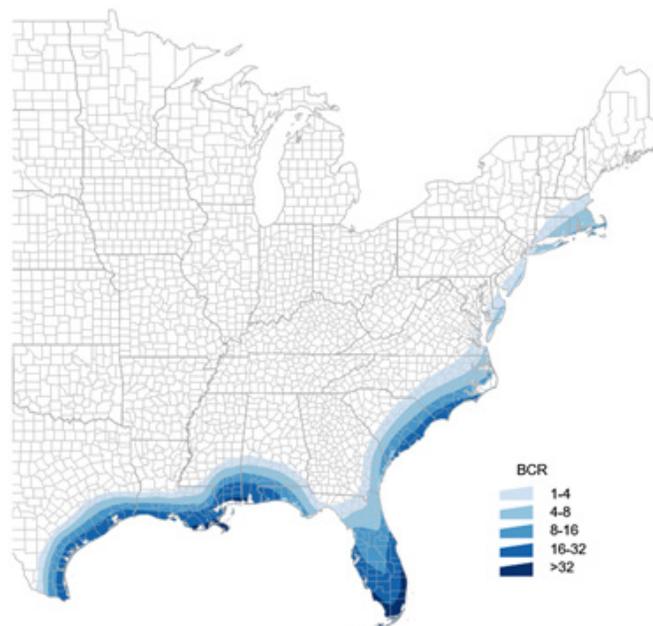


Figure 2. Stakeholder net benefits of new design to comply with 2018 IBC and IRC requirements, relative to 1990 requirements.