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 result in significant savings in terms of safety, prevent property loss and disruption of day-to-day life.

The National Institute of Building Sciences Multihazard Mitigation Council (MMC) undertook a study in 2017 to update and expand upon the findings of its 2005 Mitigation Saves study on the value of mitigation. In the 2017 Interim Report (now included into the 2018 Interim Report), the project team analyzed two areas of mitigation programs:

- **Federal grants**: The impacts of 23 years of federal grants made by the Federal Emergency Management Agency (FEMA), Economic Development Administration (EDA) and the Department of Housing and Urban Development (HUD), resulting in a national benefit of $6 for every $1 invested.

- **Beyond code requirements**: Designing new structures to exceed select provisions of the 2015 International Building Code (IBC) and International Residential Code (IRC) and the adoption of the 2015 International Wildland-Urban Interface Code (IWUIC). This resulted in a national benefit of $4 for every $1 invested.

Results of Exceeding Code for Hurricane Surge

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.
Mitigation Saves: For Hurricane Winds, Designing to Exceed 2015 Codes Provides $5 Benefit for Each $1 Invested

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Table 1. Benefit-Cost Ratio by Hazard and Mitigation Measure.

**Benefit: $3.8 billion**

- 39% – Building and contents: $1,500
- 29% – Living expenses: $1,100
- 16% – Insurance: $600
- 16% – Indirect business interruption: $600
  millions 2016 USD

**Cost: $720 million**

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).