






Mitigation Saves: Retrofitting Buildings in the WUI Saves \$2 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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RETROFITTING WILDLAND-URBAN INTERFACE BUILDINGS COULD SAVE \$430 BILLION

Approximately 2.5 million homes have been built in the wildland-urban interface (WUI) and are so vulnerable to WUI fire that it would be cost effective to retrofit them to comply with the 2018 International Wildland-Urban Interface Code. These homes, plus nearby businesses and contents, are valued at approximately \$1.3 trillion. To retrofit the most fire-resistant of these could cost as little as \$4,000 or as much as \$80,000 for the least fire resistant. The mix is highly uncertain, but even taking a conservatively high estimate of \$72,000 cost to make the exterior cladding fire resistant, replace windows with double-paned glass, and clear a defensible space of excess fuel, the average benefit of \$130,000 still would exceed the cost. In aggregate and using a conservatively high cost estimate, retrofitting all buildings in the WUI would cost \$240 billion, but save society \$430 billion, a benefit-cost ratio of 2:1. Using a lower, but still realistic, average retrofit cost of \$16,000, the benefit is still \$430 billion at a cost of \$53 billion, meaning \$8 of avoided future losses per \$1 invested.

Figure 1 shows the sources of these benefits. The benefit-cost ratios are greatest for buildings in the most fire-prone locations—where climate, slope, and fuel produce the highest probability of fire. In those locations, the benefit-cost ratio can exceed 6:1 even with the more conservative estimate of retrofit cost.

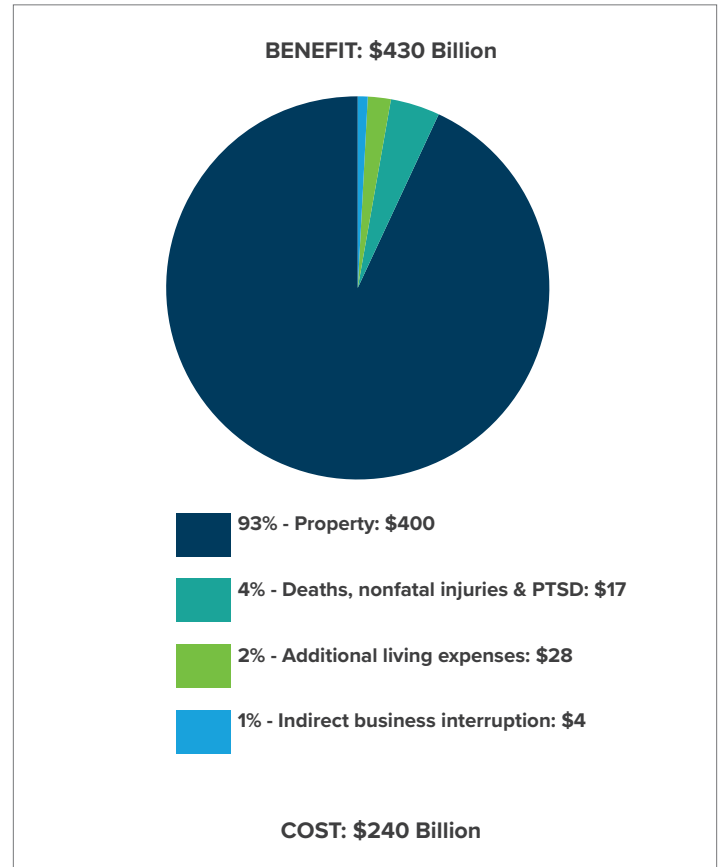


FIGURE 1. Total costs and benefits of private-sector WUI retrofit, using a conservatively high cost estimate. considered here. retrofit.

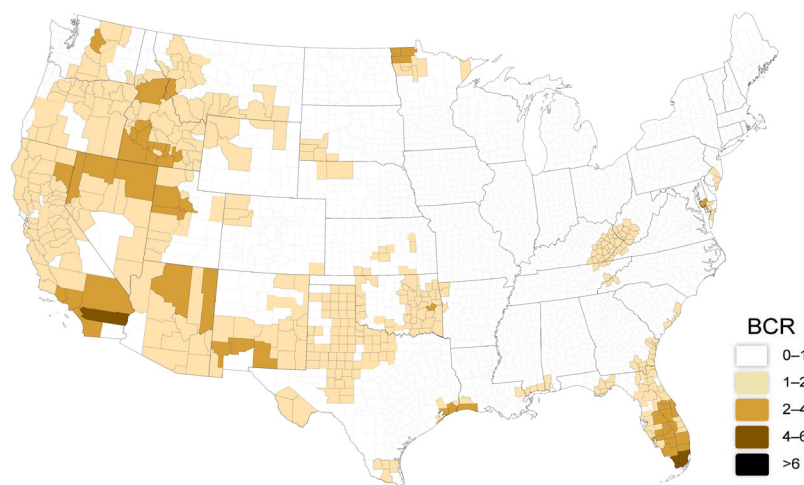


FIGURE 2.Benefit-cost ratios of retrofitting private-sector buildings to better resist fire in the wildland-urban interface. The map is shaded by county for simplicity, but typically only part of each county stands in the WUI. The shading reflects the location for the part of the county with the highest BCR. considered here. retrofit.