






Mitigation Saves: Private-Sector Retrofit Saves \$4 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 PRIVATE-SECTOR BUILDINGS COULD SAVE SOCIETY OVER \$2 TRILLION

Codes and standards have improved over time, but that means older buildings embody numerous weaknesses that could be fixed through retrofit. More than 1 million houses currently stand in the 100-year floodplain, and are more likely than not to be flooded during their economic life. A variety of retrofit measures could make these buildings safer and more efficient to own. A combination of buyouts, elevation projects, and less-expensive modifications to basements and heating and air conditioning equipment could save society almost \$1.3 trillion, albeit at a cost of \$225 billion—a benefit-cost ratio of \$6 saved per \$1 invested.

Almost 3 million older homes along the Gulf and Atlantic coasts lack modern resilience features like strong roofs that could make ordinary houses more resistant to hurricanes, or engineered tie-down systems for manufactured homes that could make them more resistant to strong winds. Efficient retrofit of these homes could save \$140 billion at a cost of \$24 billion—again, \$6 saved per \$1 invested.

Millions of homes in high-seismic areas across the U.S. have weak ground stories, freestanding furnishings, water heaters that could fall over, and other deficiencies that, if strengthened, could save \$330 billion at a cost of \$25 billion, for a benefit-cost ratio of \$13:1, the highest considered here.

Finally, 2.5 million homes stand in a part of the wildland-urban interface, where the risk of fire is so high that it would be cost effective to provide a defensible space, replace cladding, and make other changes that would save them \$430 billion, at a cost of \$240 billion, for a benefit-cost ratio of 2:1.

Considering just these retrofit options, America has a \$520 billion private-sector retrofit investment gap that, if closed, would save society \$2.2 trillion, for a benefit-cost ratio of 4:1. Figure 1 shows the sources of these benefits, totaling over the four perils and numerous private-sector retrofit options considered here.

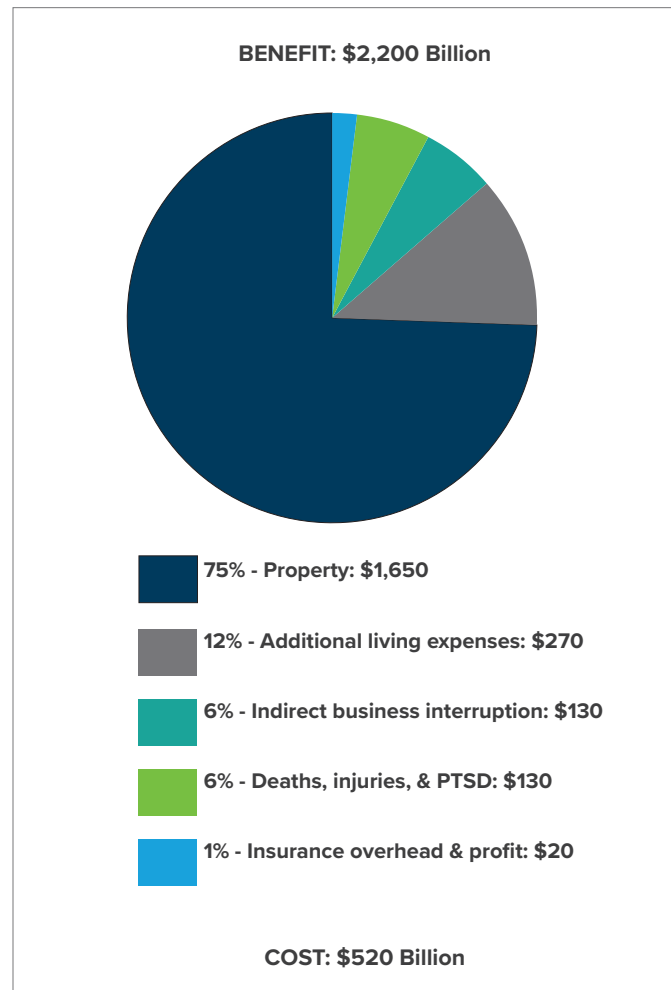


FIGURE 1. Total costs and benefits of private-sector retrofit options considered here.