

*The following material presented is an excerpt from a report entitled **Risk Analysis for Extreme Events: Economic Incentives for Reducing Future Losses** by Howard Kunreuther, Robert Meyer, and Christophe Van den Bulte from the Wharton School, University of Pennsylvania, as prepared for: Robert E. Chapman Office of Applied Economics (OAE) Building and Fire Research Laboratory National Institute of Standards and Technology (NIST).*

OAE's research focuses on developing economic tools to aid facility owners and managers in the selection of cost-effective strategies that respond to natural and man-made hazards.

Key Stakeholders and Programs

In this section we examine a set of interested parties and illustrate the types of programs that can be considered for reducing future losses and providing funds for recovery. By examining the perspectives of these individuals and groups, one can develop more effective risk management strategies for reducing potential losses from extreme events.

Property Owners

Owners of commercial and residential structures can choose from a range of risk management strategies to reduce losses. They can reduce their risk by retrofitting a structure to withstand wind or earthquake loading, transfer part of their risk by purchasing some form of insurance, and/or keep and finance their risk. They can also reduce their losses from natural disasters by adopting risk management plans.

The ways in which particular individuals decide to manage risk is often a function of their perceptions. As we discuss in Chapter 3, many homeowners do not take action even when the risk is abundantly clear and loss-reducing measures are available. It is often the case that many homeowners feel that a disaster will not affect them. A commercial property owner's risk perception and strategies to manage risk are different from those of residential owners. A commercial establishment must concern itself not only with life safety and insolvency issues, but also with the impact of a disaster on the operation of its business. Often there are extra expenses as a business tries to remain viable after a catastrophe. The company is additionally concerned about business interruption loss—the loss or reduction of income due to the suspension of operations resulting from a disaster. Business owners in hazard-prone regions are normally quite interested in purchasing coverage against this type of risk.

Insurers

An insurer provides protection to residential and commercial property owners for losses resulting from natural disasters. Losses due to damage from fires (resulting from lightning during thunderstorms) and wind (resulting from tornadoes and hurricanes) are covered by a homeowner's insurance policy, normally required by lenders as a condition for a mortgage. Loss due to water damage (resulting from floods) is covered under the National Flood Insurance Program (NFIP), a public-private partnership between the federal government and the insurance industry. Losses due to damage from ground movement (resulting from earthquakes and landslides) are covered by a policy endorsement or by a separate policy issued either by the

private sector or, in California, through a state-run, privately funded earthquake insurance company, the California Earthquake Authority (CEA).

Losses from natural disasters can have a severe impact on an insurer's financial condition. Therefore insurers want to limit the amount of coverage they provide to property owners in hazard-prone areas. An important concern for insurers is the concentration of risk. Those who cover a large number of properties in a single geographic area face the possibility of large losses should a natural disaster occur in the area. An insurer views a portfolio with this type of highly correlated (or interrelated) risks as undesirable. Subject to regulatory restrictions, an insurer limits coverage in any given area and/or charges higher premiums in order to keep the chances of insolvency at an acceptable level.

Other Private Sector Parties

Lenders play a vital role in managing risks of extreme events. Except for the uncommon case where the owner pays for property outright, banks and other financial institutions enable individuals in the United States to purchase a home or business by providing mortgages. The property is the collateral in the event that the owner defaults on the mortgage. Lenders thus have a vital stake in the risk management process, as they are unlikely to recover the full value of a loan on a piece of property destroyed by catastrophe.

Real estate agents, developers, engineers, contractors, and other service providers also play a supporting, yet important role in the management of risk from natural disasters. In hazard-prone regions, federal or state regulations require real estate agents to inform the new owner of potential hazards. Examples include the location of a home relative to an earthquake fault line or within a 100-year flood plain. Unfortunately, it is sometimes unclear how information on natural hazard risk is being used in the purchase process. A study of the impact of the California requirement that purchasers of residential property within a certain distance of a known earthquake fault be told about the hazard showed that most home buyers did not understand or recall the risk warning (Palm (1981)).

Engineers and contractors play a significant part in risk management in high hazard areas. Structures designed and built to high standards with inspections by reputable building officials can provide good protection against life and property loss in the next earthquake. Life and property loss are often attributable to inadequate design and construction practices. The problem of building and selling property in hazard-prone regions is exacerbated when disreputable building contractors bypass wind- and seismic resistant designs.

Government's Role

Federal, state, and local government often take the lead in managing risk from natural disasters. Policymakers at all levels of government have developed a set of programs for reducing risks from these disasters. In addition, they prioritize funding following a severe earthquake, flood, tornado, or other extreme events.

At the national level, the Federal Emergency Management Agency (FEMA) coordinates many of the planning and response aspects related to catastrophes. FEMA has historically taken the lead in developing strategies for mitigation. For example, in December 1995, the agency introduced a National Mitigation Strategy with the objective of strengthening partnerships between all levels of government and the private sector to ensure safer communities. This strategy was developed with input from state and local officials as well as individuals and organizations with expertise in hazard mitigation (FEMA (1997)). One of its key features was to create disaster-resistant communities through the Project Impact program. The program, begun in 1997, encouraged communities to "bring interested parties together to identify their potential natural hazards, assess the community's vulnerability, prioritize hazard risk reduction measures and communicate success to the residents" (FEMA (2000)). Over 250 communities have participated in Project Impact.

At the state level, an office of emergency services or a department of public safety promotes natural disaster preparedness. Additionally, seismic safety commissions have been established by earthquake-prone states to prioritize earthquake research and public policy needs. Building codes that include criteria for wind or earthquake resistance, and legislation for land use management, endeavor to reduce risk. Incentive programs have been instituted to reduce losses from disaster events, especially in hazard-prone states. A good example of such legislation is California's Proposition 127. Passed in November of 1990, the law states that seismic retrofitted improvements to property completed on or after January 1, 1991, and completed on or before July 1, 2000, will not increase the property tax for a homeowner until ownership changes. The state concluded that these improvements constitute such a significant reduction in the risks to life and safety, that they should be exempt from additional property tax.

At the local level, communities enforce building codes and have developed economic incentives, such as tax relief, for those who retrofit. Local communities have developed programs to promote awareness, provide training, and encourage self-help actions through neighborhood emergency response teams. The city of San Leandro, California has set priorities to retrofit both unreinforced masonry buildings and older wood-frame homes. The Home Earthquake Strengthening Program is a comprehensive, residential seismic strengthening program that provides homeowners with simple and cost-effective methods for strengthening their wood-frame houses for earthquake survival. The program includes earthquake-strengthening workshops for residents, a list of available earthquake contractors, as well as a tool-lending library for homeowners should they wish to do the work themselves.

OAE's research has produced a three-step protocol for developing a risk mitigation plan for optimizing protection of constructed facilities. This protocol helps decision makers assess the risk of their facility to damages from natural and man-made hazards; identify engineering, management, and financial strategies for abating the risk of damages; and use standardized economic evaluation methods to select the most cost-effective combination of risk mitigation strategies to protect their facility.

One may view the entire report by following the hyperlink to the referenced report above.
<http://www.bfrl.nist.gov/oe/publications/gcrs/04871.pdf>