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Reducing Losses From Catastrophes: Role of Insurance and Other Policy Tools

by Howard Kunreuther

We are in a new era of catastrophes. Worldwide, economic losses from natural catastrophes increased from $528 billion in the decade 1981–1990, to $1,197 billion during 1991–2000, and $1,213 billion during 2001–2010. In 2011 alone, economic losses amounted to over $400 billion, in large part due to the March 2011 Japan earthquake and resulting tsunami; 2012 brought another $170 billion in economic losses. Insured losses have dramatically increased as well. Between 1970 and the mid-1980s, annual insured losses from natural disasters worldwide (including forest fires) were only in the $3 billion to $4 billion range. Hurricane Hugo, which made landfall in Charleston, South Carolina, on September 22, 1989, was the first natural disaster in the United States to inflict more than $1 billion of insured losses, with insured losses of $4.2 billion (1989 prices). During the period 1980–1989, insured losses from disasters in
the United States averaged $9.1 billion annually (2014 prices), far less than during the period 2005–2014, when insured losses from disasters in the United States averaged $24.7 billion annually (2014 prices). Figure 1 depicts the evolution of the direct economic losses and the insured portion from great natural disasters over the period 1980–2014. The flood damage to South Carolina in the aftermath of Hurricane Joaquin in October 2015 is estimated to be more than $1 billion, with insured losses of at least $450 million to the private insurance industry and the National Flood Insurance Program.

In dealing with this new era of catastrophes, insurance is not effectively meeting two of its most important objectives:

- providing information to those residing in hazard-prone areas as to the nature of the risks they face.
- incentivizing those at risk to undertake loss reduction measures prior to a disaster.

When factory mutual insurance companies were formed in the mid-1800s, these were their two central goals. Inspections were undertaken prior to issuing an insurance policy and were continued on a regular basis after coverage was in force. High risks had their policies canceled; premiums reflected risk and were reduced for factories that instituted additional risk reduction measures. In many cases, factory mutual companies would provide coverage only to firms that adopted specific loss prevention methods. For example, one company, the Spinners Mutual, insured only factories where automatic sprinkler systems were installed.

This article proposes a strategy for using insurance coupled with other policy tools to take steps to return to its 19th-century roots in dealing with the risks facing property owners in hazard-prone areas. More specifically, I address the following question: What roles can the private insurance market and the public sector play in reducing losses from future natural disasters, recognizing the limitations of individuals and firms in dealing with low-probability, high-consequence (LP-HC) events and the challenges the insurance industry faces in providing coverage against these risks?

A street in New Orleans in the aftermath of Hurricane Katrina.
To answer this question it is helpful to understand why residents in hazard-prone areas often ignore future disasters, and how information can be presented in ways that they are more likely to pay attention to the hazard. To encourage investment in loss reduction measures, private insurance can be coupled with other policy tools. The public sector has a role to play by providing assistance to deal with affordability issues and offering financial protection to insurers against catastrophic losses.

Role of Intuitive and Deliberative Thinking in Dealing With Extreme Events

A large body of cognitive psychology and behavioral decision research over the past 30 years has revealed that individuals and organizations often make decisions under conditions of risk and uncertainty by combining intuitive thinking with deliberative thinking. In his thought-provoking book *Thinking, Fast and Slow*, Nobel Laureate Daniel Kahneman has characterized the differences between these two modes of thinking. *Intuitive thinking* (System 1) operates automatically and quickly with little or no effort and no voluntary control. It is often guided by emotional reactions and simple rules of thumb that have been acquired by personal experience. *Deliberative thinking* (System 2) allocate attention to effortful and intentional mental activities where individuals undertake trade-offs, and recognize relevant interdependencies and the need for coordination.

Choices are normally made by combining these two modes of thinking and generally result in good decisions when individuals have considerable past experience as a basis for their actions. With respect to low-probability, high-consequence events, however, there is a tendency to either ignore a potential disaster or overreact to a recent one so that decisions may not reflect expert risk assessments. For example, after a disaster, individuals are likely to want to purchase insurance even at high prices, while insurers often consider restricting coverage or even withdraw from the market. In these situations, both parties focus on the losses from a worst-case scenario without adequately reflecting on the likelihood of this event occurring in the future.

Empirical studies have revealed that many individuals engage in intuitive thinking and focus on short-run goals when dealing with unfamiliar LP-HC risks. More specifically, individuals often exhibit systematic biases such as the availability heuristic, where the judged likelihood of an event depends on its salience and memorability. There is thus a tendency to ignore rare risks until after a catastrophic event occurs. This is a principal reason why it is common for individuals at risk to purchase insurance only after a large-scale disaster. A study of the risk perception of homeowners in New York City revealed that they underestimated the likelihood of water damage from hurricanes. This may partially explain why only 20% of those who suffered damage from Hurricane Sandy had purchased flood insurance before the storm occurred.

Guiding Principles for Insurance

The following two guiding principles should enable insurance to play a more significant role in the management and financing of catastrophic risks.

**Principle 1—Premiums Should Reflect Risk**

Insurance premiums should be based on risk to provide individuals with accurate signals as to the degree of the hazards they face and to encourage them to engage in cost-effective mitigation measures to reduce their vulnerability. Risk-based premiums should also reflect the cost of capital that insurers need to integrate into their pricing to assure an adequate return to their investors.

Catastrophe models have been developed and improved over the past 25 years to more accurately assess the likelihood and damages resulting from disasters of different magnitudes and intensities. Today, insurers and reinsurers utilize the estimates from these models to determine risk-based premiums and how much coverage to offer in hazard-prone areas.

If Principle 1 is applied to risks where premiums are currently subsidized, some residents will be faced with large price increases. This concern leads to the second guiding principle.

**Principle 2—Dealing With Equity and Affordability Issues**

Any special treatment given to low-income individuals currently residing in hazard-prone areas should come from general public funding and not through insurance premium subsidies. It is important to note that Principle 2 applies only to those individuals who currently reside in hazard-prone areas. Those who decide to locate in these regions in the future would be charged premiums that reflect the risk.

**Strategies for Reducing Future Losses**

**Use of Choice Architecture**

If those residing in hazard-prone areas perceive the likelihood of losses to be below their threshold level of concern, they will have no interest in purchasing insurance or investing in loss reduction measures. One way to address this problem is to recognize that individuals’ decisions depend in part on how different options are framed and presented—that is, the use of choice architecture. In the context of LP-HC events, framing refers to the way in which likelihoods and outcomes of a given risk are characterized.

With respect to the likelihood dimension, people are better able to evaluate low-probability risks when these are presented via a familiar concrete context. For example, individuals might not understand what a one-in-a-million
risk means but can more accurately interpret this figure when it is compared to the risk of an automobile accident (1 in 20) or lightning striking your home on your birthday (less than one in a billion).

Probability is more likely to be a consideration if it is presented using a longer time frame. People are more willing to wear seat belts if they are told they have a 1-in-3 chance of an accident over a 50-year lifetime of driving, rather than a 1-in-100,000 chance of an accident on each trip they take. Similarly, a homeowner or manager considering flood protection over 25-years is far more likely to take the risk seriously if told that the chance of at least one severe flood occurring during this time period is greater than 1 in 5, rather than 1 in 100 in any given year.

Another way to frame the risk so that individuals pay attention is to construct a worst-case scenario. Residents in hazard-prone areas who learn about the financial consequences of being uninsured if they were to suffer severe damage from a flood or earthquake would have an incentive to purchase insurance coverage and may refrain from canceling their insurance even if they have not made a claim for a few years.

**Means-Tested Vouchers**

Individuals at risk may be reluctant to invest in cost-effective loss reduction measures when these involve a high up-front cash outlay. Given budgetary constraints and individuals’ focus on short time horizons, it is difficult to convince them that the expected discounted benefits of the investment over the expected life of the property exceeds the immediate up-front cost. Decision makers’ resistance is likely to be compounded if they perceive the risk to be below their threshold level of concern.

Residents in hazard-prone areas may also be concerned that if they move in the next few years, the property value of their home will not reflect the expected benefits from investing in loss reduction measures because the new owner will not be concerned about the risk of a disaster.

One way to maintain risk-based premiums while at the same time addressing issues of affordability is to offer means-tested vouchers that cover part of the cost of insurance. Several existing programs could serve as models for developing such a voucher system: the Food Stamp Program, the Low Income Home Energy Assistance Program (LIHEAP), and the Universal Service Fund (USF). The amount of the voucher would be based on current income and determined by a specific set of criteria as outlined by the National Research Council. If the property owners were offered a multiyear

*Flooding is one of many environmental hazards facing some communities today.*
A woman walks among building ruins in the aftermath of a large earthquake in Nepal.
loan to invest in mitigation measure(s), the voucher could cover not only a portion of the resulting risk-based insurance premium, but also the annual loan cost to make the package affordable. As a condition for the voucher, the property owner could be required to invest in mitigation.

An empirical study of homeowners in Ocean County, New Jersey, reveals that the amount of the voucher is likely to be reduced significantly from what it would have been had the structure not been mitigated, as shown in Figure 2 for property in a 100-year coastal hazard flood area (the V Zone) and a 100-year inland hazard area (the A Zone).  

**Well-Enforced Building Codes**

Risk-based insurance premiums could be coupled with building codes so that those residing in hazard-prone areas adopt cost-effective loss-reduction measures. Following Hurricane Andrew in 1992, Florida reevaluated its building code standards, and coastal areas of the state began to enforce high-wind design provisions for residential housing. As depicted in Figure 3, homes that met the wind-resistant standards enforced in 1996 had a claim frequency that was 60% percent less than homes that were built prior to that year. The average reduction in claims from Hurricane Charley to each damaged home in Charlotte County built according to the newer code was approximately $20,000.  

Homeowners who adopt cost-effective mitigation measures could receive a seal of approval from a certified inspector that the structure meets or exceeds building code standards. A seal of approval could increase the property value of the home by informing potential buyers that damage from future disasters is likely to be reduced because the mitigation measure is in place. Evidence from a July 1994 telephone survey of 1,241 residents in six hurricane-prone areas on the Atlantic and Gulf coasts provides supporting evidence for some type of seal of approval. More than 90% of the respondents felt that
local home builders should be required to adhere to building codes, and 85% considered it very important that local building departments conduct inspections of new residential construction [Insurance Institute for Property Loss Reduction (1995)].

Multiyear Insurance

Insurers could consider designing multiyear insurance (MYI) contracts of three to five years with the policy tied to the structure rather than the property owner. The annual risk-based premium would remain stable over the length of the contract. Property owners who cancel their insurance policy early would incur a penalty cost in the same way that those who refinance a mortgage have to pay a cancellation cost to the bank issuing the mortgage. Insurers would have an increased incentive to inspect the property over time to make sure that building codes are enforced, something they would be less likely to do with annual contracts. For a private insurer to want to offer multiyear coverage, there needs to be sufficient demand to cover the fixed and administrative costs of developing and marketing the product.

A Web-based experiment revealed that a large majority of the responders preferred a 2-year insurance contract over two 1-year contracts and increased the aggregate demand for disaster insurance.

Features of a Private–Public Partnership for Insuring LP-HC Events

The history of flood insurance provides guidelines for developing a public-private partnership for insuring extreme events. Following the severe Mississippi River floods of 1927 no private insurer offered flood coverage, thus leading to the formation of the federally run National Flood Insurance Program (NFIP) in 1968.

To market coverage against the flood risk, private insurers need the partnership of the public sector to deal with issues of affordability and catastrophic losses, and develop standards and regulations that will be well enforced. Such a program for residential property in flood-prone areas would include these features:

- Risk-based premiums, using accurate hazard maps and damage estimates, would give private insurers an incentive to market coverage.
- Means-tested vouchers to address the affordability issue would be

![Figure 2. Cost of Program to the Federal Government and a Hypothetical Homeowner](image)

![Figure 3. Average Claim Severity by Building Code Category From Hurricane Charley](image)
provided by the public sector to those who undertook cost-effective mitigation measures.

- Premium discounts would be given to homeowners to reflect the reduction in expected losses from undertaking cost-effective mitigation measures. Long-term loans for mitigation would encourage these investments.
- Well-enforced building codes and seals of approval would provide an additional rationale to undertake these loss-reduction measures. Land-use regulations could restrict property development in high hazard areas.
- A multiyear insurance (MYI) policy with stable annual premiums tied to the property would prevent policymakers from canceling their policies.
- Private reinsurance and risk-transfer instruments marketed by the private sector would cover a significant portion of the catastrophic losses from future disasters.
- Federal reinsurance would be provided to insurers so they are protected against extreme losses.

The benefits of this proposed program would be significant: less damage to property and potentially higher property values, lower costs and peace of mind to homeowners knowing they are protected against future disasters, more secure mortgages for banks and financial institutions, and less disaster relief assistance by the public sector borne by the general taxpayer.

The NFIP that comes up for renewal in 2017 provides a target of opportunity for taking steps to move in the direction of a more effective public-private partnership.

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**NOTES**


