



## **Congressional Testimony**

### **A Proposal to Make America More Resilient to Natural Disasters and Reduce the Federal Government's Financial Liability**

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July 28, 2011

Hearing before the Senate Appropriations Subcommittee on Financial Services  
and General Government on:

“Federal Disaster Assistance Budgeting: Are We Weather-Ready?”

Thursday, July 28<sup>th</sup> - Room SD-138 - Dirksen Senate Office Building – Washington, DC

## **Chairman Durbin and Ranking Member Moran:**

We are very pleased that you are holding this hearing to examine the costs to the federal government associated with natural disasters and steps that could be taken to reduce those costs. We agree that this is an increasingly important subject to understand and address. We, Howard Kunreuther and Erwann Michel-Kerjan, have conducted considerable research in these areas at the Center for Risk Management and Decision Processes of The Wharton School at the University of Pennsylvania. It is a pleasure to share our observations and recommendations with you.

### ***Natural Disasters Impose Severe Economic Losses***

In recent years we have witnessed a dramatic increase in the economic cost and death toll from hurricanes, earthquakes, floods and other natural disasters worldwide. Economic losses from these catastrophic events increased from \$528 billion (1981-1990) to over \$1.2 trillion over the period 2001-2010.<sup>i</sup>

Although we are only halfway through 2011, an exceptional number of very severe natural catastrophes, notably the Japan earthquake and tsunami, makes 2011 the highest economic loss year on record. In the United States, the southern and midwestern states were hit by an exceptionally severe series of tornadoes in April and May. Around this time, heavy snowmelt, saturated soils, and over 20 inches of rain in a month led to the worst flooding of the lower Mississippi River since 1927 with extensive agricultural damage, property, and inland marine losses. The U.S. National Hurricane Center at NOAA forecast in May that the 2011 hurricane season would have above-average activity in the Atlantic basin.<sup>ii</sup>

Given the increasing losses from natural disasters in recent years, it is surprising how few property owners in hazard-prone areas have invested in loss reduction measures. We propose a program that will address this issue directly and hence reduce the need for federal disaster assistance in the future.

### **Why Are Disaster Losses Increasing?**

There are at least two principal socio-economic factors that directly influence the level of economic losses due to catastrophe events: exposed population and value at risk. The economic development of Florida highlights this point. According to the U.S. Bureau of the Census, the population of that state has increased significantly over the past 50 years: 2.8 million inhabitants in 1950, 6.8 million in 1970, 13 million in 1990, and 18.8 million population in 2010 (almost a 570 percent increase since 1950). A significant portion of that population increase lives in high hazard areas of the coast. There is thus an increased likelihood of severe economic and insured losses in Florida unless cost-effective mitigation measures are implemented. Recent climate studies indicate we should also expect more extreme weather-related events in the future.<sup>iii</sup> The questions that need to be addressed directly by Congress and

other interested parties are:

- Who will pay for these massive losses?
- What actions need to be taken now so our country is more resilient when these disasters occur (as they will) in the future?

### **Increasing Role of Federal Disaster Assistance**

Not surprisingly, the disasters that occurred in now much more populated areas of the United States have led to historical levels of insurance claim payments<sup>iv</sup> as well as a surge in the number of Presidential disaster declarations. In an article published last week in *Science* about reforming the federally-run National Flood Insurance Program (NFIP), we showed that the number of major disaster declarations increased from 252 over the period 1981-1990, to 476 (1991-2000) and 597 over the period 2001-2010. In 2010 alone there were 81 such major disaster declarations.<sup>v</sup>

American taxpayers paid \$89 billion in relief in the aftermath of the 2005 hurricane season (2010 prices). This figure was actually greater than the combined amount that private insurers and reinsurers paid for wind-related insured losses due to Hurricanes Katrina, Rita and Wilma.<sup>vi</sup> This more pronounced role of the federal government in assisting disaster victims can also be seen by examining several major disasters that occurred in the past 50 years as shown in the table below.<sup>vii</sup>

Disaster	Federal aid as % of total damage
Hurricane Ike (2008)	69%
Hurricane Katrina (2005)	50%
Hurricane Hugo (1989)	23%
Hurricane Diane (1955)	6%

Each new massive government disaster relief program creates a precedent. As a result, not only are there expectations when a disaster strikes that governmental assistance is on the way, but in order to gain politically from their actions, members of Congress are likely to support bills that authorize more aid than for past disasters. If residents of hazard-prone areas expect more federal relief following future disasters, they then have less economic incentive to reduce their own exposure and/or purchase insurance.

### **Reducing Exposure to Losses from Disasters**

Today, we can more accurately estimate the risks that different communities and regions face from natural hazards. We are able to reduce potential disaster losses through mitigation measures and know that insurance can provide financial protection to those in harm's way, thus lowering the financial burden on taxpayers and increasing personal responsibility. Yet many residents in hazard-prone areas are still unprotected against earthquakes, floods, hurricanes and tornados.

We address the following question:

***How do we reduce the exposure of property to losses from natural disasters and hence reduce the need for disaster assistance following future catastrophes?***

We first focus on *why* many residents in hazard-prone areas do not protect themselves against disasters (which often starts with their moving to high-risk areas) (***a behavioral perspective***). We then propose a course of action that overcomes these challenges (***a policy perspective***). Specifically, we believe that multi-year disaster insurance contracts tied to the property and combined with risk reduction loans will lead many more individuals to invest in protection and thus be in a much better financial position to recover on their own following the next disaster. The proposed program should thus reduce the need for disaster assistance and be a win-win situation for all the relevant stakeholders compared to the status quo. Current energy efficiency programs can serve as a model for our proposal.

***Why Individuals Do Not Protect Themselves against Potential Disasters<sup>viii</sup>***

There is growing empirical evidence from psychology and behavioral economics that many decision makers ignore the potential consequences of large-scale disasters for the following reasons:

- *Misperceptions of the risk.* We often underestimate the likelihood of natural disasters by treating them as below our threshold level of concern. By failing to create scenarios in which a flood or earthquake may plausibly occur, there is no interest in undertaking protective actions such as purchasing insurance or investing in loss reduction measures.
- *Ambiguity of experts.* There are sometimes differences in experts' estimates of the likelihood and consequences of low probability events caused by limited historical data, scientific uncertainty, changing environmental conditions due to increased development and/or the use of different risk models. The variance in risk estimates creates confusion by the general public, government entities and businesses as to whether one needs to pay attention to this risk. In fact, decision makers often utilize estimates from their favorite experts that provide justifications for their proposed actions.
- *Short horizons for valuing protective measures.* Many businesses and households project only a few years ahead (if not just months) when deciding whether to spend money on loss-reduction measures such as anchoring their roofs to reduce hurricane damage. By focusing on the short-term returns, they fail to invest in risk-reducing measures that could be justified financially when comparing costs and expected returns over the expected life of the property. In other words, cost-effective mitigation measures are often disregarded due to myopic behavior.
- *Procrastination.* If given an option to postpone an investment for a month or a year, there will be a tendency to delay the outlay of funds. When viewed from a temporal distance the investment will always seem worthwhile, but when it comes time to undertaking the work, the prospect of a slight delay always seems more attractive. Moreover, the less certain one is

about a correct course of positive action, the more likely one is to choose inaction. There is a tendency to favor the *status quo* – to not change whatever one is doing now.

- *Mistakenly treating insurance as an investment.* Individuals often do not buy insurance until after a disaster occurs and then cancel their policies several years later because they have not collected on their policy. They perceive insurance to be a bad investment by not appreciating the adage that the “best return on an insurance policy is no return at all.”
- *Failure to learn from past disasters.* There is a tendency to discount past unpleasant experiences. Emotions run high after experiencing a catastrophic event or even viewing it on TV or the Internet. But those feelings fade rapidly, making it difficult to recapture these concerns about the event as time passes.
- *Mimetic blindness.* Decision makers often imitate the behavior of others without analyzing whether the action is appropriate for them. By looking at what other firms do in their industry, or pursuing the actions of their friends and neighbors, decision makers can avoid having to think independently.

In addition to these behavioral biases, there are economically rational reasons as to why firms and individuals in hazard-prone areas do not undertake risk-reduction measures voluntarily. Consider the hypothetical *Safelee* firm in an industry in which its competitors do not invest in loss prevention measures. *Safelee* might understand the investment can be justified when considering how it reduces the risks and consequences of a future disaster. However, during normal times, the firm might be at a competitive disadvantage because it cannot match the cost structure of its competitors. The behavior of many banks in the years preceding the financial crisis of 2008-2009 is illustrative of such a dynamic.

Families considering whether to invest in disaster prevention may also find the investment to be unattractive financially if they plan on moving in a few years and if they believe that potential buyers will not take into account the lower risk of a disaster loss when deciding how much they are willing to pay for the property. More generally, families might have other rational reasons for not purchasing disaster coverage or investing in risk reduction measures when this expense competes with other needs that have to be satisfied with a limited budget (living expenses, education, taxes, other insurance coverage, etc.). This aspect has more significance today given the current economic situation the country faces and the high level of unemployment.

### ***The Key Role of Insurance***

Our proposed program for reducing disaster losses and the need for the government to provide assistance to the affected communities directly addresses these behavioral concerns by providing incentives for people and firms to become more resilient. Insurance can play a central role by doing three things. First, if priced appropriately, insurance provides a signal of the risk an individual or a firm faces in their current location. Second, insurance can encourage property owners in hazard-prone areas to invest in mitigation measures by providing them with premium reductions to reflect the expected reduction in losses from future disasters. Third, insurance supports economic resiliency: following a disaster an insured individual or firm can make a claim

to obtain funds to help pay for the loss caused by the catastrophe and get back on their feet much more quickly than if they were forced to rely on federal disaster assistance.

For insurance to play this role, in combination with other programs involving the public and private sectors, we feel it is important that the following two guiding principles<sup>ix</sup> be adhered to:

***Principle 1: Premiums should reflect risk.*** Insurance premiums should be based on risk in order to provide signals to individuals about the hazards they face and to encourage them to engage in cost-effective mitigation measures that reduce their vulnerability to catastrophes. Risk-based premiums should also reflect the cost of capital that insurers must integrate into their pricing in order to meet solvency requirements from rating agencies and insurance regulators, and to also assure adequate return to their investors.

Risk-based premiums will provide a clear signal of likely damage to those currently residing in hazard-prone areas as well as those considering locating there. Risk-based premiums also enable insurers to provide discounts to homeowners and businesses that invest in cost-effective mitigation measures. If insurance premiums are not risk-based, insurers are unlikely to offer any premium discounts for those who adopt mitigation measures. In fact, they often prefer not to offer coverage to these property owners because it will be a losing proposition in the long run.

***Principle 2: Equity and affordability issues should be addressed.*** This principle reflects a concern for some residents in high-hazard areas who will be faced with large premium increases based on Principle 1. However, any special treatment given to homeowners currently residing in hazard-prone areas (e.g., low-income uninsured or inadequately insured homeowners) should be funded through an *insurance voucher* not through premium subsidies (as is often done today).

The offer of insurance vouchers applies only to needy individuals who *currently reside* in a hazard-prone area. Those deciding to move into the area in the future should be charged premiums that reflect the risk. If they were provided with financial assistance to purchase insurance, this would encourage development in hazard-prone areas and exacerbate the potential for catastrophic losses from future disasters.

### ***Our Proposal: A Multi-year Insurance-Risk Reduction Loan Program***

Given the behavioral biases and budget constraints individuals face, we propose that insurance and other protective measures be tied to the property rather than the property owner. We recommend the following five features of such a program using the two guiding principles for insurance as a basis for its design:

1. *Multi-year insurance tied to property.* When an individual or businesses purchases a piece of property, they should have an opportunity to purchase a multi-year insurance contract (for example, 5 years) at a fixed annual premium that reflects the

risk. At the end of the multi-year contract, the premium could be revised to reflect changes in the risk (higher or lower).

2. *Vouchers for those needing special treatment.* We recommend a new disaster insurance voucher program to address issues of equity and affordability to complement the strategy of risk-based premiums for all. Property owners currently residing in a risky area who require special treatment would receive a voucher by the Federal Emergency Management Agency (FEMA) or the U.S. Department of Housing and Urban Development (HUD) as part of its budget or through special appropriation. This program would be similar to the Supplemental Nutrition Assistance Program (“food stamps”) and the Low Income Home Energy Assistance Program, which in the United States enables millions of low-income households to meet their food and energy needs every year. The size of the voucher will be determined through a means-test in much the way that distribution of food stamps is determined today.
3. *Required insurance.* Since individuals tend to treat insurance as an investment rather than a protective mechanism, it may have to be a requirement for property located in hazard-prone areas, given the large number of individuals who do not have coverage today.

There is empirical evidence supporting the third feature of the proposed program. Data from the Department of Housing and Urban Development (HUD) reveal that 41 percent of damaged homes from the 2005 hurricanes were uninsured or underinsured. Of the 60,196 owner-occupied homes with severe wind damage from these hurricanes, 23,000 did not have insurance against wind loss.<sup>x</sup> We recently undertook an analysis of all new flood insurance policies issued by the National Flood Insurance Program (NFIP) over the period January 1, 2001 to 31 December 2009 and found that the median length of time before these new policies lapsed is three to four years. On average, only 74% of new policies were still in force one year after they were purchased; after five years, only 36% were still in place. The lapse rate is still high after correcting for migration and does not vary much across flood zones.<sup>xi</sup>

4. *Multi-year loans for mitigation.* To encourage adoption of loss reduction measures, state or federal government or commercial banks could issue property improvement loans so as to spread the costs over time. For instance, a property owner may be reluctant to incur an upfront cost of \$1,500 for making his home more disaster resistance but would be willing to pay the \$145 annual cost of a 20 year loan (calculated here at a high 10% annual interest rate). In many cases the reduction in the insurance premium due to lower losses from disasters will be greater than the loan cost making this investment financially attractive.
5. *Well-enforced building codes.* Given the reluctance of property owners to invest in mitigation measures voluntarily, building codes should be designed to reduce future disaster losses and be well-enforced through third party inspections or audits.

## ***Lessons from an Energy Efficiency Program***

As we think about developing incentives for disaster reduction, the Property Assessed Clean Energy (PACE) program that has been adopted by 27 states for promoting energy efficiency has features that can provide insights into designing the above program.

PACE provides long term funding from private capital markets at low cost and needs no government subsidies or taxes. It raises property values by making heating and cooling less expensive, and it enjoys broad bipartisan support nationwide at state and local levels. Here are the features of the program that encourage property owners to take measures today to make their home more energy efficient in ways that mirrors how property owners would want to make their homes more disaster resistant:

*Multi-year financing.* Interested property owners opt-in to receive financing for improvements that is repaid through an assessment on their property taxes for up to 20 years. PACE financing spreads the cost of energy improvements such as weather sealing, insulation, energy efficient boilers and cooling systems, new windows, and solar installations over the expected life of these measures and allows for the repayment obligation to transfer automatically to the next property owner if the property is sold. PACE solves two key barriers to increased adoption of energy efficiency and small-scale renewable energy: high upfront costs and fear that project costs won't be recovered prior to a future sale of the property.

*Annual savings.* Because basic energy efficiency measures can cut energy costs by up to 35%, annual energy savings will typically exceed the cost of PACE assessments. The upfront cost barrier actually turns into improved cash flow for owners in much the same way that the reduction of annual insurance premiums could exceed the annual loan costs.

*Transfer to new property owner.* Like all property-based assessments, PACE assessments stay with a property upon sale, until they are fully repaid by future owners who continue to benefit from the improvement measures.

## ***We Need to Act Now***

Our country has entered a new era of catastrophes.<sup>xii</sup> Our exposure is growing and the damage from disasters over the next few years is likely to be more devastating than what we have experienced during this past decade. When the next catastrophe occurs, the federal government will very likely come to the rescue, again. If the public sector's response to recent disasters is an indicator of their future behavior, new records will be set with respect to federal assistance.

In order to avoid this outcome we recommend that the appropriate government bodies undertake an economic analysis of the benefits and costs of the proposed *multi-year insurance-risk reduction loan program* in relation to the current system of private and public insurance and federal disaster assistance.

We have recently proposed a program along the above lines in the context of the reform of the National Flood Insurance Program (NFIP) which is set to expire by September 30 2011.<sup>xiii</sup>

We applaud the U.S. Senate for conducting this hearing on long-term exposure of the federal government to weather-related risks. We look forward to continuing to work with key stakeholders on these critical issues.

## *Endnotes and references*

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<sup>i</sup> Data from Munich Re and Swiss Re.

<sup>ii</sup> NOAA hurricane outlook indicates an above-normal Atlantic season (2011). Available at: [http://www.noaanews.noaa.gov/stories2011/20110519\\_atlanticchurricaneoutlook.html](http://www.noaanews.noaa.gov/stories2011/20110519_atlanticchurricaneoutlook.html). May 19, 2011.

<sup>iii</sup> P. C. D. Milly, Julio Betancourt, Malin Falkenmark, Robert M. Hirsch, Zbigniew W. Kundzewicz, Dennis P. Lettenmaier, and Ronald J. Stouffer, *Science* 319, 573 (2008); Knutson, T., J. McBride, J. Chan, K. Emanuel, G. Holland, C. Landsea, I. Held, J. Kossin, A. K. Srivastava & M. Sugi. Tropical Cyclones and Climate Change. *Nature Geoscience* 3, 157-163. (2010).

<sup>iv</sup> See H. Kunreuther and E. Michel-Kerjan (2009), *At War with the Weather* MIT Press, for a detailed analysis.

<sup>v</sup> E. Michel-Kerjan and H. Kunreuther (2011). Reforming Flood Insurance. *Science* 333, 408-409, July 22.

<sup>vi</sup> The figure does not include the \$17 billion paid by the NFIP for flood insurance claims for Hurricane Katrina, most of which had to be borrowed from the U.S. Treasury.

<sup>vii</sup> E. Michel-Kerjan and J. Volkman-Wise (2011). The Risk of Ever-Growing Disaster Relief Expectations. Wharton Risk Center Working Paper #2011-09. Available at <http://opim.wharton.upenn.edu/risk/papers.php>

<sup>viii</sup> The material in this section is based on Kunreuther and Michel-Kerjan (2010) "Overcoming Myopia" *Milken Review*, Fourth Quarter, pp. 48-57. More detail on these behavioral biases appears in Kunreuther, Meyer and Michel-Kerjan (in press). "Overcoming Decision Biases to Reduce Losses from Natural Catastrophes". In E. Shafir (ed.) *Behavioral Foundations of Policy*. Princeton, NJ: Princeton University Press.

<sup>ix</sup> More details on these principles appear in H. Kunreuther and E. Michel-Kerjan, *At War with the Weather* (MIT Press), (2009).

<sup>x</sup> U.S. Government Accountability Office (GAO) (2007), *Natural Disasters: Public Policy Options for Changing the Federal Role in Natural Catastrophe Insurance*, Washington, DC: GAO, November. GAO-08-7.

<sup>xi</sup> E. Michel-Kerjan, S. Lemoyne and H. Kunreuther (in press). Policy Tenure under the National Flood Insurance Program. *Risk Analysis: An International Journal*.

<sup>xii</sup> The White House (2007). *Economic Report of the President*. Washington, DC.

<sup>xiii</sup> E. Michel-Kerjan and H. Kunreuther (2011). Reforming Flood Insurance. *Science* 333, 408-409, July 22.