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Risk Management REVIEW



RISK MANAGEMENT AND DECISION PROCESSES CENTER
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Strengthening Activities on a Global Scale

Economic losses from the 175 natural disasters in 2011 were more than US\$370 billion – the highest ever. The Japan earthquake, tsunami and nuclear power plant accident in March 2011 caused over US\$225 billion in economic losses (not including nuclear-related damage) and was responsible for an estimated 19,000 deaths. Tropical Storm Washi in the Philippines and floods in Brazil and Thailand caused more than 3000 deaths. Ripple effects on supply chains worldwide were significant, confirming the necessity to better understand the interdependencies of risks on a global scale.

The interconnectedness of risks across industries and regions of the world increasingly makes managing and mitigating risks more complicated for countries and organizations. There is a growing need to not only map global risks but also to monitor them, identify ways to mitigate them and develop tools and services to aid stakeholders in understanding their vulnerabilities, prioritizing investments and enhancing their capacity for resiliency.

The Wharton Risk Center's work on global risk management has highlighted the importance of understanding how global disasters impact the public and private

sectors, with an aim to promote improved resilience.

As part of a multi-year project supported by the **Travelers Foundation**, the Risk Center and the Wharton Leadership Center is conducting interviews with chief executives and risk officers at S&P 500 firms to determine how they manage catastrophic risks. This research will help to formulate effective practices for dealing with adverse events (see page 16).

The Risk Center has deepened its partnership with the **World Economic Forum (WEF)**. Our two organizations are now working more closely to facilitate research for the annual **Global Risks Report** (see page 18) to aid decision makers in businesses and governments in developing strategies for managing complex risks.

Through the joint hire of a Senior Economist / Research Fellow (see profile of Karen Campbell on page 20), the WEF and the Risk Center are collaborating on the newly formed **Risk Response Network (RRN)** (<http://www.weforum.org/community/risk-response-network>). The RRN is gathering information from diverse sectors and regions to develop and share new approaches for managing the complex risks that leaders face and creating a

deeper understanding of resilience in the context of global interdependence.

Low- and middle-income countries have suffered disproportionately more economic and human losses from disasters. The Risk Center's research on [Evaluating Disaster Risk Reduction Investments in Developing Countries](#) with the **World Bank** has undertaken a cost-benefit analysis of mitigation measures in highly exposed regions in the developing world where financial coverage is limited.

Building on this work, Howard Kunreuther and Erwann Michel-Kerjan's paper for the Copenhagen Consensus 2012 on [Policy Options for Reducing Losses from Natural Disasters: Allocating \\$75 billion](#) undertook cost-benefit analyses of four innovative proposals to mitigate damage to property and fatalities from natural hazards in over 50 developing countries. This complements earlier work by the Risk Center team with the **United Nations Bureau of Crisis Management**.

Through its portfolio of activities, the Risk Center will continue to expand its work on global risk to develop and implement strategies that stakeholders can use to assess and mitigate their vulnerability and help stimulate innovation and economic growth.

Assessing the Feasibility of a U.S. Private Market for Flood Insurance

by Jeffrey Czajkowski, Wharton Risk Center Willis Re Fellow, jczaj@wharton.upenn.edu

There may be opportunities for private insurers to profitably reenter the flood insurance market charging risk-based premiums incorporating catastrophic flood losses.

In July 2012, President Barack Obama signed into law a five-year extension of the National Flood Insurance Program (NFIP). The Biggert-Waters Flood Insurance Reform and Modernization Act of 2012 extends NFIP funding to September 2017 and calls for an assessment of options and strategies for privatizing the NFIP, as well as consideration of the inclusion of catastrophic loss years in determining chargeable premiums.

Groundwork on these issues is provided in the Wharton Risk Center's report, [*A Methodological Approach for Pricing Flood Insurance and Evaluating Loss Reduction Measures: Application to Texas*](#) (January 2012).

Our study performs a quantitative analysis of private residential flood risk utilizing a catastrophe risk model to ascertain the probabilistic flood risk at the single-family residence level, and compares the resulting risk-based premiums with those currently charged by the NFIP. Our findings indicate there may be opportunities for private insurers to profitably reenter the flood insurance market by charging risk-based premiums that incorporate potential catastrophic flood losses.

In the United States, coverage for flood damage is explicitly excluded in homeowners' insurance policies. Flood insurance is available through the fed-

erally-managed NFIP, begun in 1968 in response to private insurers' contention that the peril was uninsurable due to adverse selection, the possibility of massive losses, and concerns about their inability to correctly price the product because of limitations in hazard assessment. Today, however, improved technology in risk assessment could make it possible for private firms to reenter the flood insurance market in the United States.

Using state-of-the-art probabilistic catastrophe models by CoreLogic and Swiss Re, we calculated the risk-based flood insurance pure premium – defined as the expected average annual loss over 10,000 model years across thousands of possible scenarios – for more than 300,000 residences in Galveston and Travis Counties in Texas.

Texas was a natural choice for the study because it has the second highest number of NFIP policies-in-force of all states in the nation (Florida has the highest) and is exposed not only to significant riverine flooding but also to storm-surge related flooding from hurricanes.

We find firstly substantial variation in flood exposure (and hence risk-based pure premiums) between coastal and inland locations within FEMA-designated zones of similar risk classification. For instance, residences in the moderate risk (X500/B) zones in Galveston are exposed to a flood risk 2.5 times greater on average than residences in the similarly classified moderate risk (X500/B) zones in Travis. Second, the range of average values between high- and low-risk are found

FEMA Flood Zone	Travis County	Galveston County
V: High Risk Coastal Areas Coastal areas with a 1% or greater chance of flooding and additional hazard associated with storm waves. These areas have a 26% chance of flooding over the life of a 30-year mortgage.	N/A	\$6.60
A: High Risk Areas Areas with a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage.	\$5.51	\$6.31
X500/B: Moderate Risk Areas Areas of moderate flood hazard, in the range between 100-year and 500-year floods.	\$1.69	\$4.21
X/C: Minimal Risk Areas Areas of minimal flood hazard, usually above 500-year floods.	\$0.07	\$1.64

BASED ON THE PROBABILISTIC MODEL, FLOOD RISK ACROSS IDENTICALLY LABELED FLOOD ZONES IS HIGHER ON AVERAGE IN GALVESTON COUNTY THAN IN TRAVIS COUNTY. THE TABLE SHOWS THE RISK-BASED PURE PREMIUMS FOR THE MEAN AVERAGE ANNUAL LOSS PER \$1000 OF EXPOSURE IN EXISTING FEMA DESIGNATED FLOOD RISK ZONES IN TRAVIS AND GALVESTON.

to be much wider in Travis than in Galveston. Third, FEMA characterizes only an average flood risk in a given zone without indicating the variance across properties, which we find can be very high.

Finally, our analysis indicates a significant amount of storm-surge exposure in Galveston County zones outside of the FEMA-designated storm-surge risk zones. Thus, FEMA tends to undercharge policyholders for that coverage — historically a large source of flood claims in Galveston — because storm surge is not incorporated into rates in these areas. These findings highlight the importance of a probabilistically-based microanalysis of the exposure of residents to riverine flood and storm surge to determine the true flood risk.

We next compared the current NFIP premiums (from the database that FEMA provided to the Wharton Risk Center) with the pure premiums generated by the CoreLogic and Swiss Re probabilistic flood models. We find that relative to the probabilistic flood model results, the current unloaded NFIP premiums are “too low” in some areas and “too high” in others. For example, in Travis County, the NFIP on average underprices the risk in A zones and overprices the risk in X500 and X zones relative to the model results.

There are several possible reasons for these findings. First, many FEMA flood maps are outdated (due mainly to limited resources at their disposal) and do not indicate the current flood risk. Also, while the NFIP calculates rates for a variety of floodplains within the high-risk A and V zones, the final elevation based rates are set for each flood zone for the nation as a whole. Furthermore, rates for low- and

moderate-risk zones are derived from the high-risk modeled rates rather than their own distinct local flood risk maps. This pricing strategy leads to cross-subsidizations in the program. Rates are not risk-based at the local level (as probabilistically defined), so prices will be “too low” in some areas and “too high” in others.

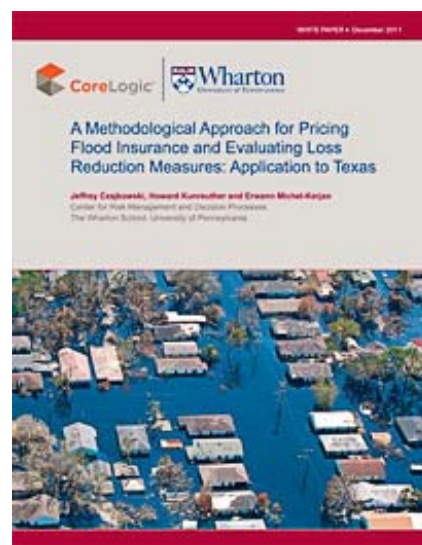
There are thus opportunities for the insurance industry, especially in the existing FEMA-defined low-risk areas, to market insurance at lower rates than the NFIP. This finding is supported even when taking into consideration the additional amounts that private insurers would charge if they applied a loading cost of 50, 100, 200, and 300 percent to reflect expenses such as cost of capital, and dividends to their shareholders. In areas where the NFIP overprices the risk on average relative to findings from the probabilistic model such as the Travis County X500 and X zones and the Galveston County V zones, we find that a loading factor of 200 percent must be applied for private insurers to charge more than the NFIP.

In instances where an insurer has a relatively small loading cost, there are targets of opportunity for that insurer to actively sell flood insurance today. This could increase take-up rates and ensure more individuals are effectively covered against floods.

Of course, the decision by primary insurers to sell flood insurance also depends on other factors that have not been studied here, such as their ability to charge rates reflecting risk in a highly regulated market and the possible correlation or diversification of flood risk with wind exposure from hurricanes and other risks in an insurer’s portfolio. Addressing these issues forms the basis for future re-

search on how private insurers could be more active in providing flood coverage as a complement to the NFIP.

In conclusion, this report provides the first systematic analysis of the potential for private flood insurance to complement the current NFIP operation. We have disseminated these findings widely including keynotes and presentations at **FEMA’s 2012 National Flood Conference**, the **Intermediaries and Reinsurance Underwriters Association**, the **National Association of Insurance Commissioners**, the **National Flood Determination Association**, **Reinsurance Association of America**, the **Center for Insurance Policy and Research**, and briefings at **Congress** and the **White House’s Office of Management and Budget** as stakeholders examine ways to reform the flood insurance program and reconsider the role that the private sector can play in reducing America’s exposure to future floods.



“A Methodological Approach for Pricing Flood Insurance and Evaluating Loss Reduction Measures: Application to Texas” is available on the Risk Center’s website at: http://opim.wharton.upenn.edu/risk/library/WhartonRiskCenter_TexasFloodInsurancePricingStudy.pdf

The Affordability Challenge: National Flood Insurance Program

By Krishna Kaliannan, Julie Shen and Ashima Sukhdev

The **Congressional Research Service**, Library of Congress, sponsored a **Capstone Program** with the Wharton Risk Center in 2011-2012. The project was managed by Rawle King, Specialist in Financial Economics and Risk Assessment, with funding provided by the CRS Director's office.

This article summarizes findings by three students who pursued this research under the supervision of Professors Howard Kunreuther and Erwann Michel-Kerjan as part of an independent study project. Findings were presented to senior directors of the Congressional Research Service and congressional staffers in the Library of Congress in Washington, DC in May 2012.

After the turbulent 2005 Atlantic hurricane season and Hurricane Ike in Texas in 2008, the National Flood Insurance Program's (NFIP) debt stands at nearly \$18 billion, calling into question the NFIP's lack of fiscal sustainability in the wake of large-scale disasters.

In 2011, prompted by the inability of the NFIP to pay its existing debt, inefficiencies in the program and numerous short-term reauthorizations over the past decade, Congress created legislative proposals to reform the National Flood Insurance Program. The House bill (H.R. 1309) and the Senate Committee on Banking and Urban Affairs bill (S. 1940) proposed to reauthorize the NFIP for a five-year term with a requirement that premiums be incrementally adjusted to reflect true flood risk.

The new legislation calling for risk-based rates may raise affordability concerns for those homeowners who will be faced with higher rates if premiums accurately reflect risk.

To assess the economic impact of risk-based premiums, we utilized the NFIP database provided to the Risk Center team to study a proposal for flood insurance vouchers which may make the shift to risk-based premiums more implementable. Our study,

"Modifying the National Flood Insurance Program to Reduce Flood Losses: Risk-Based Premiums and Affordability" builds on the Wharton Risk Center's January 2012 study, *"A Methodological Approach for Pricing Flood Insurance and Evaluating Loss Reduction Measures: Application to Texas."*

To understand the impact that risk-based premiums would have on affordability, we analyzed flood risk and flood insurance premiums in fourteen relevant postal zones in Galveston County, Texas. For our study, we looked at pure unloaded premiums, which are based on only the flood risk and do not include other costs such as administrative expenses. Analysis showed that, on average, residents in four of the fourteen postal zones are currently paying premiums that are higher than risk levels would suggest.

This is not the case for the majority, however; in the worst case, the difference between the mean pure premium currently charged by the NFIP and the mean pure premium needed to account for actuarially-based flood risk is approximately \$873. And that is just the mean – under a move to risk-based premiums, many individuals would see their annual flood insurance premium increase by well over \$1,000.

To analyze the impact of increased premiums on the constituents of Galveston County, we defined five differ-

ent measures of affordability: the federal poverty line (FPL), 150 percent FPL, 30 percent of the average median income (AMI), 50 percent AMI, and 80 percent AMI. The first two measurements are used commonly in insurance studies and the latter three

are used widely by the U.S. Department of Housing and Urban Development to determine

eligibility for various income-based programs. These definitions yield wide ranges with respect to the percentage of the population that can afford flood insurance. We then analyzed different affordability scenarios where insurance vouchers could be used to reduce the amount paid by low income households.

We also calculated the number of years that would be required to increase pure premiums from their current levels to risk-based levels under transition scenarios of 10, 15 and 20 percent. We found that with a 10 percent annual increase, it would take ten years for the majority of premiums to reach risk-based levels. A transition rate of 20 percent would bring premiums to risk-based levels in five years.

Our study demonstrates that moving to risk-based premiums can be effective with appropriately designed supports to achieve policy goals. We

Our study demonstrates that moving to risk-based premiums can be effective when combined with appropriately designed supports to achieve policy goals.

Insurance vouchers could be used to address affordability concerns for low-income households in flood-prone areas who need assistance to pay for flood insurance. The amount of the voucher would be determined by the family's income and the magnitude of the increase in the insurance premium. Several existing models for developing such a voucher system are the **Food Stamp Program**, the **Low Income Home Energy Assistance Program (LIHEAP)** and **Universal Service Fund (USF)**.

propose that premiums should be adjusted to risk-based levels immediately with subsidies to individuals provided in the form of insurance vouchers.

The immediate implementation of risk-based premiums would offer a number of benefits. Firstly, it would improve the financial sustainability of the program by increasing funding. It could also discourage further development in high-risk areas.

Importantly, risk-based premiums would also serve as a signal to homeowners in flood-prone areas as to the level of risk they face. Homeowners who adopt mitigation measures to reduce future losses could receive premium discounts from the NFIP, reflecting the expected loss reduction from future flooding. As mitigations measures can be costly, we recommend the availability of loans to cover the upfront cost of mitigation. The resulting reduction in premiums could help homeowners offset their loan repayments.

We were pleased to present this research to the Congressional Research Service to be used in formulating policy for the NFIP. We benefitted from interactions with Rawle King and members of the Congressional Research Service, including policy makers, engineers and economists. These meetings allowed us to better understand the core issues underlying the NFIP from multiple perspectives and expanded our arsenal of tools available to solve these problems and develop innovative solutions. — Authors



Rawle King, Erwann Michel-Kerjan, Howard Kunreuther, Julie Shen and Ashima Sukhdev outside the Library of Congress in May 2012.

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*In July 2012, President Barack Obama signed into law a five-year extension of the National Flood Insurance Program. **The Biggert-Waters Flood Insurance Reform and Modernization Act of 2012** extends NFIP funding to September 2017 and makes substantial changes to the program. These changes include allowing multi-family properties to purchase NFIP policies, imposing minimum deductibles ranging from \$1,000 to \$2,000, and phasing out premium subsidies for many properties. Increases in premiums will be phased in over a five-year period at a rate of 20 percent to reflect updated risk-based levels as assessed by FEMA. Rates for some properties, such as second homes and severe repetitive loss properties will be increased by 25 percent per year until premiums meet the full actuarial cost. The new law also requires FEMA to develop a plan to eliminate its debt.*

National Research Council Releases Study on Disaster Resiliency: A National Imperative

The **National Research Council**, a branch of the **National Academies of Science**, released its report [Disaster Resiliency: A National Imperative](#) on July 31, 2012. Among the recommendations in its report, the NRC suggests investment in risk reduction through insurance and other financial instruments that enhance resilience by encouraging mitigation of properties and infrastructure. More specifically, the report recommends multi-year insurance policies tied to the property with premiums reflecting risk. Risk-based pricing can serve as an incentive that clearly communicates to those in hazard-prone areas the level of risk that they face. Use of risk-based pricing could also reward mitigation through premium reductions and should apply to both privately and publicly funded insurance programs. The report suggests that the National Flood Insurance Program can set a tone for these broader recommendations by developing better flood maps and moving to risk-based pricing with insurance vouchers for those who need financial assistance.

The Untold Story of Federal Disaster Relief

by Erwann Michel-Kerjan, Managing Director, Wharton Risk Management Center, erwannmk@wharton.upenn.edu

The year 2011 was the fifth most costly on record with respect to catastrophic losses in the United States. Insured catastrophe losses from Hurricane Irene and other disasters in the U.S. totaled \$36 billion, well above the 2000 to 2010 average of \$23.8 billion per year (in 2011 dollars).

This upward trend in losses also has had an impact on post-disaster relief to assist the affected communities in rebuilding destroyed infrastructure, providing temporary housing to displaced victims and payments to uninsured victims. In the United States, federal and state governments have played an increasingly important role in providing such relief. A look at the number of U.S. presidential disaster declarations since 1953 clearly reveals a striking evolution (see graph).

The number of presidential disaster declarations has dramatically increased over time, from 191 declarations over the period 1961-1970, to 597 for the period 2001-2010.

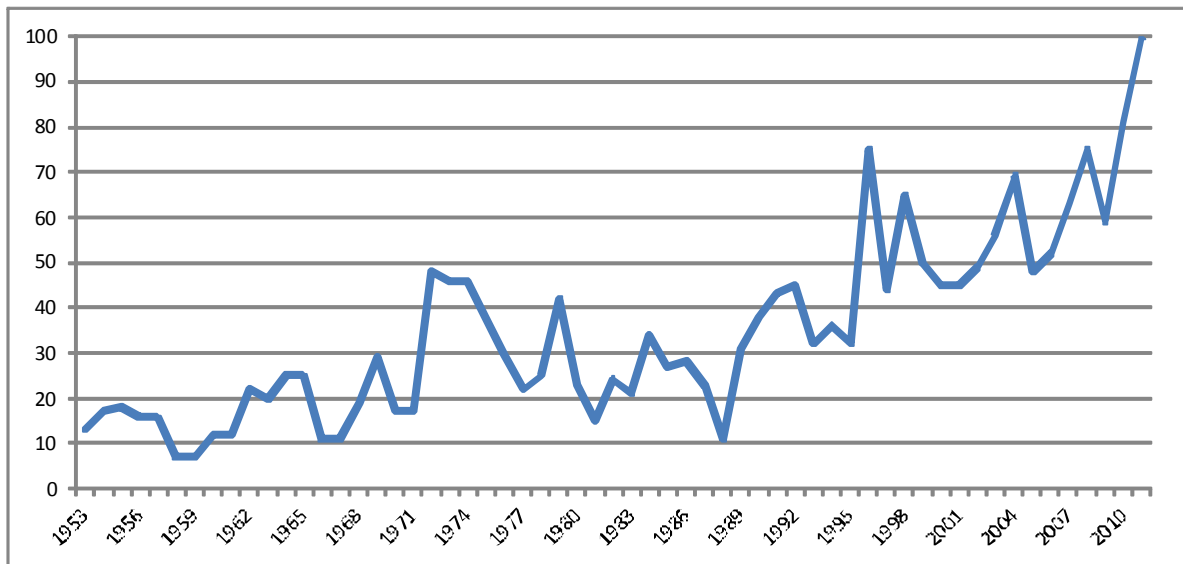
Many of the peak years correspond to presidential election years. Four salient examples are 1964 (the Alaska earthquake); 1972 (Tropical Storm Agnes); 1992 (Hurricane Andrew); and 2004 (Hurricanes Charley, Frances, Ivan and Jeanne). The presidential election years of 1996 and 2008 each had 75 disaster declarations. This record number was exceeded in 2010 when there were 81 major disaster declarations, and again in 2011 with 99 declarations. Will the 100 threshold soon be met?

The proportion of losses paid by federal relief is also increasing rapidly—and this is new. Disaster relief had not been viewed as an ongoing federal responsibility in the United States until well into the twentieth century. Indeed, in the wake of Hurricane and Flood Diane in 1955, federal disaster relief spending covered only 6.2 percent of total damages, whereas Hurricane Hugo in 1989 triggered federal aid equal to about 23 percent of the total losses.

These rates climbed dramatically in the first decade of the twenty-first century. The ratio of federal relief to total losses for the terrorist attacks of 9/11 and natural disasters between 2000 and 2008 was 62 percent. For the 2005 hurricane season and other disasters through 2008, the ratio of federal aid to total losses averaged 69 percent; that is a ratio three times larger than for Hurricane Hugo.

If this trend continues, the expected exposure of the U.S. government to natural and man-made disasters over the next 75 years could reach a staggering \$7 trillion.

The problem, of course, is that this creates a vicious cycle. To benefit politically from their actions, elected officials might feel that they have no alternative than to provide even more relief than was previously given. Unless this cycle is broken, the American taxpayers should be ready to pay much more in the coming years.



Evolution of the Number of U.S. Presidential Disaster Declarations – 1953-2011

Financial disincentive

The expectation of governmental funding results in economic disincentives for people and businesses to reduce their own exposure and/or purchase proper insurance coverage. If individuals assume that they will be bailed out after a disaster, why should they purchase insurance or avoid locating in high-risk areas?

The irony is that governmental disaster relief is usually earmarked primarily to rebuild destroyed infrastructure, rather than as direct aid to victims. Moreover, because a large portion of such disaster relief goes to the states, post-disaster assistance also distorts the incentives of state and local governments to pre-finance their disaster losses through insurance and other mechanisms.

Surprisingly, only a handful of empirical analyses have looked at the impact of recent federal disaster relief increase on demand for catastrophe insurance.

Supported by a multi-year grant from the **National Science Foundation (SES#1062039, Division of Social and Economic Sciences)**, Carolyn Kousky (Resources for the Future) and I, along with Paul Raschky (Monash University, Australia) are now finalizing a large empirical study to measure the impact on insurance demand of (a) post disaster individual assistance (IA); and (b) disaster loans from the Small Business Administration (SBA) which provides disaster loans to families and small businesses (see page 11). These two programs provide funds to help victims recover from *uninsured* losses.

Our analysis benefits from a unique access to the entire National Flood Insurance Program portfolio over the past 12 years as well as access to individual-level data on IA and the SBA's loan portfolio from FEMA.

We find significant evidence of moral hazard: homeowners living in areas that received governmental disaster relief in the previous year show a decreased demand for flood insurance; the higher the relief, the more significant the decrease.

We find significant evidence of moral hazard: homeowners living in areas that received governmental disaster relief in the previous year show a decreased demand for flood insurance.

This finding holds even for those who *did not personally* receive relief. To our knowledge, this constitutes the first empirical evidence of this phenomenon.

Moving forward, it will be important to determine whether this effect is due to perfect knowledge about how much victims received, or the assumption that they received a lot.

The distinction is an important one. Indeed, in the immediate aftermath of a catastrophe, the media likes to announce large figures for disaster relief ("State A received \$1.5 billion, State B even more"), which may create a misplaced economic incentive for individuals to act irresponsibly in the face of the risk.

The untold story about federal relief, though, is that it is likely to be fairly low. For instance, individual

assistance for repair is capped at nearly \$32,000 but the average aid for repair for a damaged home is only about \$4,000. SBA disaster loans are capped at \$200,000 for

buildings and another \$40,000 for contents, but this is a loan, not a grant. Ultimately, the family or business-owner will have to pay it back with interest in addition to any mortgage it might already have. In comparison, flood insurance costs on average \$50 a month across the country and covers up to \$350,000 (contents and buildings).

As these findings indicate, it is time for our country to have a serious and transparent discussion about the myths and realities of disaster risk financing protection. I made this point clearly to 1,000 risk management and insurance professionals when giving the opening speech at the [2012 FEMA annual National Flood Conference](#) in Austin, Texas. In the meantime, the clock is ticking.

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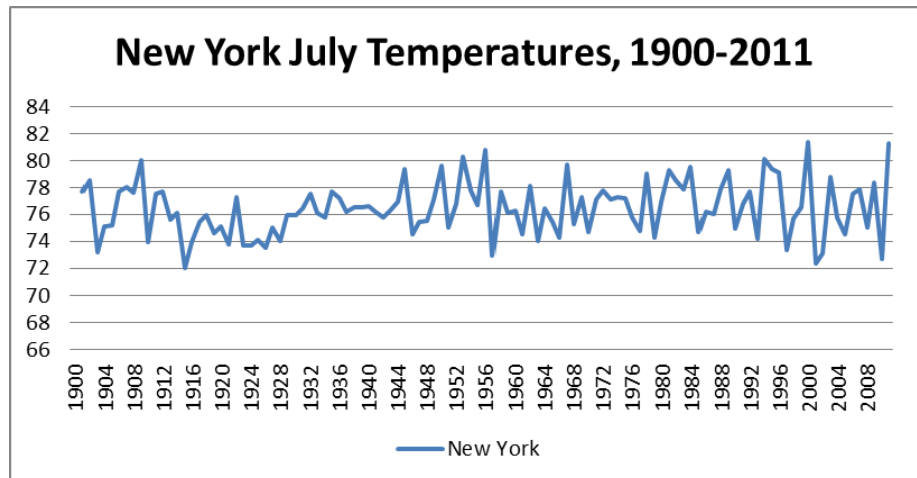
The Challenge of Communicating Climate Change

by Robert Meyer, Co-Director, Wharton Risk Center; Gayfryd Steinberg Professor of Marketing, meyerr@wharton.upenn.edu

For most residents of the United States the summer of 2012 can be summarized in one word: *hot*. In June the mountain West baked under record temperatures and suffered a spate of wildfires, and by July the extreme warmth had made its way into the Midwest and the East. To the north, the summer extent of arctic sea ice was approaching the second-smallest ever recorded, with over 2 million square kilometers of open water where ice has historically been. But whereas most of us saw the heat simply as a source of discomfort and high utility bills, for many climate scientists the summer of 2012 offered an opportunity not to be missed: a chance to convince a skeptical population that unless aggressive adaptation measures are taken the summer of 2012 offers a preview of what life in the near future may soon be like.

How successful will this message be to motivate investments in adaptation? The most likely answer: probably not at all. Although the threats posed by climate change have been broadcast repeatedly for at least a decade, motivating individuals to take it seriously enough to merit taking costly adaptive action has proven to be a formidable challenge.

For example, in a 2010 World Bank study of public opinions about climate change, only 31 percent of Americans saw the problem as “serious” and less than half of these — 14 percent — saw it as sufficiently serious to warrant sacrificing economic growth as a means of solution (*Public Attitudes Toward Climate Change: Findings from a Multi-Country Poll*, World Bank, 2010). Moreover, rather than increasing with time, public concern about the issue has, if anything, tended to diminish in recent



years. According to a 2010 Gallup poll, the percentage of Americans who believe that concerns about global warming have been exaggerated by the media has increased from a low of 30 percent in 2006 to 48 percent in 2010. Likewise, whereas in 2008, 58 percent thought it unlikely that they would see any effects of climate change in their lifetimes, this skeptical percentage increased to 67 percent in 2010. In short, were climate-change communication an advertising campaign, it has been one of the least successful in history.

Why the failure? Well, one simple explanation is that for most of us, climate change is something that we must accept as an article of scientific faith rather than something we can see on a day-to-day basis. To illustrate, while the climate record is unambiguous in showing an increase in *global* temperatures in recent years—particularly since the mid-nineties—it is not a change that is evident in the temperature records of, say, New York City where, as shown in the graph, mean summer temperatures today are largely the same as they were when great grandparents

strolled Central Park around the turn of the century.

Likewise, while the decline in arctic sea ice is quite real, most residents of Alaska would have a hard time seeing this manifested in a lower need for coats. For example, while July temperatures in Fairbanks, Alaska in the first decade of the 2000s were indeed a half-degree warmer than they were in the decade of the 1950s (when modern urban temperature records started), most residents would likely recall 2000-2009 as a decade of summer cool, as the mean July temperature during this decade was a full 2.7 degrees lower than it was during the 1990s.

So how does one convince residents of future change that is not yet in evidence? One approach widely used by the media is to point to current extreme events—such as floods, droughts, and hurricanes—as illustrations of the effects of climate change. This approach can be quite successful in the short run because people’s perceptions of climate are often driven by the weather they are experiencing at the moment. A nice illustration of this effect was recently provided by Ye Li, Eric Johnson, and Lisa Zaval

("Local warming: Daily temperature changes influences belief in global warming." *Psychological Science* 22, no. 4 April 2011) who found that beliefs in global warming expressed in surveys were highly sensitive to the departures from normal temperatures respondents were experiencing at the time the survey was taken: global warming was "real" during unusual heat spells, but "exaggerated" during cold spells. It thus follows that if one can make extreme weather events more salient in people's minds — and tie their incidence to global warming — we should see heightened concerns about the threats posed by climate change, resulting in a greater willingness to invest in adaptation.

Or will we? While such a strategy might indeed well work in the short run (such as in the immediate wake of Hurricane Katrina or the 2012 heat wave), tying beliefs about climate change to highly variable short-term indicators such as extreme weather may ultimately do more to diffuse rather than reinforce perceptions. The simple reason is that extreme events, by definition, are rare, meaning that such communications establish expectations about the short-term tangible impacts of climate change that will be disconfirmed far more often than confirmed. As an example, in 2005 many climate-change communications made a point of attributing the record-setting hurricane season that year to the effects of global warming, and suggested that such seasons will thus be the norm in years to come. But the natural variability in storm frequencies virtually guaranteed that the record-setting numbers in 2005 would not occur in 2006, and, indeed, this turned out

to be the case: rather than seeing a recurrence of 2005, the years from 2006-2011 have proven to be the quietest such period on record as measured by the number of hurricanes making landfall in the United States. The strategy thus had the unintended consequence of delivering a victory for climate-change skeptics who took the safe bet that, rather than signaling a trend caused by global warming, 2005 was a statistical outlier in an otherwise stationary probabilistic process.

So if it is indeed a mistake to tie communications about climate change to short-term weather events, and if change indeed occurs too slowly and too unevenly to be visible, what would possibly motivate anyone to voluntarily invest in long-term adaptation?

First, communications about climate change need to set proper expectations that the effects are *not* going to be easily visible in the short run, nor are the effects known with any certainty. In this sense, climate-change communication could borrow a page from the communication strategies used in consumer health care, designed to encourage long-term investments in prevention, where the goal is to establish health norms whose validity does not necessarily rest on the short-term visibility of benefits.

But simply heightening long-term concerns about the effects of climate change will be insufficient to induce adaptation if expenditure decisions themselves are made on a short-term (year-to-year) basis,

where absence of a flood or hurricane discourages investments in future protective measures. To address this, communication strategies must be coupled with the design of investment mechanisms that are *temporally aligned* with the long-term nature of the risk. A good example is the proposal for long-term flood insurance where insurance would stay with the house rather than the resident. One can imagine similar mechanisms being designed to encourage long-term investments in adaptation, such as those by communities faced with the hazards posed by gradual sea-level rise.

Finally, it is worth noting that while many Americans are unconvinced about the urgency of the threats posed by climate change, this view is far from universal globally. In developing countries such as Bangladesh, Kenya, and Senegal

Communication strategies must be coupled with investment mechanisms that are temporally aligned with the long-term nature of the risk.

where even slight increases in sea levels or incidences of drought can have catastrophic consequences, close to 80 percent of respondents to the 2010 World Bank survey saw climate change as a serious concern, and over 50 percent were willing to sacrifice economic growth to fund solutions. Unfortunately, given the limited economic resources of such countries, the burden of solution will likely fall on more developed countries such as the United States where, as has been noted, the case for large-scale investments in adaptation has yet to be convincingly made.



New Technologies for Assessing Disaster Impacts: The Deepwater Horizon Spill

by Sabrina McCormick, Wharton Risk Center Fellow; Associate Professor, Department of Environmental & Occupational Health, School of Public Health and Health Services, George Washington University, sabmc@gwu.edu

One of the most difficult aspects of disaster response and recovery is identifying actual impacts. Under-reporting, over-reporting and misreporting are rampant, often resulting in legal and political controversies.

This is reflected in the most devastating environmental disaster in United States history – the BP Deepwater Horizon spill in April, 2010. Over two years later, lawsuits continue. Policy change is still debated. Practices of oil companies are still being scrutinized. Developing innovative strategies to identify the impacts of an oil spill, as well as other disasters, is gaining importance.

As a fellow of the Wharton Risk Center, I received a National Science Foundation grant in September, 2010, to examine how impacts of the BP oil spill were assessed. Knowing that perceptions about disaster impacts often diverge between the communities that experience the disaster, government risk assessors, and the private sector, I compared how the impacts of the spill were being calculated differently by each of these groups, focusing particularly on communities in the most affected areas.

While there is a rich literature on the role of citizen science in detecting environmental exposures otherwise undetected by experts, little work has been devoted to studying the new technological tools being used by communities affected by disasters.

One of these new tools is an online, open source mapping system called the Oil Spill Crisis Response Map. The [Louisiana Bucket Brigade](http://www.oilspill.labucketbrigade.org/) (LABB) worked with Ushahidi, a group of crisis mappers that had created this basic interactive map during the period of civil unrest in Kenya then employed it for disaster response in the Haitian earthquake, to develop and implement this map. LABB is an environmental

justice organization that has worked in the Gulf Coast for ten years to use a technologically-rigged bucket to detect air-borne exposures from oil refineries that expose communities living on the “fence line” of their facilities.

The Crisis Response Map allows the public to upload exposure data about the spill through cell phone-based text messages and web-based submissions. Such crowdsourcing that allows the public to drive data aggregation is a new form of citizen science, where lay people engage in research design, data collection, and analysis.

The map became the main centralized, accessible information database in which community experiences and risk perception were collected in real time. Response categories included a variety of spill impacts, such as oil in water, oil on shore, health effects, smoke, birds, marine wildlife, livelihood threatened, cultural loss, tainted seafood, property damaged by oil, solutions and ideas, community meetings and organizing, and needs.

The map has been increasingly populated since its inception two weeks after the spill occurred. An analysis of

the response map conducted by the LABB found that by October 10, 2010, there were 2,628 reports.

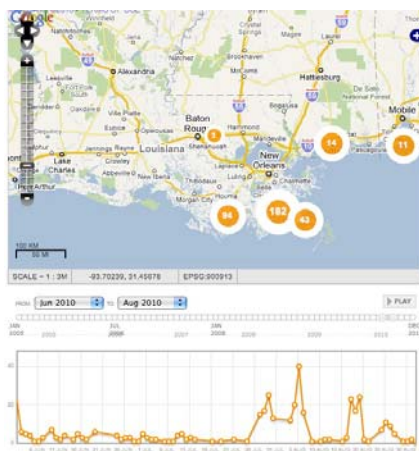
Reports were collected across the Gulf region, including areas where impacts were otherwise unmeasured. By December 1, 2010, reports had been received from Texas, Louisiana, Mississippi, Alabama and Florida, as well as from Mexico, Cuba, and the Cayman Islands.

Although the Environmental Protection Agency, the National Oceanic Aerospace Administration, British Petroleum, and other agencies implemented one of the widest disaster response strategies in history, monitoring did not always begin immediately, and was not comprehensive across the Gulf. Citizen reports filled these gaps.

The map demonstrates how this new, online, open source approach can result in a wider breadth and larger amount of data that can be paired with publicly available listings of government monitoring. In the past, capturing this amount and diversity of data has been limited by technical capacity. As such, this case demonstrates the benefits of crowdsourcing disaster risk assessment.

Results derived from this map and others like it remain controversial because of issues related to validity and accuracy. Yet, the Administrator of the Federal Emergency Management Agency, Craig Fugate, has recommended interactive maps like this one to address gaps in disaster surveillance and response systems.

These systems can be particularly important in measuring the immediate aftermath of a disaster, moments in which risks and impacts otherwise go unmeasured. As such, the data collected has potentially massive ramifications, especially in the case of the Deepwater Horizon oil spill whose impacts are wide-ranging, legally-charged, and economically impactful.



Source: Louisiana Bucket Brigade, 2010. <http://www.oilspill.labucketbrigade.org/>

Congressional Testimony

Examining the Role of Government Assistance for Disaster Victims: H.R. 3042

H.R. 3042 is proposed legislation that would affect federal disaster loans under the Small Business Administration. In the event of a declared disaster, the bill would provide SBA loans at 1 percent interest for eligible applicants.

Howard Kunreuther was among those who testified before the [House Committee on Small Business, Subcommittee on Economic Growth, Tax and Capital Access](#) on February 16, 2012, *Examining the Role of Government Assistance for Disaster Victims: A Review of H.R. 3042*. Among concerns: the bill would create a moral hazard by encouraging people to locate their homes and business in hazard-prone areas and reduce economic incentives to purchase insurance and invest in mitigation measures prior to a disaster. In fact, the proposed program has the potential of creating a situation in which homeowners and businesses in hazard-prone areas would be financially better off after a disaster than they were before the event occurred. Written testimony, “*Oversight of the SBA’s Disaster Assistance Program and Examining Changes Proposed by H.R. 3042—The Disaster Loan Fairness Act of 2011*” is online at http://smbiz.house.gov/UploadedFiles/Kunreuther_Testimony.pdf. Video is online at <http://smbiz.house.gov/Multimedia/?VideoID=FIh4FvRlvuM>.



The Future of Homeland Security: Evolving and Emerging Threats

On July 11, 2012, the **U.S. Senate Homeland Security and Governmental Affairs Committee** convened the first in a series of hearings to mark the tenth anniversary of the legislation that created the **Department of Homeland Security**. **Stephen Flynn**, a Senior Fellow of the Wharton Risk Center and Professor of Political Science at Northeastern University, testified as a part of a panel that included former CIA Director Michael Hayden. Flynn called for a new strategic approach to the homeland security mission that emphasizes building greater community and infrastructure resilience. Given that acts of terrorism cannot always be prevented, Flynn outlined the case for investing in measures that assure the continuity of critical societal values, functions, and services in the face of disruptive events. Video of the hearing and Dr. Flynn’s written testimony, “*The New Homeland Security Imperative: The Case for Building Greater Societal and Infrastructure Resilience*” is online at <http://www.hsgac.senate.gov/hearings/the-future-of-homeland-security-evolving-and-emerging-threats>.



TRIA at Ten Years: The Future of the Terrorism Risk Insurance Program

The **House Committee on Financial Services, Subcommittee on Insurance, Housing and Community Opportunity** held its hearing, “*TRIA at Ten Years: The Future of the Terrorism Risk Insurance Program*” on September 11, 2012. The hearing was convened to examine options for the future of the Terrorism Risk Insurance Program which Congress established in 2002 as a temporary loss-sharing program between the federal government and the insurance industry: the program is set to expire on December 31, 2014. **Erwann Michel-Kerjan** was among those who testified about options for encouraging greater private sector participation in the market for terrorism risk insurance, and ways other countries have addressed the terrorism risk insurability challenge. The panel also included Chris Lewis of The Hartford on behalf of the American Insurance Association, both of which are partners of the Risk Center. Video and written testimony is online at <http://financialservices.house.gov/calendar/eventsingle.aspx?EventID=307443>.



Citizens' Concepts of Their Duty as Voters

by Jonathan Baron, Professor of Psychology, University of Pennsylvania; Wharton Risk Center Fellow, baron@psych.upenn.edu

A series of web studies explored citizens' concepts of their duty as voters and their choices concerning actual policies.

Polling and survey evidence suggest that self-interest voting in the United States has increased over the last few decades, perhaps because politicians, starting primarily with Ronald Reagan, have appealed to voters on this basis.

Of course, people can and do engage in political action for reasons aside from benefits to self. They could vote on the basis of what they think is best for their group (their nation, their ethnic group, and so on), or on the basis of what they think is best for humanity in the long run. Interestingly, some people see voting for their group as their moral duty, even when their vote to help their group comes at the expense of outsiders and of themselves. When people feel a duty to vote for the good of their nation (as they see it), they may think that this duty arises from the fact that their nation gave them the right to vote. They may think that using their vote for any other purpose is a betrayal. Of course, people may vote for other reasons aside from the perceived interests of themselves or others: they may vote to express solidarity or moral opinions, without thinking much about the consequences.

It has been known for some time that self-interest does not usually justify voting, no matter how one votes. Politics is an inefficient way to pursue self-interest, although it is efficient for advancing the good of all. The chance of having an effect is very low, so voting for your self-interest is a losing proposition, like buying a lottery ticket.

Politics is an inefficient way to pursue self-interest, although it is efficient for advancing the good of all.

It is often the case that the policy that is the best for all is fairly clear, yet people still favor policies that are in their self-interest. The number of people affected by certain policy issues is orders of magnitude greater than the number of voters. Policies concerning climate change or preservation of fish species, for example, affect children (who cannot vote yet), foreigners, and future people not yet born, possibly many generations of them. The large number of people who might be affected makes up for the low probability of having any effect.

Think about the provision of a public good that requires individual sacrifice, such as reducing our carbon footprint to curtail global warming. Each of us could reduce our footprint spontaneously. Given the personal cost of this sacrifice, many people are unlikely to make it. Indeed, they have had the chance and few people have done much. This is a social dilemma, in which the option of "defecting" (doing nothing) is better in terms of self-interest, and the other option of "cooperating" (footprint reduction) is better for everyone else. Voting for the good of all is like cooperating in a social dilemma.

Democracy is best suited for advancing the public good. It is less well suited for advancing the interests of a group when the group is in conflict with outsiders, and even less well suited when the group is a single person who tries to use political participation to advance self-interest. Yet citizens do not always understand these features of the system in which they participate. They fruitlessly try to use their political influence (small as it is) to advance their self-interest or the interest of a particular group. The desire to advance a group's interest is, arguably, fragile and difficult to defend when the group's interest conflicts both with self-interest and with the good of all. Moreover, there are better ways to advance self-interest, such as participation in a market economy.

Can we change the norms about when different kinds of action are effective and appropriate? Can people understand these efficiency arguments? We have reasons for optimism. These arguments are not that difficult, but they are essentially not made. They are absent from high-school civics courses, from most college courses about political science, from the news media, and from political discourse itself, including campaigns and speeches by politicians in office. Thus, before we attribute people's lack of understanding to some sort of inherent cognitive limitation, we ought to see if people can, in fact, learn.

In one study, self-interested voters generally favored lower taxation and lower government spending. However, when given an exhaustive list of major categories of government spending and asked to adjust the spending in each category upward or downward to match what they felt the spending level should be, they adjusted some of the categories upward, with the result that total spending was essentially unchanged, even though the subjects still favored lower taxes.

It is easy to understand this result: everyone is affected by most forms of taxation, but spending policies typically benefit only a minority in the case of each policy, for example, students, the unemployed, etc. Indeed, the spending proposals that correlated with self-interest duty were those that the subjects thought would benefit themselves personally.

Baron, J. (2012). The "culture of honor" in citizens' concept of their duty as voters. *Rationality and Society*, 24(1) 37-72.

McCaffery, E.J. & Baron, J. (2006). Isolation effects and the neglect of indirect effects of fiscal policies. *Journal of Behavioral Decision Making* 19: 1-14.



Identity Concerns Affect Demand for Energy Efficiency

by Dena Gromet, Wharton Risk Center Travelers Postdoctoral Research Fellow, denag@wharton.upenn.edu

Climate change presents a major challenge to the way in which we consume energy. Although the development of energy efficient technologies provide one means of coping with climate change, there are a number of potential roadblocks to the widespread adoption of energy efficiency.

One issue is that people are unaware of which options will lead to the greatest energy reduction and cost savings. For example, people underestimate the benefits reaped from making the worst-performing cars more fuel-efficient, as well as underestimating the possible energy savings in high-energy-consuming activities.

Even when people are knowledgeable about which options are the most energy efficient, people can be deterred from making these purchases or investments based on (1) the greater upfront costs that energy efficient options require, such as the installation of a new heating and cooling system (even though the upfront investment results in long-term savings), and (2) individuals' beliefs that the negative effects of climate change are distant and uncertain.

Given these issues, the marketing of energy efficiency has focused on its additional benefits as compared to standard energy options, in particular, on the environmental benefits of energy efficiency, which allows people to be "green." Despite these marketing techniques, widespread demand for energy efficiency has remained low.

The Wharton Risk Center, in conjunction with the **Fuqua School of Business at Duke University**, has investigated whether a contributing factor to this low demand is the reliance on promoting a "green" identity to market energy efficiency. Research by Dena Gromet, Howard Kunreuther and Rick Larrick has investigated whether highlighting energy efficiency's environmental benefits in fact per-

versely results in an additional roadblock to increasing demand. If everyone does not want to be green, then making energy efficiency the "green choice" can deter otherwise interested consumers due to its (unwanted) identity connotations.

As economists and psychologists have found, people's decisions are often affected by identity-related concerns. They make choices that align with salient identities, and use their choices to distinguish themselves from others. People will avoid purchases that signal an identity (such as membership with a group) that they do not want. In particular, although political liberals (Democrats) tend to desire a green identity, political conservatives (Republicans) do not. Therefore, appeals for energy efficiency that emphasize the benefits of "being green" might deter a large segment of the population who reject this identity.

Promotions signaling a green identity (for example, through labels or slogans) can undermine political conservatives' choice of energy-efficient products, even when people are aware that these products will produce long-term cost savings.

One demonstration of this finding comes from a lab-based experiment on light bulb purchases. Participants were given a choice between wattage-equivalent incandescent and compact fluorescent (CFL) light bulbs. All participants were provided with the same information about the energy and costs savings of the energy efficient CFL. But, for half the participants, the CFL bulb was associated with a green identity, as it came with an environmental sticker. When the CFL bulb was more expensive than the incan-

descent bulb (reflecting current market-pricing), this signaling of a green identity led to a drop in CFL purchases amongst more conservative participants, which was not matched by a corresponding increase in more liberal

participants buying the CFLs.

Additional evidence for the polarizing effect of a green identity on energy efficiency comes from other studies by the team, based on

the opinions and buying behavior of more than a thousand adult participants from across the country. These studies have shown that whereas the reduction of carbon emissions is the more important energy-related value for political liberals, it is the least important for political conservatives. And, publicly showcasing this concern for emissions reduction – such as by a "Save the Earth" emblem on a car's rear bumper, decreases the number of Republicans willing to spend more for a hybrid version of a vehicle.

However, our research has identified potential solutions to this green identity problem for the adoption of energy efficiency. Beyond energy efficiency, there are additional values that are able to effectively reach a broader audience. In particular, the promotion of energy independence has a wider appeal.

Specifically, we have found evidence that identity and value concerns do not influence people's choice of energy efficient products when the energy-efficient option does not require a greater upfront cost than the standard option. In the light bulb experiment, when the CFL was the same price as the incandescent bulb, almost all participants chose the CFL over the in-

(Continued on page 14)

Promotions signaling a green identity can undermine political conservatives' choice of energy-efficient products, even when people are aware that these products produce long-term cost savings.

(Continued from page 13)

candescent bulb. This finding suggests that when energy efficient options do not require larger upfront costs than standard options, unwanted identities can deter people from choosing energy efficiency.

Overall, this research has identified a previously unappreciated roadblock to the widespread adoption of energy efficiency. People have different values related to energy efficiency associated with their political leanings. The salience of these values can both attract and repel people from selecting more expensive energy efficient options. As there are ideological differences in beliefs about global warming, certain messages (in particular, messages about environmental benefits of energy efficiency) can polarize people's choices, whereas other messages (in particular, messages about energy independence) can reach a broader audience.

The Wharton Risk Center is also studying ways to motivate demand for energy efficiency buildings. This project, which has received funding from the **U.S. Department of Energy** as part of the **DoE Innovation Hub for Energy Efficient Buildings**, will address split-incentive issues for building owners and tenants.

This research will examine how people's values and cost considerations combine to affect tenant demand for energy efficiency, and their willingness to pay more to live in energy-efficient buildings. This research is designed to illustrate how economic and psychological considerations interact to influence demand for energy efficiency.

A conference bringing together the top researchers in this area to share findings is being planned for 2013, co-organized by the Wharton Risk Center, the **Initiative for Environmental Leadership (IGEL)**, **Penn Institute for Urban Research (Penn IUR)**, the **Wharton Geospatial Initiative and Laboratory**, and the **Wharton Small Business Development Center (SBDC)**.



Improving Insurance Decisions for Extreme Events

by Howard Kunreuther and Mark Pauly

In his compelling book, *Thinking, Fast and Slow*,¹ Daniel Kahneman characterizes two systems of thinking:

- **System 1** operates automatically and quickly, with little or no effort and no sense of voluntary control and uses simple associations, including emotional reactions that have been acquired by personal experience with events and their consequences.
- **System 2** allocates attention to the effortful and intentional mental activities that demand it, including computations and formal logic.

Kahneman argues convincingly that the distinction between Systems 1 and 2 helps clarify the tension between automatic, largely involuntary responses, and effortful, deliberate processes in the human mind. Extreme events, where there is a low probability of occurrence but where consequences can be very severe, are likely to induce System 1 behavior.

Indeed, individuals and insurance firms often make insurance decisions by utilizing simplified and imperfect decision rules rather than systematic thought.

Specifically, decision makers are likely to ignore events that they perceive to be below their threshold level of concern. Yet following a severe disaster, the likelihood of another disaster is perceived to be much higher than it actually is, illustrating the *availability bias*, where the salience of an event is the basis for estimating its probability of occurrence. In the absence of another disaster over the next few years, the event is again treated as highly unlikely. As such, many homeowners will cancel their flood insurance policies and insurers will reduce their terrorism premiums, often leading the government to bail out those who suffer losses and are not adequately protected.

In our forthcoming book, *Insurance and Behavioral Economics: Improving Decisions in the Most Misunderstood Industry*, we document how System 1 behavior before and after an extreme event triggers poorly thought-out actions. We then propose a set of strategies to encourage System 2 behavior that helps insurers and consumers make better decisions.

Examples of how System 1 behavior triggers poorly thought-out actions:

Flood Insurance Protection by Homeowners

Most homeowners residing in flood-prone areas in the United States do not voluntarily purchase flood insurance even though premiums are highly subsidized by the federal government. After a disaster, there is considerable demand for flood insurance, yet many of those who purchase coverage cancel their policies several years later because they didn't experience another flood and then consider insurance to be a bad investment.

Terrorism Insurance Coverage by Insurers

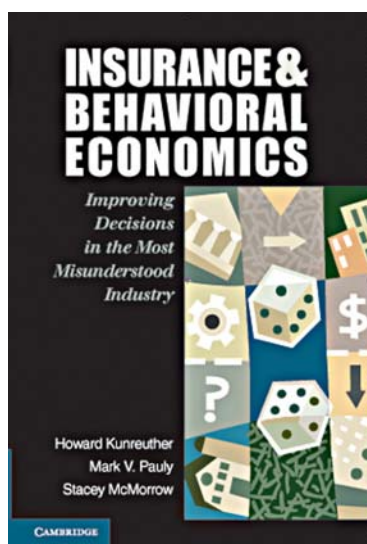
Prior to September 11, 2001, terrorism was not specified as a separate risk in "all-perils" insurance policies. Insurers did not charge for this coverage even though terrorists had attacked the North Tower of the World Trade Center in 1993. After 9/11, few insurers offered terrorist coverage; those who did, charged extremely high premiums for it. Insurers are now protected against a large loss by the federal government through the Terrorism Risk Insurance Act and offer coverage to those who demand it. Rates have decreased in recent years primarily because the U.S. has not experienced another terrorist attack.

The public sector also has a role to play with respect to providing protection against events that may be so catastrophic that the private sector cannot provide adequate insurance and reinsurance to cover losses. For example, enforcing regulations that require those at risk to purchase coverage and developing well-enforced building codes may be necessary to overcome poorly thought-out behavior.

By taking these steps, individual and social welfare are likely to be enhanced. These objectives have political appeal and may lead to general consensus as to the roles the private and public sectors should play in reducing losses from extreme events.

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Insurance and Behavioral Economics: Improving Decisions in the Most Misunderstood Industry. By Howard C. Kunreuther, Mark V. Pauly and Stacey McMorrow. Cambridge University Press, 2013.

Supply-Side Strategies

Insurers should utilize valid risk estimates in determining premiums. Studies should be undertaken to estimate the likelihood of future events rather than focusing on a specific past disaster, as insurers did after the 9/11 terrorist attacks.

Higher premiums should reflect increases in risk rather than increases in losses. Insurers should recognize that after a low probability catastrophic event occurs, it is unlikely that a similar one will occur in the near future if the events are considered to be independent, such as hurricanes.

Offer all-perils policies. To overcome the tendency for individuals to regard the likelihood of an event as below their threshold level of concern, insurers should consider offering consumers an *all-perils* policy that covers damage to an asset regardless of cause, as is done in France, Spain and New Zealand with respect to property insurance.

Demand-Side Strategies

Explain the purpose of insurance. Individuals often view insurance as an investment rather than as a protective measure. One way to convince consumers that they should celebrate **not** having experienced a loss is to indicate the magnitude of their losses should their house and contents be seriously damaged by a natural disaster. It would also be useful to point out that if they were uninsured they would have to use their own resources to rebuild their home. They should reflect on both these points before deciding to cancel their insurance policy because they had not collected on it for several years.

Provide accurate information to correct biases. To correct the availability bias, provide individuals with information on the chances of a future disaster and the likely claims payment if the event occurs. These data enable consumers to undertake the relevant tradeoffs between the cost of insurance and its expected annual benefits. They can then make a more informed decision as to how much coverage (if any) to purchase. Better data on probabilities and outcomes may help convince those at risk that the best return on an insurance policy is no return at all.

Extend the time frame. One way to convince individuals to pay attention to risk is to stretch the time horizon over which the probability of a loss is measured. A study by Neil Weinstein and his colleagues² showed that people are much more willing to take risk seriously if they are told that the chance of at least one disaster occurring in a 25-year period is greater than 1 in 5, versus 1 in 100 in any given year.

¹ Kahneman, D. (2011). *Thinking, Fast and Slow*. New York: Farrar, Straus and Giroux.

² Weinstein, N., Kolb, K., & Goldstein, B. (1996). "Using Time Intervals Between Expected Events to Communicate Risk Magnitudes." *Risk Analysis* 16:305-308.

Effective Corporate Practices in Catastrophe Risk Management

If appropriate preparative measures are not taken, natural hazards and created threats — hurricanes, earthquakes, pandemics, financial crises, industrial accidents, disruptive technologies and more — can deeply affect companies.

Leadership capabilities can make a great difference in company performance in an uncertain and fast-changing environment. Research reveals that the quality of top management teams is a better predictor of company performance than the CEO alone. Other research shows that governing boards can have a significant impact on company practices, especially when executives and directors view their relationship as a strategic partnership.

The Wharton Risk Center in collaboration with the Wharton Leadership Center as part of the **Travelers-Wharton Partnership for Risk Management and Leadership** is examining the practices of large, publicly traded companies to determine effective strategies for detecting, preparing for and coping with catastrophic events. An important outcome of this research will be a set of business and policy guidelines for leadership strategies to manage catastrophic risk in large companies.

The research encompasses a range of qualitative and quantitative measures, including analysis of S&P 500 stock price events to assess significant price drops that can be correlated to catastrophic events, analysis of firm credit ratings, and analysis of SEC Form 10-K filings with an interest in the specific risks that firms report in their 10-Ks.

A key feature of this study is an ongoing series of confidential interviews we are conducting with senior executives of S&P 500 companies. The research team has interviewed senior executives from one hundred firms across a variety of industry sectors including finance, energy, insurance, healthcare, technology, manufacturing and communications.

These interviews focus on the adverse events that firms have faced and steps taken to prevent a repeat occurrence, how risk management is structured organizationally, and how firms balance the tension between risk mitigation and firm growth. Conversations such as these with leadership professionals of this caliber bring valuable perspective to our research.



Preliminary Findings

Our research provides important insights on the role that board members, senior management and employees can play in managing catastrophic risk

The value of experience. Firms that implement continuous learning cycles, by viewing crises as an opportunity to change those organizational factors that contributed to the crisis in the first place, are better prepared to manage catastrophic losses than firms that lack such feedback loops.

The power of proactive boards. Boards of directors who ask tough questions of senior management about risks and risk management, and who review firm risk exposure and mitigation strategies on an ongoing basis through board-level risk committees, create robust risk cultures.

The importance of practice. Crisis managers that strengthen their catastrophic risk response of their firms through regular drills, tabletop exercises and simulations prepare key personnel to act decisively in the moment of a crisis.

Catastrophic risk management (CRM) is good for business. Assessing strategic objectives in light of their accompanying risks (internal and external) makes good business sense. It helps firms to eliminate outsized risks and to focus on effectively allocating their financial resources and human capital.

Effective CRM takes time. The implementation of a CRM strategy requires at least a year of concerted effort by the C-Suite working together with the Board and line employees.

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Managing Risk for Resilience: How Top Risk Managers are Entrepreneurial

by Karen Campbell, Wharton Risk Center Research Fellow; Senior Economist, World Economic Forum karenca@wharton.upenn.edu

“Can we think of entities that not only resist the ravages of time, but that, through the creation and recombination of novel components, become able to cope with an unpredictable future?”

-- Antoine Danchin,
*The Anti-Fragile Life of the Economy*¹

Managing Complex and Unpredictable Risks

As the world becomes more interconnected, the level of dependency on the actions of others increases. This raises the level of complexity of our systems, creating a challenging environment for developing risk management strategies.

How are those responsible for managing risk at top global companies dealing with these uncertainties and unknown unknowns? Enhancing organizational resilience seems to be a key. But this raises the question: how does one operationalize organizational resilience?

Described broadly, resilience means being able to recover quickly from an adverse event to achieve either the same or an improved state than one was in just prior to the event. Resilience to predictable risks can be enhanced, for example, by having insurance or mitigation strategies that reduce the negative financial and physical impacts of a risk event.

However, when it comes to unpredictable events, looking at how entrepreneurs deal with highly unpredictable outcomes might lend insight into how to build resilience to these risks. Expert entrepreneurs, those who have created multiple new endeavors, are likely to be quite resilient because they regularly face situations of high uncertainty and often learn from their initial failures.

Thus, entrepreneurs' strategies for making decisions could provide insights into strategies that leaders and risk managers can use to enhance resiliency within their organizations. In fact, top risk managers may already use such strategies to operationalize risk resiliency within their organizations. Understanding what these strategies are in the context of resilient risk management practices can equip risk managers with a broader set of tools for dealing with a complex risk landscape.

How do Entrepreneurs Make Decisions when Outcomes Are Unpredictable?

Contrary to what one might think, studies have shown that there are no systematic differences in the degree of risk aversion between entrepreneurs and non-entrepreneurs.² But entrepreneurs do perceive risk differently. What is important is not their risk propensity, but rather their feelings of control and responsibility.³

The decision process that entrepreneurs use to manage uncertain risks is known as *effectual logic*. In contrast with *causal logic*, which aims to predict the future in order to control it, effectual logic aims to control the future, negating the need to predict it. Both types of strategies are needed in making decisions. Causation invokes search and select tactics and underpins most good management theories. Effectual reasoning invokes tactics that increase the size of the problem space thereby bringing more problems (or risks) to light, where predictive strategies may then take over.

A Risk Culture

Interviews with CROs and CEOs at 100 S&P 500 companies are being conducted at Wharton's Risk Management and Decision Processes Center as part of a multi-year project funded by the Travelers Foundation (see facing page). The transcript data will be used to test whether top risk managers, when faced with unpredictable risks, use similar strategies as entrepreneurs to identify and manage them. And, if so, do these strategies offer a key to creating resiliency within organizations by building a risk culture?

Operationalizing Resilience

Preliminary data suggests that some risk managers are using effectual strategies to manage these types of risk. By documenting these strategies and understanding them in the existing decision-making

framework of entrepreneurs, we can learn how to operationalize resilient risk management. Whereas predictive tools for risk management build hedges for risk and seek to mitigate them by taking measures that reposition the organization's exposure to the risk, effectuation tools for risk management builds a risk culture throughout the organization.

It is this risk culture that enhances the resiliency of an organization to many

Effectuation is a “general theory of decision making in uncertain situations” that focuses on the human action as the “predominant factor shaping the future.”^{4,5}

unforeseen risks and becomes an intangible asset that should be measurable. As effectual risk manage-

ment becomes better understood and utilized, leaders could also potentially use these strategies to reduce vulnerability to global risks. For example, many of the 50 prioritized risks in the World Economic Forum's annual *Global Risk Report* (see page 18) depend on the complex interaction of decisions made by many different stakeholders. Rather than using predictive strategies to try to mitigate and respond to this class of risks, effectual risk management strategies may prove more useful. Effectual risk management would give leaders proactive strategies that create a risk culture, which can help enhance global socio-economic resiliency.

¹ Danchin, A. “The Anti-Fragile Life of the Economy.” *Project Syndicate Commentary*, at <http://www.project-syndicate.org/commentary/the-anti-fragile-life-of-the-economy> (retrieved 2 April 2, 2012).

² Miller, K.D. (2007). Risk and rationality in entrepreneurial processes. *Strategic Entrepreneurship Journal*, 1(1-2), 57-74. doi:10.1002/sej.2.

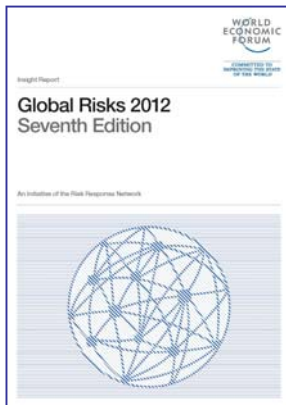
³ Sarasvathy, D.K., Simon, H., & Lave, L. (1998). Perceiving and managing risk: Differences between entrepreneurs and bankers. *Journal of Economic Behavior and Organization*, 33, 207-225.

⁴ Sarasvathy, S.D. & Venkatarama, S. (2011). “Entrepreneurship as Method: Open Questions for an Entrepreneurial Future.” *Entrepreneurship Theory and Practice*, January.

⁵ Brettel M., Mauer, R., Engelen, A., & Küpper, D. (2012). Corporate effectuation: Entrepreneurial action and its impact on R&D project performance.” *Journal of Business Venturing* 27(2): 167-184.



World Economic Forum's Global Risks Report 2012



The world's vulnerability to further economic shocks and social upheaval may undermine the progress that globalization has brought, warns the [2012 Global Risks Report](#).

The report is the flagship initiative of the **World Economic Forum's**

Risk Response Network, which provides private and public sector leadership with an independent platform to better map, monitor, manage and mitigate global risks. The Wharton Risk Center has been the academic partner of the World Economic Forum since 2005. Other partners are **Marsh & McLennan, Swiss Reinsurance Company** and **Zurich**.

The report describes 50 global risks grouped into economic, environmental, geopolitical, societal and technological categories. Within each category, the report singles out the most significant systemic risks. Analysis across all five categories revealed three constellations of risks that were developed into case studies for this year's report: Seeds of Dystopia, Unsafe Safeguards and the Dark Side of Connectivity.

Chronic fiscal imbalances and severe income disparity are the risks seen as most prevalent over the next ten years. These risks in tandem threaten global growth as they are drivers of nationalism, populism and protectionism at a time when the world remains vulnerable to systemic financial shocks, as well as possible food and water crises. These are the findings of a survey of nearly 500 experts and industry leaders, indicating a shift of concern from environmental risks to socioeconomic risks compared to a year ago.

Global governance is closely intertwined with all other global risks. The report argues for rethinking private and public responsibilities to foster greater trust. It provides the basis for a dialogue on the adverse impacts of myopic thinking and the importance of designing implementable long-term strategies.

Seeds of Dystopia

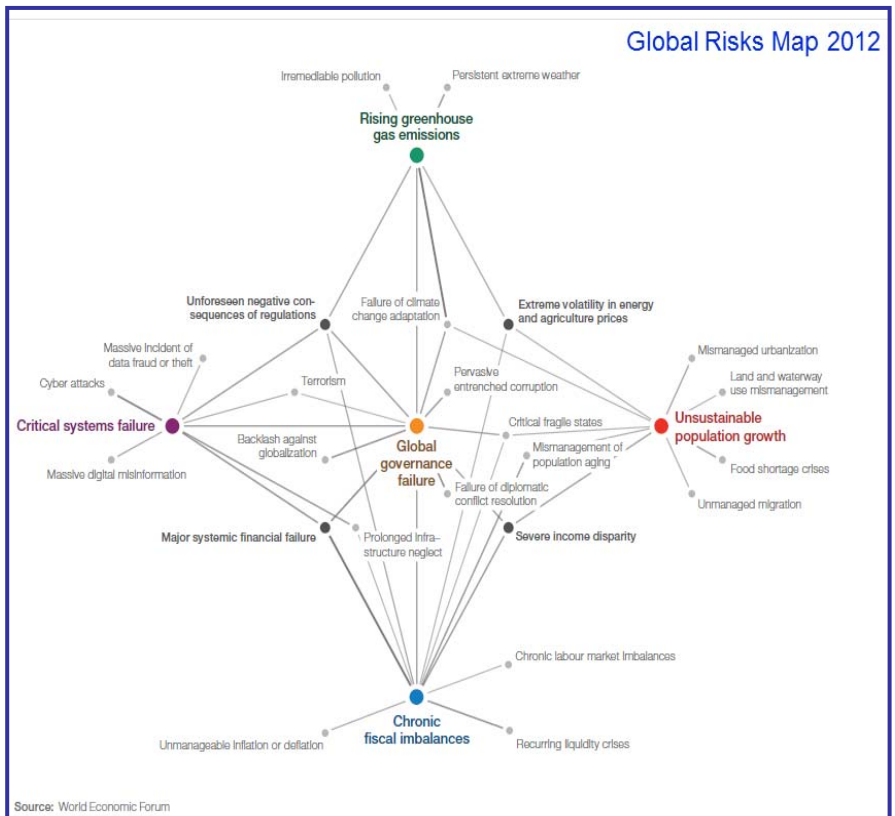
Bulging populations of young people with few prospects, growing numbers of retirees depending on debt-saddled states (stoking fiscal imbalances) and the expanding gap between rich and poor are fuelling resentment worldwide.

Unsafe Safeguards

Policies, norms and institutions from the 20th century may no longer protect us in a more complex and interdependent world. The weakness of existing safeguards is exposed by risks related to emerging technologies, financial interdependence, resource depletion and climate change, leaving society vulnerable.

The Dark Side of Connectivity

Our daily lives are almost entirely dependent on connected online systems, making us susceptible to malicious individuals, institutions and nations that increasingly have the ability to unleash devastating cyber attacks. The 2011 Japan earthquake and subsequent crisis at the Fukushima nuclear plant is a reminder of the destructive power of nature and the limits of technology, and the subject of a special chapter on key lessons learned: Organizations will be far more resilient to major shocks if they have clear lines of communication and if employees across the organization are empowered to make decisions.



Global Risks 2012 at http://www3.weforum.org/docs/WEF_GlobalRisks_Report_2012.pdf

In Memoriam: Paul R. Kleindorfer



On August 24, 2012 Paul Kleindorfer passed away in Paris, France after a struggle with ALS. Paul came to Wharton in 1973 after receiving his Ph.D. at Carnegie Mellon University, and joined the newly formed Decision Sciences Department, now Operations and Information Management. As the Anheuser-Busch Professor of Management Science, Paul served Wharton in a number of roles, including two terms as department chair and Vice Dean of the Doctoral Programs.

Paul became Co-Director of the Risk Management and Decision Processes Center with Howard Kunreuther shortly after it was established in 1984 and served in this role until his retirement from the University of Pennsylvania in 2006. During his time with the Risk Center, Paul was instrumental in initiating a number of research projects that focused on strategies for managing risks from natural hazards, chemical accidents and other extreme events.

One of those projects led to path breaking studies on chemical accidents under a cooperative agreement with the Environmental Protection Agency (EPA). Kleindorfer and his colleagues provided insights into the nature of the risks associated with accidents from chemical plants. Paul was instrumental in bringing together a team of epidemiologists, statisticians and risk analysts to examine data collected by the U.S. EPA in 1999-2000 on more than 15,000 facilities in the United States that store or use toxic or flammable chemicals. These data were key inputs to assessing the likelihood of chemical accidents and their impacts on the firms as well as on the surrounding areas and the economy. Paul combined these assessments with an understanding of the institutional arrangements and decision processes of the key stakeholders to develop strategies for reducing the risk of future chemical accidents.

On a broader note, Paul had both a philosophical and analytic bent that enabled him to appreciate the importance of designing economically efficient programs for managing the risks associated with low-probability high-consequence events while taking into account issues of fairness, equity and ethical considerations. Paul was an extremely generous and modest person, giving freely of his time to others,

mentoring students and his colleagues without calling attention to himself. He had a special love for doctoral students, so it is most appropriate that the OPIM Department created the Paul Kleindorfer OPIM Scholar Award given to the doctoral student with the most outstanding progress toward the completion of his or her dissertation.

Paul was active in research until his death. His most recent research focused on single-year and multi-year insurance policies in a competitive market, assessment of catastrophe risk and potential losses in industry, restructuring initiatives in network industries, and risk management and sustainability strategies for carbon-intensive industries.

In June 2012 Paul was named an MSOM Fellow by the Manufacturing and Service Operations Management Society of INFORMS. He prepared an acceptance speech that reflected his recent research, which was delivered by his former colleague, Morris Cohen.

All of us at the Wharton Risk Management Center learned so much from Paul Kleindorfer through personal interactions and from his writings. His contributions will be lasting ones, not only to the research community but also to businesses and policymakers alike. Those who knew Paul will miss him greatly. His spirit and great sense of humor will always be with us.

Research Fellows and Visiting Scholars

The Risk Center is delighted to welcome our new research fellows and visiting scholars. They are among the nexus of people — over 70 faculty, fellows and doctoral students — devoted to furthering the practical understanding of how to manage situations of risk involving safety and the environment, economics and finance.



Karen Campbell is a Research Fellow at the Wharton Risk Center and Senior Economist at the **World Economic Forum**. The position is a partnership initiative of the **Risk Response Network** with the **Wharton Center for Leadership** and the Wharton Risk Center.

Karen earned her doctorate in economics in 2008 at Temple University, where she then taught microeconomics and macroeconomics as an adjunct instructor. Previously, Karen was a Senior Macroeconomic Policy Analyst at The Heritage Foundation in Washington, D.C. where she researched how public policy affects the economy. She is a member of the Institute of Certified Management Accountants, the American Economic Association and the National Association of Business Economists, and has testified before the Senate Finance Committee.

Karen's research at the Risk Center focuses on several projects, including building a framework for understanding strategies that manage risks for resilience (see page 17), studying decision-making and incentives for new energy technology investments, and developing metrics and analytical tools to aid in monitoring supply chain vulnerabilities. In her role with the World Economic Forum, she is applying leading research concepts and methods to support a growing knowledge base for risk response strategies to build on the *Global Risk Report* (see page 18).



Ginger Turner is the Travelers Companies Postdoctoral Research Fellow at the Risk Center. She holds a master's degree in engineering from Stanford University and arrives at Wharton directly from the University of Oxford as a Rhodes Scholar, where her Economics Ph.D. dissertation examined the effect of natural disasters on U.S. population movements. She is one of eight fellows of the Global Governance 2022 development group, a partnership which brings together scholars to envision the next 10 years of global development governance.

Ginger's research focuses on household migration and insurance response to natural disasters. She is currently working under a three-year British Academy-funded collaboration with the Lahore School of Economics in Pakistan, which includes field studies to be conducted in villages affected by severe flooding in 2010.



Jon-Francis Winkles is a second-year student in the master's degree program of Public Policy and Management at the Heinz College at Carnegie Mellon University. His interests are focused on disaster policy and developmental patterns associated with populations both before and after disasters.

Visiting the Wharton Risk Center as a summer research intern, he tested the feasibility of long-term NFIP contracts in relation to federal and state-based income assistance programs by modelling a flood insurance voucher that could accompany the implementation of long-term flood insurance contracts under the NFIP.



W.J. Wouter Botzen is Assistant Professor at the Department of Environmental Economics of the Institute for Environmental Studies, VU University of Amsterdam. His research interests focus on climate change economics, individual decision making under risk, natural disaster insurance, and natural disaster risk management. Wouter obtained his doctorate in economics from the University of Amsterdam in 2010. In his dissertation, he examined the implications of climate change for the insurance industry and designed an insurance arrangement for flood risks in the Netherlands where flood insurance is currently not available.

At the Risk Center, Wouter is conducting an economic experiment that examines demand for multi-year flood insurance policies in the Netherlands. He is also working on a project on flood risk management in New York City for which he will conduct a household survey on flood risk perceptions and demand for mitigation measures.



Dr. Heidi Cullen has been appointed as a Senior Research Fellow at the Wharton Risk Center. She will continue as a research scientist and correspondent for Climate Central in Princeton, NJ while partnering with the Risk Center on projects involving climate change perception and risk communication. Dr. Cullen was *The Weather Channel's* first on-air climate expert and helped create *Forecast Earth*. Prior to that she was a research scientist at the National Center for Atmospheric Research in Boulder, CO. She is the author of *The Weather of the Future* (Harper Collins, 2010).

Dr. Cullen presented a seminar on *The Weather of the Future* at the Wharton Risk Center in March 2012.

Risk Regulation Seminar Series

The Risk Regulation seminar series brings distinguished speakers to address topics of importance to academia, industry and public policy makers. The series is jointly sponsored by the Penn Program on Regulation; the Program on Law, the Environment and the Economy; the Wharton Risk Management and Decision Processes Center; the Institute for Global Environmental Leadership; and the Fels Institute of Government. Information on seminars can be found at <https://www.law.upenn.edu/academics/institutes/regulation/seminars.html>.

March 27, 2012

"The Future of Nuclear Power after Fukushima"

Paul Joskow, President, Alfred P. Sloan Foundation; Elizabeth and James Killian Professor of Economics, Emeritus, MIT

February 21, 2012

"Will Adaptation Save Us from Climate Change?"

Michael Greenstone, 3M Professor of Environmental Economics, MIT

January 24, 2012

"A Regulatory Framework for Managing Systemic Risk"

Steven L. Schwarcz, Stanley A. Star Professor of Law & Business, Duke University

November 29, 2011

"Out of Balance: How Uncertainty Figures in Risk Analysis and Regulatory Economics"

Adam M. Finkel, Senior Fellow and Executive Director, Penn Program on Regulation; Professor of Environmental and Occupational Health, UMDNJ School of Public Health

October 25, 2011

"The Tragedy of the Risk-Perception Commons: Culture Conflict, Rationality Conflict, and Climate Change"

Dan M. Kahan, Elizabeth K. Dollard Professor of Law, Yale Law School

September 27, 2011

"Ambiguity and Climate Policy"

Geoffrey Heal, Paul Garrett Professor of Public Policy and Business Responsibility, Columbia Business School



Paul Joskow (Sloan Foundation and MIT) delivers a seminar on "The Future of Nuclear Power after Fukushima."

Russell Ackoff Doctoral Student Fellowship Awards

The **Russell Ackoff Doctoral Student Fellowship** program of the Wharton Risk Management and Decision Processes Center provides grants to doctoral students across the University of Pennsylvania who are pursuing research in decision making under risk and uncertainty. The awards can be used to fund data collection, conference participation, and other direct research expenses.

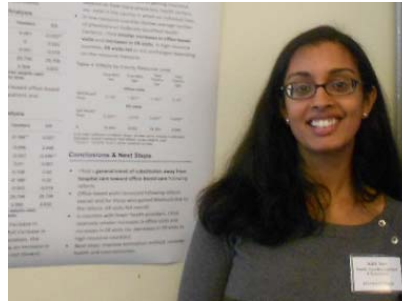
Prof. Emeritus Russell Ackoff's (1919-2009) pioneering work was dedicated to furthering our understanding of human behavior in organizations. Fellowships are funded by an endowment provided to the Wharton School by the Anheuser-Busch Charitable Trust. Information about the competitive application process and call for proposals is available at http://opim.wharton.upenn.edu/risk/ackoff/WRC-Ackoff_rfp.pdf. Prior years' research awards can be found at <http://www.wharton.upenn.edu/riskcenter/ackoff.html>.

The Wharton Risk Center is pleased to announce the fellowships which were awarded this year to 22 doctoral students at Penn.

RECIPIENT	DEPARTMENT	RESEARCH FOCUS
Pavel Atanasov	Psychology	Risk Preferences in Choosing for Self and Others
Luis Ballesteros	Management	Corporate Philanthropic Catastrophe Relief: Drivers and Consequences
Alixandra Barasch	Marketing	The Impact of Individual versus Societal Optimism on Risk-taking and Decision-making under Uncertainty
Bob Batt	OPIM	Docs Under Load: The Endogenous Nature of Work Content in an Emergency Department
Jonathan Berman	Marketing	Discipline and Desire: Strength of Will and Purity of Character in Judgments of Virtue
Alison Brooks	OPIM	Reappraising Anxiety as Excitement with a Minimal Statement Improves Performance
Cindy Chan	Marketing	Gratitude, Guilt, and Gift Giving
Hengchen Dai	OPIM	A Test of the Availability Heuristic: The Impact of Media Attention Devoted to Celebrity Cancer Diagnoses on Cancer Screening Rates
Anthony DeFusco	Applied Economics	Estimating the Price Elasticity of Demand for Housing Services Using GSE Private Mortgage Insurance Requirements
Barbara Elias-Sanborn	Political Science	The Critical Ally: Conditions for Cooperation and Defiance in Counter-insurgency Partnerships
Katrina Fincher	Psychology	Power & Punishment: When Power Causes a Change of Conscience
Burcu Guray	Psychology	Understanding Complex Judgment Processes: Multiple Cue Judgment Tasks with Three Cues
Theresa Kelly & Berkeley Dietvorst	OPIM	Subjective Anonymity: The Influence of Identity on Prosocial Behavior in Anonymous Settings
Hyun Suk Kim	Annenberg School for Communications	Social Diffusion of Health Risk Information: The Roles of Message Characteristics, Message Tailoring, and Social Influence
Emma Levine	OPIM	Thinking and doing: Why we procrastinate on thinking tasks
Livia Levine	Business Ethics and Legal Studies	Behavioral Responses to Contemptuous Expressions
Susan Mello	Annenberg School for Communications	Visual Communication and Public Consciousness of 'Invisible' Environmental Health Risks
Anita Mukherjee	Applied Economics	Understanding the Emerging Micropensions Sector in India
Vivek Shah	Applied Economics	Managing weather risk through workfare participation: Evidence from India's NREGA scheme
Dina Shapiro	Annenberg School for Communications	Impact of Targeted HIV Messages on Anticipated Stigma Risk
Melanie Thomas	Marketing	The Influence of Speed on Time Allocation Decisions in Social Connection



Alison Brooks (OPIM), "I'm sorry about the rain! Superfluous apologies demonstrate empathic concern and increase trust." From left: Prof. Bob Meyer, Alison Brooks, Prof. Deb Small, Hengchen Dai (OPIM, 2012 Ackoff Fellowship recipient).



Aditi Sen (Health Care Management), presents her research, "The Effect of Insurance Changes on the Demand for Health Care: Evidence from Massachusetts."

Doctoral students and faculty from across the University of Pennsylvania came together to network and share research at the Risk Center's annual Ackoff luncheon, where recipients of the 2011 Ackoff Doctoral Student Fellowship Awards presented their research findings. The event was held in April 2012, coinciding with the announcement of the 2012 Ackoff grant recipients.



Pavel Atanasov (Psychology) (center) with his research on "Choosing for Self, Others and Groups under Uncertainty," Prof. Howard Kunreuther (left) and Prof. Jon Kolstad.



Cindy Chan (Marketing) presents her research on "Pride and Preference."



Jonathan Berman (Marketing) (left), presents "Self-Interest without Selfishness: The Hedonic Benefit of Imposed Self-Interest" to 2012 Ackoff recipients, Emma Levine (OPIM) and Berkeley Dietvorst (OPIM). The paper is published in *Psychological Science*.

Wharton Risk Center Undergraduate Research Assistants 2011-2012

"Effective Corporate Leadership and Governance Practices in Catastrophe Risk Management"

Richard Hong (Wharton 2014/Engineering Master's degree candidate)

Benjamin Huynh (Wharton 2014 degree candidate)

Nicole (Danbi) Hwang (Wharton 2014 degree candidate)

Nicole Kwok (Wharton 2015 degree candidate)

Wing Li (Wharton and Engineering 2014 degree candidate)

Sean Niznik (Wharton 2014 degree candidate)

"Modifying the National Flood Insurance Program to Reduce Flood Losses: Risk-Based Premiums and Affordability"

Krishna Kaliannan (Univ. of Pennsylvania, Jerome Fisher Program in Management & Technology 2013 degree candidate)

Julie Shen (Wharton 2012)

Ashima Sukdhev (Wharton 2012)

Christina Zima (Wharton 2012)

"U.S. Department of Energy Innovation Hub for Energy Efficient Buildings"

Douglas J. Miller, Jr. (Univ. of Pennsylvania, College of Arts and Sciences 2012 degree candidate)

RECENT PUBLICATIONS

More at <http://opim.wharton.upenn.edu/risk/papers.php>

- Baillon, Aurélien, Laure Cabantous & Peter Wakker. "[Aggregating Imprecise or Conflicting Beliefs: An Experimental Investigation Using Modern Ambiguity Theories](#)", *Journal of Risk and Uncertainty*, April, Vol.44, Issue 2, pp 115-147. 2012.
- Baron, Jonathan. [The 'culture of honor' in citizens' concepts of their duty as voters](#). *Rationality and Society*, 24(1):37-72.,2012.
- Berman, Jonathan Z. & Deborah A. Small. [Self-interest without Selfishness: The hedonic benefit of imposed self-interest](#). *Psychological Science*, 2012.
- Carrigan, Chris & Cary Coglianese. [The Politics of Regulation: From New Institutionalism to New Governance](#). *Annual Review of Political Science*, Vol. 14, pp. 107-129.,2011.
- Chan, Cindy, Jonah Berger & Leaf Van Boven. [Identifiable but Not Identical: Combining Social Identity and Uniqueness Motives in Choice](#). *Journal of Consumer Research* 39 (3), 2012.
- Czajkowski, Jeffrey, Howard Kunreuther & Erwann Michel-Kerjan. [A Methodological Approach for Pricing Flood Insurance and Evaluating Loss Reduction Measures: Application to Texas](#). Wharton Risk Center, January 2012.
- Flynn, Stephen. [The New Homeland Security Imperative: The Case for Building Greater Societal and Infrastructure Resilience](#) Prepared for a hearing of the Committee on Homeland Security and Governmental Affairs U.S. Senate on "The Future of Homeland Security: Evolving and Emerging Threats." July 11, 2012
- Gao, Simin & Guifeng Shi. [Sweetening the Lemon with Fair Cost: Flaws of the U.S. Government's Toxic Asset Programs and Possible Legal Solutions](#). *The Banking Law Journal*, 29(4). 2012.
- Gelber, Alexander. [How do 401\(k\)s Affect Saving? Evidence from Changes in 401\(k\) Eligibility](#). *American Economic Journal: Economic Policy*, 3(4):103-122. 2011.
- Gino, Francesca, Alison Brooks & Maurice Schweitzer. [Anxiety, advice and the ability to discern: Feeling anxious motivates individuals to seek and use advice](#). *Journal of Personality and Social Psychology*, 2012.
- Gong, Min, Jonathan Baron & Howard Kunreuther. [Why do Groups Cooperate More than Individuals to Reduce Risks?](#) *Theory and Decision*, in press. (DOI) 10.1007/s11238-012-9318-3, 2012.
- Heal, Geoffrey & Howard Kunreuther. [Tipping Climate Negotiations](#) In: *Climate Change and Common Sense: Essays in Honour of Tom Schelling*. R. Hahn and A. Ulph (eds.) Oxford University Press, 2012.
- Kleindorfer, Paul R., Howard Kunreuther & Chieh Ou-Yang. [Single-Year and Multi-Year Insurance Policies in a Competitive Market](#), *Journal of Risk and Uncertainty*, 45(1) 2012.
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- Kunreuther, Howard & Erwann Michel-Kerjan. [People Get Ready: Disaster Preparedness](#). *Issues in Science and Technology*, a publication of the National Academy of Sciences, September 2011.
- Lin, Fern & Deborah A. Small. [Cheapened altruism: Discounting prosocial behavior by friends of victims](#). *Organizational Behavior and Human Decision Processes*, 117, 269-274. 2012.
- McCormick, Sabrina. [After the Cap: Risk Assessment, Citizen Science and Disaster Recovery in the 2010 British Petroleum Oil Spill](#). *Ecology and Society*, forthcoming.
- McCormick, Sabrina. [Disaster Distrust: Risk Assessment, Citizen Science and Technological Debates in the BP Oil Spill](#). In *Black Beaches and Bayous: The BP Deepwater Horizon Oil Spill*, L. Eargle and A. Esmail, eds. Lanham, MD: University Press of America.
- Meyer, Robert J. [Failing to Learn from Experience about Catastrophes: The Case of Hurricane Preparedness](#). *Journal of Risk and Uncertainty*, forthcoming.
- Michel-Kerjan, Erwann, Sabine Lemoine de Forges & Howard Kunreuther. [Policy Tenure under the U.S. National Flood Insurance Program \(NFIP\)](#). *Risk Analysis*, 32(4): 644-658. 2012.
- Orts, Eric W. [Climate Contracts](#), *Virginia Environmental Law Journal*, 29, 197 - 236. 2011.
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- Pope, Devin & Maurice Schweitzer. [Is Tiger Woods loss averse? Persistent bias in the face of experience, competition, and high stakes](#). *American Economic Review*, 101 (February), 129-157. 2011.
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- Yin, Haitao, Howard Kunreuther & Matthew W. White. [Does Private Insurance Reduce Environmental Accidents?](#) *Regulation. The Cato Review of Business and Government*, 35(2):36-46. 2012.



[Regulatory Breakdown: The Crisis of Confidence in U.S. Regulation](#)

Cary Coglianese, editor
University of Pennsylvania Press. 2012.
304 pages | 6 x 9 | 10 illus.
Cloth 2012 | ISBN 978-0-8122-4460-1 | \$49.95s
Ebook 2012 | ISBN 978-0-8122-0749-1 | \$49.95s

Regulatory Breakdown brings clarity to the heated debate over regulation by dissecting the disparate causes of the current crisis as well as analyzing promising solutions to what ails the U.S. regulatory system. This volume shows policymakers, researchers, and the public why they need to question conventional wisdom about regulation—whether from the left or the right—and demonstrates the value of undertaking systematic analysis before adopting policy reforms in the wake of disaster.

RISK CENTER IN THE NEWS

More at <http://www.wharton.upenn.edu/riskcenter/facultynews.cfm>

August 29, 2012, *CNN.com*, [The real trouble begins after Isaac is gone](#)

Op-ed by Stephen Flynn and Sean Burke. Public officials and emergency managers are getting good at getting people out of harm's way. Unfortunately, official plans are likely to fall short in helping evacuees to quickly get back on their feet.

August 17, 2012, *The Wall Street Journal*, [Failing to Learn from Hurricane Experience. Again and Again](#)

Research by Robert Meyer suggests that requiring consumers to opt out of flood insurance, rather than opt in, could ensure protection.

August 15, 2012, *The Wall Street Journal*, [The Cheater's High](#)

Research by Risk Center Fellow Maurice Schweitzer and Risk Center Ackoff Fellowship recipient Nicole Reudy examines "cheater's high."

August 8, 2012, *The Huffington Post*, [Why We Should Not \(Always\) Blame Congress](#)

Op-ed by Erwann Michel-Kerjan and Howard Kunreuther: The Biggert-Waters Flood Insurance Reform Act of 2012 significantly reforms the federally-run National Flood Insurance Program (NFIP) to ultimately help America become more resilient to future floods.

July 22, 2012, *Washington Post Online*, [Giving to get ahead](#)

Eric Orts notes, "For companies to take corporate social responsibility seriously, it has to be integrated into the DNA of the enterprise."

July 26, 2012, *Philly.com*, [Michael Useem and climbing the Everest of leadership](#)

Interview with Michael Useem on the failure of leadership globally.

July 15, 2012, *The Washington Post*, [Port security: U.S. fails to meet deadline for scanning of cargo containers](#)

Interview with Risk Center Fellow Stephen Flynn, an expert in container security: "The current system is woefully inadequate for stopping any determined adversary who wants to get a weapon of mass destruction into the United States."

July 5, 2012, *Bloomberg Businessweek Online*, [The Case for Way More Mandates](#)

Howard Kunreuther and Mark Pauly explain the rationale for insurance mandates.

Summer 2012, *Regulation (Cato Institute)*, [Does Private Insurance Reduce Environmental Accidents?](#)

Gas station underground tank leaks decreased when states switched from state-managed assurance programs to mandatory private insurance. Research by Haitao Yin, Howard Kunreuther and Matthew W. White.

June 19, 2012, *CFO.com*, [Human Error Triggers Rise in Catastrophe Cost](#)

Research by Howard Kunreuther (Wharton) and Geoffrey Heal (Columbia Business School) in their paper, "Managing Catastrophic Risk" explains that the escalating costs of disaster are more about flaws in human behavior and risk management than bad luck.

May 4, 2012, *Slate*, [An Ounce of Prevention ...](#)

Summary of Howard Kunreuther and Erwann Michel-Kerjan's entry to the Copenhagen Challenge 2012. "Policy Options for Reducing Losses from Natural Disasters" is an economic analysis of innovative solutions to mitigate the challenge of natural disasters in developing countries.

April 14, 2012, *CNN*, [Concerns over U.S. efforts to stop nuclear terror](#)

Risk Center Fellows Noah Gans and Stephen Flynn on their research on the feasibility of 100 percent scanning of cargo on shipping vessels.

February 8, 2012, *New York Times*, [Entrepreneur Pushes Chinese Role in Global Credit](#)

Anastasia Kartasheva addresses criticism of rating agencies.

January 24, 2012, *Risk & Insurance*, [Federal Flood Insurance Program Gets Extension](#)

Article cites [research](#) by the Wharton Risk Center's study on the National Flood Insurance Program and potential for private industry to consider supplementing the flood insurance offered by the government.

January 21, 2012, *The Wall Street Journal (Asia)*, [Is Income Disparity Slowly Fueling the Next Global Crisis?](#)

Op-ed by Erwann Michel-Kerjan and Kevin Lu on top risks outlined in the World Economic Forum's Global Risks Report 2012.

January 20, 2012, *Bloomberg Television's "Inside Track"* Video interview with Erwann Michel-Kerjan: the World Economic Forum's Risks Report 2012 notes that income disparity and fiscal imbalances are the most likely threats to global prosperity in the next decade.

January 17, 2012, *U.S. News and World Reports*, [Top 5 Global Risks for 2012](#)

Erwann Michel-Kerjan: "When most people think about risks, they think about sudden events like a terrorist attack or an earthquake,"

January 14, 2012, *The Economist*, [Counting the cost of calamities](#)

Article cites research by the Wharton Risk Center. Robert Meyer: "People have a tendency not to price rare, unpredictable events into their decisions, even if these may have catastrophic consequences."

January 11, 2012, *The New York Times*, [Economic Troubles Cited As the Top Risks in 2012](#)

Interview with Howard Kunreuther, Erwann Michel-Kerjan and co-authors of the World Economic Forum's Global Risk Report 2012.

December 20, 2011, *Insurance Journal*, [Study: Private Insurers Can Complement Nation Flood Insurance](#)

The Wharton Risk Center's research on the feasibility of private flood insurance is discussed in this article.

November 18, 2011, *NBC Nightly News*, [Extreme Weather Tied to Climate Change](#)

Risk Center Fellow Sabrina McCormick is interviewed in this report on the work of the Intergovernmental Panel on Climate Change.

October 10, 2011, *The Washington Times*, [Investors turn to 'catastrophe bonds' as hedge against uncertain market](#)

Erwann Michel-Kerjan is interviewed about ways to stabilize reinsurance prices.

October 1, 2011, *New York Times*, [Who Benefits From Federal Flood Aid?](#)

Op-ed by Howard Kunreuther on reforms to the National Flood Insurance Program.

In collaboration with our Research Sponsors ...

Travelers Companies

Having strong building codes in place in a community is frequently touted as a critical component to reducing total property damage due to natural disaster occurrence. However, not all jurisdictions equally enforce these codes once they have been adopted.

The Risk Center and **Travelers Companies, Inc.** are undertaking a research effort aimed at empirically testing whether municipalities with effective, well-enforced building codes demonstrate better loss experience in regard to the occurrence of natural disasters. The initial phase of the project, "*Quantifying the Role of Effective Building Codes in Minimizing Missouri Hail Damage*," is investigating hail claim data from 2008 to 2010 in the highly hail-impacted state of Missouri. While the primary focus of the research is on building code effectiveness ratings, the empirical modeling also controls for other relevant hazards, exposure, and vulnerability factors and thus should help to inform catastrophe loss modeling of hail damage.

Consolidated Edison Co. of NY

The Risk Center is working with **Con Edison** on an examination of some of the differing approaches currently taken in the utility industry to estimate impact and restoration times from storms. The research will provide initial academic recommendations on model design, merits and drawbacks of the different utility approaches considered in the study, relative value of differing approaches, and comparison to insurance industry models.

New Partner: The Hartford

The Wharton Risk Center is pleased to announce that **The Hartford** has joined the Center as a new partner. Christopher Lewis, Enterprise Chief Insurance Risk Officer of The Hartford notes: "The Hartford is a proud advocate of research designed to help society better understand and manage exposures to extreme events, and is pleased to partner with the Wharton Risk Center in the *Managing and Financing Extreme Events* initiative."

The Hartford Financial Services Group, Inc. is a leading provider of insurance and wealth management services for millions of consumers and businesses worldwide, consistently recognized for superior service, sustainability efforts and as one of the world's most ethical companies.

Willis Re

With support from the **Willis Research Network (WRN)**, the Risk Center is partnering on cross-disciplinary research efforts addressing the modeling of losses from tropical cyclones that better integrate the physical science aspects of this natural hazard with the socio-economic exposure. One project is in conjunction with WRN researchers at **Princeton University** who have developed a methodology to quantify inland flood magnitude stemming from a tropical cyclones. This inland flood hazard is then translated into expected economic losses utilizing access to NFIP flood claim data. The second effort is in conjunction with WRN researchers at the **National Center for Atmospheric Research** and the **University of Oxford** to assess existing modeling of hurricane damages and how this research is translated into predicting future damages under climate change projections.

Department of Homeland Security

Under a grant from the **U.S. Department of Homeland Security**, the **Center for Risk and Economic Analysis of Terrorism Events (CREATE)** and its project partners are undertaking research to enhance the security of the United States.

The Wharton Risk Center's contribution on *Enhancing Post-Disaster Economic Resiliency* provides the first empirical analysis of corporate demand for insurance coverage of catastrophic and non-catastrophic risks and quantify the key factors that explain which corporations are more likely purchase terrorism insurance. The Risk Center also analyzed homeowners' demand for flood insurance at the state and national levels utilizing the database of the federally run National Flood Insurance Program (NFIP) over the period 2000-2009.

The **Government of Chile** has appointed Michael Useem of the Wharton Center for Leadership, and Howard Kunreuther and Erwann Michel-Kerjan of the Wharton Risk Center as advisers to **Chilean President Piñera** and his Ministers on matters of catastrophic risk management. The team will produce a report on lessons learned from the management of the February 2010 earthquake and the recovery phase.

Become a Partner of the Wharton Risk Center

Research Sponsors and Corporate Associates are a vital part of the Wharton Risk Center's operations

In addition to providing crucial support for the Center's operations, **Corporate Associates** participate in roundtable discussions and offer insight into the value, direction and timing of research projects. **Research Sponsors** provide funding for specific research initiatives of mutual interest and regularly interact with Risk Center directors, faculty and fellows to discuss these initiatives. Associates and Sponsors attend our workshops and conferences at no cost. These meetings offer an opportunity to consult with experts and policy makers from research institutions, industry and government agencies from the U.S. and abroad.

The Risk Center is inviting interested organizations to become **Strategic Partners**. With a five-year commitment, Strategic Partners play a key role in the Center's research which can enable these organizations to impact the future of their industry. Strategic Partners will also benefit from greater visibility and customized relationships across the Wharton School through membership in the Wharton Partnership, Wharton's primary vehicle for fostering industry-academic collaboration.

Corporate Associate, Research Sponsorship, and Strategic Partnership contributions to the Risk Management and Decision Processes Center of the Wharton School are tax-deductible.

We thank our Corporate Associates, Research Sponsors and Strategic Partners for their support and involvement.

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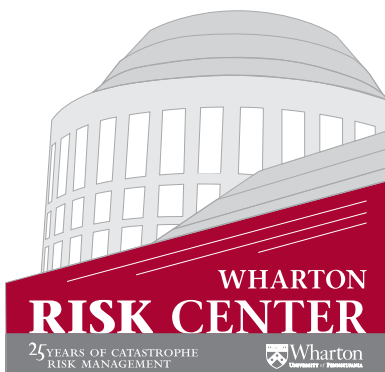
Or visit our website at <http://www.wharton.upenn.edu/riskcenter>

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Established in 1984, the Risk Management and Decision Processes Center at the Wharton School has been at the forefront of basic and applied research to promote effective corporate and public policies for low-probability events with potentially catastrophic consequences. The Wharton Risk Center has focused on natural and technological hazards through the integration of risk assessment and risk perception with risk management strategies. After the attacks of September 11, 2001, research activities were extended to include national security issues (e.g., terrorism risk insurance, protection of critical infrastructure).

Building on the disciplines of economics, finance, insurance, marketing, psychology and decision sciences, the Center's research program is oriented around descriptive and prescriptive analyses. Descriptive research focuses on how individuals and organizations interact and make decisions regarding the management of risk under existing institutional arrangements. Prescriptive analyses propose ways that individuals and organizations, both private and governmental, can make better decisions regarding risk. The Center supports and undertakes field and experimental studies of risk and uncertainty to better understand the linkage between descriptive and prescriptive approaches under various regulatory and market conditions.

In the past several years, the Center has significantly increased its size to now include 70 faculty, research fellows, students and visiting scholars to undertake large-scale initiatives.

Providing expertise and a neutral environment for discussion, the Center team is also concerned with training decision makers and promoting a dialogue among industry, government, interest groups and academics through its research and policy publications and through sponsored seminars, roundtables and forums. Our newsletter and issue briefs provide updates of Center activities and publications.

Risk Center on the World Wide Web

Wharton Risk Management and Decision Processes Center
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