

Reauthorizing the National Flood Insurance Program

Congress has the opportunity to make this program more transparent, more cost-effective, more equitable, and more appealing to property owners.

Since 1968, the federal government has provided flood insurance to homeowners residing in flood-prone areas through the National Flood Insurance Program (NFIP) which is under the jurisdiction of the Federal Emergency Management Agency (FEMA). The NFIP is scheduled to be reauthorized this year, and this provides an opportunity to make changes to the program that will improve its effectiveness.

When the NFIP was created, communities that wanted to participate had to first agree to adopt flood insurance rate maps (FIRMs) that delineate flood risk zones, and specify building codes and land-use regulations to reduce future water-related damage. Flood insurance premiums on existing homes in flood-prone areas were highly discounted to maintain property values and encourage residents to purchase coverage; properties constructed after the FIRMs were in place were charged risk-based premiums.

During the first five years of the program, relatively few homeowners purchased coverage, leading Congress to pass the Flood Protection Act of 1973, which created a mandate for vulnerable property owners to purchase flood insurance. Today, all properties located in a mapped 100-year floodplain, designated as a Special Flood Hazard Area (SFHA), are required to purchase flood insurance if they have a mortgage or loan from a federally backed or regulated lender.

In July 2012 (three months before Hurricane Sandy), Congress passed the Biggert-Waters Flood Insurance Reform Act of 2012 (BW12) which required that the NFIP gradually remove insurance premium discounts so that properties would eventually be charged premiums that reflected their flood risk. Soon after becoming law, however, BW12 faced significant challenges from many homeowners who felt that their premium increases were unjustified and unfair. Many contended that the flood maps were inaccurate and

that they could not afford the increased cost of flood insurance. Hence, in March 2014, Congress passed the Homeowner Flood Insurance Affordability Act, which slowed some rate increases, halted others altogether, and led to two reports by the National Research Council (NRC) on how to deal equitably with issues of affordability if accurate risk-based premiums are enacted.

Although over the past decade flooding and tropical cyclones have caused an annual average of \$200 billion in damage in the United States, the penetration rate for flood insurance in SFHAs remains surprisingly low. Only 49% of residences in these areas are insured against damage from floods despite mandates to purchase coverage, as lending intuitions have not enforced this requirement. In areas outside the SFHA, where flood insurance is not required, the purchase rate is much lower.

The massive damage and disruption from hurricanes Harvey, Irma, and Maria in the fall of 2017 has highlighted the importance of encouraging protection against future damage from urban flooding, also, a hazard that is currently not considered in FEMA's flood maps. Few individuals had protected themselves against damage from these disasters by investing in loss-reduction measures or purchasing flood insurance. More specifically, FEMA estimated that prior to Harvey, only 15% of residents in Harris County, Texas, had flood insurance, and fewer than half of homeowners in Florida were protected against the losses they experienced from Irma. Fewer than 1% of households in Puerto Rico had flood insurance from the NFIP when Hurricane Maria devastated the island, so it is not surprising that there have been only \$125,000 in NFIP claims for flood-related damage from this hurricane.

Not only do relatively few homeowners purchase flood insurance, but they also do not invest in cost-

effective risk-reduction measures. In a survey of 893 residents in coastal counties from southeastern Louisiana to northeastern New Jersey during Hurricane Isaac and Superstorm Sandy in 2012, a large majority of respondents reported undertaking at least one storm preparation activity, but these were mainly short-term preparation actions that required limited effort and cost, such as buying batteries, food, and water reserves. Only slightly more than half of the respondents who had purchased shutters to reduce wind- and water-related damage from hurricanes actually installed them. This lack of preparation is even more disturbing given that many residents expected the storms to be more severe than they actually were. Residents viewed the likelihood of their experiencing hurricane-force winds to be five times greater on average than the probabilities provided by the National Hurricane Center.

Given that many homeowners in areas of the United States subject to flood and hurricanes are inadequately protected against these hazards, I propose two principles to guide the reauthorization of the NFIP. Moreover, recognizing that individuals are not accustomed to making decisions under risk and uncertainty and are prone to rely on simplified rules of thumb that lead them to underprepare for disasters, we need to design and enact strategies that will guide individuals to undertake cost-effective protective measures.

Guiding principles

Insurance spreads risk across all policyholders, each of whom pays a relatively small premium so insurers can cover the large losses suffered by a few. Policyholders who invest in loss-reduction measures should be rewarded with lower premiums because their expected claims payments from flood-related disasters are lower than they would be if they had not invested in such measures.

When designed this way, insurance provides economic incentives to undertake preventive measures prior to a disaster while at the same time providing financial benefits in the form of claim payments after a disaster. Certain states, including Alabama, California, Florida, Louisiana, Maryland, Mississippi, New York, South Carolina, and Texas have laws requiring companies to offer premium discounts for certain hazard-mitigation measures, or have state insurance programs that offer such discounts. For example, as of 2006, all residential property insurance companies in Florida are required to offer premium discounts to policyholders that have hardened or reinforced their homes against wind damage. Qualifying measures include actions such as securing a roof with hurricane

clips or wraps and installing impact-resistant glass on windows and openings.

An important feature of properly designed insurance programs is that risk-based premiums not only provide transparent information to those residing in hazard prone areas as to the degree of risk they face, but can also incentivize property owners to reduce future losses. For insurance to play this role today with respect to natural hazards, two guiding principles deserve consideration:

Premiums should reflect risk. *Insurance premiums should be based on risk to provide individuals with accurate signals as to the degree of hazard they face and to encourage them to engage in cost-effective adaptation measures to reduce their vulnerability.*

Accurate flood maps are necessary to set risk-based insurance premiums. Congress responded to this need when it formed a Technical Mapping Advisory Council (TMAC) in 2012 to assess concerns about the current flood mapping program's credibility and to present its findings to FEMA. In its December 2015 annual report, the TMAC recommended that "FEMA should transition from identifying the 1-percent-annual-chance floodplain and associated base flood elevation as the basis for insurance rating purposes to a structure-specific flood frequency determination." In other words, premiums should reflect the reality that the risk of damage to a structure is influenced not only by where it is, but also by whether it incorporates features that reduce flood damage.

This recommendation is in line with a June 2015 NRC report on pricing premiums for negatively elevated structures (that is, where the elevation of the lowest floor including basement is lower than the water level anticipated in a 100-year flood). The NRC report concluded that "current NFIP methods for setting risk-based rates do not accurately and precisely describe critical hazard and vulnerability conditions that affect flood risk for negatively elevated structures."

As noted above, accurate flood maps are needed not only for the highest-risk areas but also for other areas subject to flooding, such as Baton Rouge, Louisiana, and Houston, Texas, which suffered major damage from rain-driven flooding in 2015 and 2017. In fact, FEMA notes that more than 20% of flood claims come from properties located outside the SFHA. Accurate flood maps, coupled with elevation data on individual structures, provide information on the likelihood of floods of different depths that could cause damage to the structure, its contents, and critical systems such as the air conditioning and heating units.

The task of developing accurate flood maps can be aided today with remote sensing technologies, such as LIDAR (Light Detection and Ranging). They enable

scientists and mapping professionals to examine both natural and manmade environments with accuracy, precision, and flexibility so they can determine the likelihood of damage to the different structures from potential floods. A recent analysis of three counties in North Carolina found significant differences between the current NFIP premiums and the premiums calculated with the more-accurate measurements that used LIDAR.

Cost estimates by the Association of State Flood Plain Managers for developing accurate flood maps for the entire country are in the range of \$4.5 to \$7.5 billion with annual maintenance costs of \$116 to \$275 million. As technology improves these estimates are likely to fall considerably. With accurate maps in place, FEMA and other interested parties will then be able to communicate the nature of the flood risk to all residents whose property is subject to inundation.

At this time, private insurers provide few policies compared to the 5 million managed by the NFIP. In order for the private sector to be interested in offering a significant amount of flood insurance, accurate flood maps, such as those developed in North Carolina, will be needed throughout the country to specify risk-based premiums.

Principle 2: Dealing with fairness and affordability. *Any special treatment given to low- and middle-income individuals currently residing in hazard-prone areas who cannot afford risk-based premiums should come from general public funding rather than through insurance premium discounts. Means-tested vouchers have been proposed for this purpose. To reduce government expenses, homeowners can be incentivized to invest in cost-effective loss reduction measures through long-term loans and well-designed building codes.*

Risk-based premiums provide essential signals to homeowners on how serious their flood hazard may be, but the cost of insurance can cause economic hardship to some individuals. One way to maintain risk-based premiums while at the same time addressing issues of fairness and affordability is to offer means-tested vouchers or tax credits that cover part of the cost of insurance. Several existing federal efforts could serve as models for developing such a voucher system: the Supplemental Nutrition Assistance Program, the Low Income Home Energy Assistance Program, and Universal Service Fund for phone service. A recent RAND study recommends that those whose total housing costs, including flood insurance premiums, exceed a certain percentage of their income be provided with financial assistance.

As a condition for the voucher, the property owner could be required to invest in cost-effective loss-

reduction measures. A study of homeowners in Ocean County, New Jersey, reveals that investing in prevention reduces insurance premiums significantly and thus lowers the cost to the government. Funding to provide vouchers could be obtained from several different sources such as general taxpayer revenue, state government, or taxes on insurance policyholders.

Although the overall societal benefit of making homes less vulnerable to flood damage is apparent, homeowners normally perceive the upfront costs of investing in flood protection measures to be much higher than the resulting expected benefits from reduced damages. If the cost to elevate a home is \$25,000 or more, many homeowners will have little desire to undertake this project, particularly if they perceive the likelihood of future floods as below their threshold level of concern.

One way to overcome homeowner reluctance to undertake expensive protective measures is to offer long-term low-interest loans that spread the upfront costs over time. For example, Connecticut initiated its Shore Up CT program in July 2014 to help residential and business property owners in vulnerable locations to elevate buildings, retrofit properties with additional flood protection and wind-proofing improvements. This state program, the first of its kind in the United States, enables homeowners to obtain a 15-year loan ranging from \$10,000 to \$300,000 at an annual interest rate of 2 $\frac{3}{4}$ percent. This is a step in the right direction, but to be fully successful it must be linked to insurance policies that provide reduced rates to homeowners who invest in protective measures.

To illustrate this point, consider a homeowner in Ocean County, New Jersey, who would have to pay \$25,000 to elevate her coastal property from 3 feet below Base Flood Elevation (BFE) to one foot above BFE to reduce storm surge damage from hurricanes. If flood insurance is risk-based, an annual risk-based premium of \$4,000 would decrease to \$520 for the elevated home. A 15-year loan for \$25,000 at an annual interest rate of 2 $\frac{3}{4}$ % would cost the homeowner \$2,040 a year. The combined cost of repaying the loan and the reduced premium would be \$2,560, a significant savings compared to the \$4,000 annual premium.

Expensive protective measures might be necessary for existing homes, but the more cost-effective solution is to make homes safer when they are built by establishing rigorous standards. Following Hurricane Andrew in 1992, Florida reevaluated its building code standards and in 2001 enacted the Florida Building Code (FBC), the strongest statewide building code in the United States. A study of the difference in damage from hurricanes in Florida during the period from 2001

to 2010 found that homes built to FBC standards suffered 53% less water- and wind-related damage than homes built prior to the enactment of the FBC. Although it costs more to build to FBC standards, the expected reduction in damage across the life of the home reveals that for every dollar of increased construction costs there is an average savings of two to eight dollars in expected damage reduction.

Designing a behavioral risk audit

An insurance program can succeed only if consumers are willing to purchase the insurance, hence the design of an insurance program must recognize that consumers are not driven strictly by actuarial tables. In fact, a large body of cognitive psychology and behavioral decision research over the past fifty years has revealed that decision makers are often guided not by cost-benefit calculations but by emotional reactions and simple rules of thumb that have been acquired by personal experience. This is not the best way to make choices about purchasing insurance. Daniel Kahneman highlights the differences between intuitive thinking and deliberative thinking in his book, *Thinking, Fast and Slow*. In deciding whether to undertake protective measures for floods, relying on one's intuition may be problematic if one has limited or no past experience with extreme events. To design an effective insurance program it is necessary to understand and counter the primary biases that lead homeowners to underinvest in insurance and preventive measures. Some of these biases are listed in Box 1.

BOX 1. SYSTEMATIC BIASES CHARACTERIZING INTUITIVE THINKING

1. **Myopia** – the tendency to focus on overly short future time horizons when appraising immediate costs and the potential benefits of protective investments
2. **Amnesia** – the tendency to forget too quickly the lessons of past disasters
3. **Optimism** – the tendency to underestimate the likelihood that losses will occur from future hazards
4. **Inertia** – the tendency to maintain the status quo or adopt a default option when there is uncertainty about the potential benefits of investing in alternative protective measures
5. **Simplification** – a tendency to selectively attend to only a subset of the relevant facts to consider when making choices involving risk
6. **Herding** – the tendency to base choices on the observed actions of others
(For more detail, see *The Ostrich Paradox: Why We Underprepare for Disasters*.)

One way to deal with these biases is to conduct a behavioral risk audit. It starts by characterizing how individuals are likely to perceive risks and why they might not focus on the likelihood and consequences of the risk in the same way that an expert would. We then need to develop strategies that work *with* rather than *against* people's risk perceptions and natural decision biases. A good guide is "choice architecture" proposed by Richard Thaler and Cass Sunstein in their book, *Nudge*. Choice architecture frames choices in ways that lead individuals to pay attention to the risk. When risk communication is combined with short-term economic incentives, individuals are likely to consider investing in protective measures that reduce the potential consequences of future flood-related events.

Strategies that would address systematic biases derived from intuitive thinking are outlined below. The output of a behavioral risk audit will not be a single remedy for enhancing preparedness, but rather a suite of measures. The policy recommendations of the behavioral risk audit are also likely to evolve over time as the nature of the risk changes and innovative protective strategies emerge.

Myopia. *Provide low-interest loans coupled with a reduction in insurance premiums to reflect the lower expected claims.* This incentive can provide net economic benefits to the homeowner annually and will overcome the concern that the upfront cost is too expensive to justify the measure. If the reduction in the annual insurance premium is greater than the yearly cost of the loan, there will be a financial savings to the property owner immediately after the protective measures is implemented.

Amnesia. *Offer multiyear insurance policies tied to the property to avoid the tendency for homeowners to cancel their insurance after not experiencing a claim for a few years.* The insurance policy would carry an annual risk-based premium that would remain stable over the length of the contract. With a multiyear insurance contract, insurers would have an incentive to inspect the property over time to make sure that building codes are enforced, something they would be less likely to do with annual contracts.

Optimism. *Stretch the time horizon when presenting information on the likelihood of a flood occurring to avoid having individuals treat the likelihood of a disaster next year as below their threshold level of concern.* Homeowners are more likely to take the risk seriously when told that living in a 100-year flood location means that one has a greater than one-in-four chance of experiencing a flood in the next 30 years. FEMA has recently recognized the importance of communicating the flood risk in this manner.

Inertia. *Add flood coverage to a standard homeowners' policy, which is normally required as a condition for a mortgage.* The tendency not to move from the status quo when making financial decisions implies that default options can play an important role in influencing choices. Property owners would be informed that they may opt out of flood insurance if they don't want this protection. Homeowners who were under the misimpression that their standard homeowners' policy covered water-related damage would likely want to maintain this coverage as would others concerned with their flood risk. If lenders and real estate agents indicate that this coverage will give them full protection against both wind and water damage from hurricanes, there is a good chance that many individuals will decide to maintain the flood insurance rider to their homeowner's policy.

We have empirical evidence that this strategy works. In the early 1990s, New Jersey and Pennsylvania offered car owners the opportunity to buy either lower-priced policies that carried a limited right to sue in the case of an accident or a higher-priced policy that had no such restriction. In New Jersey, the default was the plan with the limited right to sue, while in Pennsylvania, the opposite held. This difference had a huge effect on policy preferences; in Pennsylvania, only 30% of drivers opted to restrict their right to sue, but in New Jersey, where such an option was the default, 79% maintained the status quo.

Simplification. *Present worst-case scenarios that illustrate the financial impact of being uninsured and experiencing severe flood damage to switch attention from a focus on the low likelihood of such a disaster to its potential consequences.* Receiving information on the potential financial consequences of a disaster may lead homeowners to consider purchasing insurance and investing in protective measures rather than treating the flood as below their threshold level of concern.

Herding. *Develop social norms for protection.* A 2013 study of the factors that caused Queenslanders to buy flood insurance found that the purchase was highly correlated with whether residents believed there was a social norm for the insurance. In other surveys of homeowners in flood and earthquake-prone areas, one of the most important factors determining whether a homeowner purchased earthquake or flood insurance was discussions with friends and neighbors rather than considering the perceived likelihood and consequences of a future disaster occurring. One option for encouraging homeowners to invest in protective measures would be to offer a certificate of flood-readiness if the property passes a rigorous inspection. The certificate could be perceived as enhancing the home's desirability and value.

The recommendations proposed in the behavioral risk audit reinforce the need to prepare now for future flood-related disasters. An important first step in encouraging individuals to protect themselves against possible damage from future storms and hurricanes is for Congress to provide significant funding for more accurate flood maps in reauthorizing the National Flood Insurance Program (NFIP). It is essential that residents in flood-prone areas be provided with accurate information on the degree of risk they face, the steps they can take to reduce their future losses, and how insurance can protect them should they suffer severe damage. For such a program to be successful requires the support and interest of real estate and insurance agents, banks and financial institutions, builders, developers, contractors, and local officials concerned with the safety of their communities. If these interested parties recognize the importance of reauthorizing the NFIP to adhere to the guiding principles for insurance, we are likely to be more successful in financially protecting property owners in hazard-prone areas and reducing flood-related losses in the future.

Howard C. Kunreuther is the James G. Dinan Professor of Decision Sciences and Business and Public Policy at the University of Pennsylvania's Wharton School and co-director of the Wharton Risk Management and Decision Processes Center.

Recommended reading

- Kahneman, Daniel (2011). *Thinking, Fast and Slow*. New York: Farrar, Straus and Giroux.
- Kousky, Carolyn (2018). "Financing Flood Losses: A Discussion of the National Flood Insurance Program." *Risk Management and Insurance Review* (forthcoming).
- Kunreuther, Howard, John Dorman, Scott Edelman, Chris Jones, Marilyn Montgomery and John Sperger (2018). "Structure Specific Flood Risk Based Insurance" *Journal of Extreme Events* (in press)
- Meyer, Robert J., Jay Baker, Kenneth Broad, Jeff Czajkowski, and Ben Orlove (2014). "The dynamics of hurricane risk perception: Real-time evidence from the 2012 Atlantic hurricane season." *Bulletin of the American Meteorological Society* 95(9): 1389-1404.
- Meyer, Robert, and Howard Kunreuther (2017). *The Ostrich Paradox: Why We Underprepare for Disasters*. Wharton Digital Press.
- Thaler, Richard and Cass Sunstein (2008). *Nudge: The Gentle Power of Choice Architecture*. New Haven, CT: Yale University Press.