

FIXING A BROKEN NATIONAL FLOOD INSURANCE PROGRAM: RISKS AND POTENTIAL REFORMS



June, 2012

by Dan Huber,
Center for Climate and Energy Solutions

The National Flood Insurance Program (NFIP) insures 5.6 million American homeowners and some \$1 trillion in assets. For many years, however, the premiums collected have not been sufficient to cover losses, resulting in a current debt to the U.S. Treasury of more than \$18 billion. A number of factors, including increased flooding as a result of climate change, are likely to further widen the gap between revenue and risk. Reforms are needed to put the NFIP on the path to solvency and to reduce homeowners' exposure to chronic and catastrophic flooding risk. Ideally, such reforms should fully account for the increased risks posed by climate change. At a minimum, steps are needed to adjust premiums, improve flood mitigation measures, and prepare for the catastrophic risk of events like Hurricane Katrina.

■ INTRODUCTION

With government budgets still reeling from the effects of the recent recession, and ongoing debates over the future costs of Medicare and Social Security, unfunded public liabilities are of growing concern. The National Flood Insurance Program (NFIP) is one such liability that is often overlooked. The NFIP is already significantly in debt due to premiums that have not reflected the true risk of flood damages. Looking forward, the risk of further losses only increases, as demographic trends place

more infrastructure in harm's way, watersheds are developed and climate change increases flood risk over time.¹

This paper explores the structural issues underlying the growing gap between flood insurance premiums and actual flood risk. It also examines reforms that can put the program on a more sound financial footing and the incentives needed to reduce the potential costs of future flooding. A report by the American Enterprise Institute

found that insurers have “a huge opportunity today to develop creative loss-prevention solutions.”² Using both adaptive and financial tools to manage the rising risks posed by climate change will be critical to preventing losses and maintaining the insurability (and therefore property values) of trillions of dollars in at-risk property assets.

Between 1980 and 2005, U.S. insurers paid out a total

of \$320 billion in weather-related insurance claims.³

While not all weather-related claims are flood claims, losses from weather events are increasing.⁴ Today, the NFIP covers over \$1.2 trillion in assets, representing more than a fourfold increase since 1980.⁵ If providing this coverage is to remain affordable, Congress must provide FEMA with the tools to accurately price and manage risk

■ FLOOD RISK IN THE PRIVATE SECTOR

Historically, it is the public sector, and not the private sector, that has generally covered the vast majority of flood risk. Flood risk is generally unpalatable to the private sector due to a number of factors:

- Losses are strongly clustered through space and time;
- Major events account for the vast majority of losses;
- Only the riskiest property owners buy insurance;
- Properly priced (i.e. risk-appropriate) premiums are regarded as overpriced by consumers;
- High premium prices increase policy abandonment, which further increases prices; and
- Flood insurance requires that large amounts of capital be kept on hand.

Increasing risk due to climate change has exacerbated the impact of these factors and has made private insurer participation even less likely. Insurance companies prefer risks that occur independently in consistent numbers year to year. This allows insurers to spread the risk across the consumer pool and across time, thereby charging the appropriate premium to each participant. Climate change threatens to make extreme weather risk subject to ever increasing losses—a poor business proposition. But even in the absence of climate change, flood insurance defies these requirements for private market operation. In contrast, fire risk is generally held privately as most fires are contained locally and the amount of damage incurred from fires is fairly consistent year to year, allowing insurers to charge appropriate premiums and make a consistent profit.

Currently, the private residential flood insurance

market is very small, with size estimates ranging between 100,000 and 200,000 policies underwritten by private insurers.⁶ These policies satisfy the mandatory purchase requirement for flood insurance as required by federally-backed lenders and meet or exceed the coverage provided by the NFIP. For some homeowners, these policies can provide more flexible terms at competitive rates. Private insurers also write a sizeable number of gap policies, perhaps bringing the total number of privately underwritten contracts to as many as 260,000.⁷ These policies do not increase the total number of houses covered by flood insurance, but rather add to the coverage from an existing NFIP policy when a lender determines that NFIP coverage is insufficient. The existence of this market at the lower risk margins of the NFIP pool is evidence that private insurance has a role to play, but that it remains unlikely to provide the level of affordable, broad coverage that the NFIP does.

Private flood insurance would only be widely feasible if insurers were able to lower their capital costs and transfer catastrophic and clustered risk elsewhere through reinsurance or securitization. However, even if these conditions were met, private insurers would still be unlikely to offer coverage at a price competitive with the NFIP. The NFIP retains some notable advantages, namely that it has no profit requirement and, as part of the federal government, it has access to a much larger pool of money at very low interest rates and would presumably require smaller reinsurance purchases. Reinsurance or securitization has a role to play under either scenario, by taking on risks that are simply too large for the individual insurer to handle. For the NFIP, this would include relocating the risk of truly crippling events such as Hurricane Katrina onto global capital markets.

■ THE NATIONAL FLOOD INSURANCE PROGRAM

The National Flood Insurance Program was created in 1968 in response to a series of findings that revealed the true level of flood risk in the United States. Prior to 1968, flood losses were dealt with on an ad-hoc basis by the federal government through direct payments. Various attempts to deal with flood risk in a more systematic manner had been attempted and proven ineffective. The Flood Control Act of 1936 was passed to build a massive structural flood control apparatus⁸ but losses of life and property continued to mount, and assistance to victims grew unabated. Congress then considered a national flood insurance mechanism incorporating the private sector, but determined that flood risk is generally uninsurable in the private sector at a price that consumers are willing to pay.

In 1968, Congress created the NFIP to reduce the costs of taxpayer-funded disaster relief efforts by using premiums collected from flood-prone homeowners to pay out on any loss incurred. Federally-backed flood insurance was made available to residents in communities that chose to participate in the program. Today, the NFIP insures 5.6 million homeowners, renters and business owners across the United States in flood-prone areas, generating around \$2.3 billion in annual premiums and offering coverage up to \$250,000 for residential buildings and \$500,000 for commercial buildings.⁹¹⁰

The program was given a mandate of affordability and availability to affected communities across the country. Participation in the NFIP is conditionally available to communities nationwide with few exceptions. Within participating communities, flood insurance is generally available everywhere except for areas covered by the Coastal Barrier Resources Act (COBRA). COBRA areas bar the federal government from having any financial role in new development, and as such, flood insurance is only available to buildings that existed prior to the COBRA designation, not new construction.

For all other areas, the only general condition to participating in the program is that communities agree to enforce floodplain management requirements within “Special Flood Hazard Areas” (SFHA), defined as the area subject to a 1percent annual chance of flood. The floodplain management requirements were designed to prevent new development from increasing the flood risk

and to protect existing buildings. Communities participating in the NFIP must require permits for all new development in the SFHA and the lowest floor of all residential development must be above the base (100-year) flood elevation.¹¹ It is estimated that 70 percent to 85 percent of communities are in compliance with NFIP regulations, but on-site inspections are rare.¹²

Despite seeming to provide a solution to the coupled issue of repetitive taxpayer-funded disaster relief and inadequate private insurance, the NFIP suffers from large deficits and crippling interest payments, which were estimated at over \$400 million annually¹³ despite lower claims rates since the 2005 hurricane season.¹⁴ It is apparent from the level of debt that programmatic income is not commensurate with the level of risk the government is assuming. Although the pre-FIRM (Flood Insurance Rate Map) subsidy is not available to new construction, premiums are still priced below private sector rates, thereby offering below-market coverage to development in areas that are both environmentally sensitive and have high disaster risk, placing further financial burdens upon the NFIP.^{15,16} In 1966, the Presidential Task Force on Federal Flood Control Policy warned that:

A flood insurance program is a tool that should be used expertly or not at all. Correctly applied it could promote wise use of flood plains. Incorrectly applied, it could exacerbate the whole problem of flood losses. For the Federal Government to subsidize low premium disaster insurance or provide insurance in which premiums are not proportionate to risk would be to invite economic waste of great magnitude.

In practice, rates have been proven to fall far short of covering risks as Congress has displayed little appetite to authorize rate increases. As the NFIP’s own *Actuarial Rate Review* observed, “it is currently impractical for the NFIP to be actuarially sound in the aggregate.”¹⁷ Homes built before the advent of the NFIP are charged a lower rate – 35 percent to 40 percent of what FEMA considers actuarial risk.¹⁸ But even the FEMA-defined “full-risk premiums” charged to properties that are newly constructed fail to cover the true risk.¹⁹ Flood maps must

be regularly updated in order to cover ongoing changes to risk, yet much of the data used to estimate the probability of flooding has not been updated since the 1980s and the rate-level maps remain out of date. FEMA also does not map for long-term erosion, which is a significant flooding hazard to some buildings.²⁰ Moreover, climate change, improved understanding of inter-annual climate variability, and natural changes mean that highly damaging flooding is now more likely than the historical record would indicate. Outdated risk maps and damage assumptions result in distorted premiums even before subsidies are taken into account.

One recent analysis illustrates the concern that SFHA maps do not accurately reflect risk in some areas. In ten states, average claims were higher in low-risk X zones that lack a mandatory purchase requirement than in high risk-coastal V zones. This imbalance in claims occurs despite premiums that are four times higher in V zones than X zones.²¹ This implies that large losses occur outside of SFHAs and that many additional uninsured properties are likely at risk. However, these differences in premiums could be due to stricter flood mitigation measures in high-risk areas or grandfathered properties that exist in a high-risk zone, but are categorized as low risk.

In response to these issues, FEMA has begun to update maps through the Risk Mapping, Assessment, and Planning (Risk MAP) program to address gaps in flood hazard data. This project aims to provide a foundation for risk assessment, floodplain management and flood mitigation. New products include improved analytical tools for assessing the probability and economic consequences of flooding as well as a greater emphasis on public engagement tools.²² In addition, FEMA will continue to update FIRMs to reflect constantly changing flood hazards.

However, remapping alone will not solve many of the issues with underpriced premiums. When a structure is remapped into a higher zone, it is “grandfathered” and retains its previous lower rate, while structures that are remapped into lower risk areas receive a discount.²³ This property can retain its grandfathered status even if it is sold, so long as the building is continuously insured.²⁴ Like the directly subsidized rates, these grandfathered structures do not generate sufficient premiums to cover expected losses, but the size of this hidden subsidy is unknown, as FEMA does not retain information on grandfathered properties, nor measure their financial

impact.²⁵ This grandfathering policy, in practice, guarantees that the number of structures receiving hidden subsidies will continue to increase as maps are continually updated, thus systematically lowering premiums relative to the updated risk, the opposite of what is needed to correct the problem. The intent of the original legislation was to phase in FEMA-defined full-risk based rates over time, but this shift has been slow to occur. Indeed, the number of subsidized policies has continued to increase over the past two decades, even while the percentage of subsidized policies has been cut in half, due to large increases in total insured properties.^{26,27}

The problem has been further exacerbated by the extension, from one to two years, of the preferred risk policy program for structures that have been mapped from low-risk areas into Special Flood Hazard Areas with a mandatory purchase requirement. For these structures, which do not fall under the “grandfathered” category since they did not previously purchase insurance, the lowest-cost flood insurance policy is made available, regardless of the real level of flood risk.²⁸ The result of these grandfathered and subsidized rates is a cross-subsidy from homeowners in low-risk areas to homeowners in high-risk areas. If the prospect of a Congressional appropriation to cover the NFIP’s debt (as has occurred in the past) and federal disaster relief money is taken into account, insufficient premiums to cover risk represents a massive taxpayer subsidy to at-risk homeowners.

It has been estimated that between 1978 and 2004 (pre-Katrina) the NFIP’s claims and expenses on full-risk policies exceeded premium income by about 5 percent. For the full 28 years of data through 2006, the NFIP grossed \$12.6 billion in premiums while spending \$24.2 billion in claims and expenses, a staggering shortfall primarily due to catastrophic risk exceeding premium levels.²⁹ FEMA expects to pay out about \$1.3 billion per year, but this amount is inadequate especially when exceptional loss years are included.³⁰ For example, claims from hurricanes Katrina, Rita and Wilma totaled \$20.7 billion, an unprecedented single-year sum.³¹ As a result, the 2005 hurricane season greatly exceeded the NFIP’s financial reserves, a key financial risk that drives private insurers away from the flood market. FEMA’s financial overrun forced Congress to authorize borrowing from the Treasury beyond the program’s specified credit line. The ability to be temporarily insolvent is an advantage the NFIP possesses, but with the program over \$18 billion in

debt, there is little prospect of repayment at current premium levels.^{32,33}

FEMA sets actuarial rates on the basis of a theoretical rate model consisting primarily on the probability of a water surface elevation relative to the region's 100-year base flood elevation (PELV) and the ratio of the flood damage to the value of the insurable property (DELV). Historical data is only used to generate the expected damage curves, not probability curves. For the probability of flooding, models of frequency curves are used, which are truncated around the 350-to-500-year level due to uncertainty. Each risk zone has its own PELV curve profile based on calculations made by engineers and hydrologists at various federal agencies such as the U.S. Army Corps of Engineers and private engineering firms. Minor factors included in the rate model include deductible offset, under-insurance factor, loss adjustment expense factor and a contingency loading of 10 percent in non-V Zones and 20 percent in V Zones. It is notable that V Zones are the only NFIP zone to fully cover claims and expenses since 1978 despite being located directly on the coast.³⁴

FEMA estimates catastrophe loss based on flood damage models. These models use elevation data and regionally regressed historical data, but do not include climate change projections to model the risk of catastrophic loss. Damages from Hurricane Katrina were

incorporated into the process by correlating water levels to damage totals. However, Katrina's damages were far in excess of most large flood events since flood waters did not recede following the event, saturating homes and multiplying damages. Due to these unusual circumstances and the rarity of a Katrina-type storm, losses were weighted at the hundred-year level (1percent) for the purposes of setting subsidized premiums. Therefore, Katrina only affected rates insofar as it changed historical average loss, which is the level of losses that the NFIP aims to cover in a given year. Subsidized premium rates are set such that the overall program (including actuarial) premiums are sufficient for the *historic* average loss year, if not the *long-term* loss rate, which includes catastrophic years. Weighting Katrina as an equal year among that data record would result in a historical average loss that is near the expected equilibrium long run level of losses, thereby virtually eliminating subsidies if the program were to maintain its policy of covering historic loss levels. However, eliminating subsidies as the result of equation output was considered to be a significant enough change that only an act of Congress could authorize it; therefore FEMA rated Katrina on an interim basis as a hundred-year event, in an attempt to strike a balance between preserving subsidies and reflecting the events of 2005 in premium levels.³⁵

■ PARTICIPATION IN THE NATIONAL FLOOD INSURANCE PROGRAM

Insurance programs work best when there is wide participation in the market, inclusive of both high- and low-risk individuals, yet market penetration statistics are mostly unknown to the NFIP. However, there is evidence of a lack of market participation by both high- and low-risk homeowners. Homes that are located within SFHAs and have a federally regulated mortgage are required to purchase insurance, but only 75 percent to 80 percent of homes in this category actually have coverage, although this number varies widely across the country.³⁶ Moreover, it is generally unclear which buildings are actually inside flood hazard areas. In a 2002 review, Fannie Mae randomly selected 9,500 loans and asked four flood determination companies to indicate whether the buildings were inside or outside SFHAs. For 68 percent of the buildings, one or more companies disagreed on the

location or the flood status.³⁷ For this reason, along with the difficulty in translating between street maps and flood maps and the lack of monetary incentive for accuracy, flood determinations are often inexact.³⁸

Despite this uncertainty, it is estimated that 80 percent to 90 percent of homes with mortgages in a SFHA are subject to the mandatory purchase requirement, indicating that around 50 percent to 60 percent of all homes in SFHAs are subject to the mandatory purchase requirement.³⁹ More precise statistics are unavailable because the Department of Commerce does not collect data on unregulated lending activity, thus it is difficult to accurately determine the proportion of mortgages that are subject to the mandatory purchase requirement.⁴⁰ Among homeowners outside SFHAs that are not required to purchase insurance but are still exposed to flood risk,

only around 20 percent buy coverage, indicating that many potential flood victims lack insurance.⁴¹ For example, after a flood in Vermont in 1998, FEMA discovered that 84 percent of the flooded homes in the SFHAs lacked flood insurance even though 45 percent were required by their federally-backed lender to have coverage.⁴²

Some buildings in mandatory purchase areas lack insurance due to the high nonrenewal rate of flood insurance coverage after the first year of a loan.⁴³ Research has indicated that the median tenure of new policies enacted between 2001 and 2009 is between two and four years, indicating that many households are allowing their coverage to lapse soon after purchasing it.⁴⁴ This tenure rate is fairly stable over time and among various levels of flood hazard, although households with minor flood claims are more likely to keep insurance for longer while households with major claims allow coverage to lapse sooner.⁴⁵ Enforcing insurance requirements falls to mortgage holders, which generally lack the capacity to ensure continued compliance. In addition, mortgages are often transferred between banks, removing incentive from the original lender to ensure compliance. The president of the National Lenders' Insurance Council once observed that the mandatory purchase requirement "creates an adverse selection process fraught with perplexing, inconsistent and sometimes unworkable rules that create seemingly endless customer service and compliance issues." Furthermore, many agents and insurers view flood risk as so remote that the time required to become familiar with the issue is not justified.⁴⁶

Lenders are only required to verify that a property is insured when a loan is modified, not when an area is remapped, meaning that when an actual change in flood status occurs (such as during remapping) lenders do not ensure that homeowners comply with the adjustment. However, if a lender "becomes aware" during a loan that flood insurance is now required, they must enforce purchase, but few lenders monitor map changes or have internal capacity to make SFHA designations. Some private companies offer "life-of-loan" flood determinations where lenders will be notified of the consequences of map revisions to bridge this gap, but not all lenders utilize this service. Lenders should be interested in protecting assets through flood insurance, but no flood-related legislation requires that loan

portfolios be reviewed for flood risk even when lenders are known to be significantly exposed, meaning that flood risk may not be clearly reflected in the price of a mortgage asset.⁴⁷

Lenders who do not comply with flood insurance regulations are subject to civil fines from whichever federal authority they are regulated under. Fines are limited to \$350 per violation and \$100,000 per institution, although each regulatory agency has a slightly different fine structure and applies penalties on an ad hoc basis. Fines are only levied when there is a "pattern or practice of violation," not individual infractions.⁴⁸ Fines had been imposed on 95 companies through 2004, with the Federal Deposit Insurance Corporation accounting for 60 of these civil penalties. These penalties are intended to force lenders to comply with federal regulations, but there is little evidence they are successful.

Flood insurance, in general, has an adverse selection bias where only homeowners that perceive their flood risk to be high buy insurance and few homeowners expect to be flooded. Due to the NFIP's affordability mandate, the lack of price differentiation between properties means that the highest risk properties are the most heavily subsidized and homeowners that have either undertaken mitigation measures or live in a lower-risk area do not receive adequate premium relief to induce them to buy insurance. Hence, under-pricing premiums for high-risk homeowners has the unintended consequence of systematically limiting participation rather than accomplishing the intent of increasing overall coverage.

The NFIP suffers additional moral hazard in that homeowners who haven't participated in the NFIP often receive federal disaster relief. FEMA's Individuals and Households Program (IHP) provides money to repair and rebuild homes to people specifically when losses have not been covered by insurance. Historically, over 80 percent of federal disaster relief funds have gone toward weather-related events and both the number of declared events and expenditures of inflation-adjusted dollars have increased substantially since the 1950s.⁴⁹

The result of these skewed incentives is a program that has a highly risky pool of insured properties that is heavily weighted towards repetitive loss and high-risk locations but does not collect premiums at rates that comport with the risk. It is estimated that 1 percent of policies are responsible for 25 percent to 30 percent of losses and the number of repetitive-loss properties has increased by 50

percent in just the last decade.^{50,51} This increase is spread over the decade and is not concentrated in any single anomalous year, such as 2005.⁵² This number is likely to rise as increases in sea level and rainfall intensity push properties into the repetitive-loss category. A forthcoming study by FEMA finds that the effects of climate change must be more directly incorporated into the various aspects of the NFIP.⁵³

However, evidence is limited that increases in the market penetration rate of flood insurance result in lower amounts of disaster assistance. A RAND study found that the number of single-family unit flood insurance policies in force in an area has no effect on disaster assistance expenditure. The analysis did suggest that the number of flood insurance policies in force had a negative effect on the size of disaster payments, but this effect was tiny, with a 10 percent increase in market penetration only causing a .22 percent reduction in family assistance grants.⁵⁴ In

■ RISK MITIGATION IN THE NFIP

Risk mitigation aims to lessen damages when floods do occur by increasing resilience to flooding and has the additional benefit of helping to prepare homes and businesses for climate change. Mitigation can include restoring wetlands, elevating buildings or improving flood defenses. The potential appears to exist to substantially reduce risks through mitigation measures. One study found that simply enforcing existing building codes on all residential property could reduce damages by 61 percent in Florida from a 100-year hurricane and by 31 percent in New York for a 500-year loss.⁵⁶

The NFIP does require that communities adopt floodplain management regulations that meet or exceed minimum levels. Floodplain management ordinances specify when building permits are required, ensure that new development does not increase flooding elsewhere and require mitigation standards for new building construction. Mitigation measures include materials requirements as well as standards for building elevation and flood-proofing. Local communities enact and enforce these requirements. However, municipalities have little incentive to tighten standards beyond what is required by the NFIP. Disaster risk does not factor into municipal bond ratings as the combination of state and FEMA disaster aid typically reimburses between 80 percent and

addition, this effect was only found for the relatively small part of disaster assistance that directly overlaps with the insurance coverage available from the NFIP.

This calls into question the effectiveness of the entire program, since the NFIP was originally created to help reduce the cost of federal disaster assistance for flooding and the wisdom of increasing NFIP participation as a means to control disaster assistance costs. A possible explanation for this relationship would be if people who receive disaster assistance were only those who lack the means to buy flood insurance, but per capita income also has no effect on levels of disaster assistance. It is unlikely that increasing flood insurance market penetration would cause substantial reductions in disaster assistance because statistically, areas with high flood insurance uptake rates receive virtually the same amount of federal disaster assistance as areas with low uptake rates.⁵⁵

100 percent of expenses, blocking the risk price signal from reaching municipalities. A common outcome from a natural disaster is actually the revitalization of the local economy and infrastructure from incoming rebuilding and reconstruction funds.⁵⁷

Unfortunately, residents of flood-prone areas are also generally reluctant to invest in mitigation measures beyond what is required by the NFIP even when these measures have a net positive value to the homeowner.⁵⁸ A survey in May of 2006 revealed that 83 percent of residents of the Atlantic and Gulf coasts had taken no adaptive measures to bolster defenses against flooding and a majority of individuals had no plan in case of a disaster.⁵⁹ Even after seeing the devastation of Hurricane Katrina, residents still continue to resist implementing mitigation measures. In some cases, inaction may be rational if homeowners intend to sell the property in the near future and buyers will not value mitigations, or if there is a pervasive moral hazard at work where government subsidies will cover losses regardless of the level of risk mitigation undertaken by the homeowner. However, for residents who intend to stay in their homes for an extended period, and live in a community that achieves premium discounts through the community rating program, it would be irrational not to pursue lower

premiums through collective mitigation actions. From a societal perspective, the costs of risk mitigation are likely to be far less than continued reliance on disaster relief payments.

The community rating system (CRS) is a voluntary incentive program that encourages community-based flood management practices. Premium rates are discounted for the community based on three goals: reduced flood losses, facilitation of accurate insurance ratings, and promoting the awareness of flood insurance.⁶⁰ Communities are awarded points depending on their actions and residents in these communities receive discounts between 0 and 45 percent depending on their point totals, as long as the community remains in compliance with NFIP minimum hazard-reduction requirements. Points are awarded on the basis of public information, mapping and regulations, flood damage reduction and flood preparedness. Only about 5 percent of NFIP communities participate in the CRS and the vast majority of those are at the lower discount levels.⁶¹ Only one community nationally has received the highest discount level and only nine communities receive discounts above 25percent.⁶²

Increasing participation in the CRS program could significantly reduce flood risk, since CRS-participating communities account for 62 percent of NFIP policies, 55 percent of premiums and 38 percent of losses. Communities reported that factors that inhibit successful participation are lack of commitment and resources at the community level, poor communication, and lack of local institutional knowledge. FEMA currently estimates that the CRS saves policyholders \$94 million annually in reduced premiums and prevents \$1 billion per year in damages, but the FEMA Office of Inspector General concluded that there is “very little definitive data to substantiate that participation in CRS reduces flood losses and/or disaster costs.”⁶³ Many of the factors that the CRS awards points for are not risk-correlated, meaning that implementation of these steps does not reduce monetary losses. The CRS incentivizes things that are good public

policy, but not all recommended actions incentivize loss-reducing mitigation. This mix of incentives for risk- and non-risk-correlated activities can undermine private sector market participation since private insurers can only lower costs for risk-correlated mitigation measures, not activities that solely represent beneficial public policy.

A range of physical adaptation options are available for households beyond the collective CRS framework. Elevating properties on stilts by 50cm is estimated to reduce future average losses from coastal flooding by 60 percent and 150cm stilts reduce future average losses by 95 percent, although mitigation is not always cost-effective, even at very high damage reduction levels.⁶⁴ Other mitigation options include reinforced foundations and cladding that ensure structural integrity during a flood or protecting vulnerable home electrical and mechanical systems. Dry-proofing areas of a home that are below the projected flood level to make them water-tight is effective for mild flooding, but not for major floods where the pressure of the water will collapse the home.

If all mitigation measures were taken, future losses could be reduced to 3 percent of present-day levels.⁶⁵ Mitigation is even more important when considering the climate-related risk of increased hurricane intensity and relative sea-level rise. A study by Lloyd’s estimated that if aggressive mitigation actions were implemented, expected losses in the 2030’s could be reduced to less than the present-day losses, even after accounting for the increase in climate change risk.⁶⁶

Therefore, maintaining the long-term fiscal solvency of the NFIP is feasible, but only with a combination of increased participation in the program, accurate risk-based pricing, and much more aggressive mitigation of flood risk. Incentives for greater risk mitigation could drastically reduce future losses and potentially make the current premium levels reflective of actuarial risk, and thereby avoid raising rates. The main barriers to risk mitigation are the upfront costs of mitigation measures and lack of enforcement of existing building codes and participation mandates.

■ POTENTIAL REFORMS

To be fiscally sound, the NFIP needs to increase premiums to reflect full risk. Over time, these

adjustments must accurately reflect the increased flooding risk posed by climate change. In coastal V zones,

a combination of sea-level rise, erosion and land subsidence will cause properties to flood more often and inundate areas that previously did not flood. Changing frequency of storms also has the potential to render previous assumptions about surge recurrence inaccurate. For inland and riverine areas, which historically already face the greatest shortfalls between premiums and risk, the increasing frequency of heavy rainfalls threatens to expand this deficit. Recent floods in 2008, 2010 and 2011 placed significant strain up on the NFIP and prevented the program from making headway in repaying the debt incurred from Hurricane Katrina.

In order to ensure that the NFIP remains financially viable into the future, assessments of risk cannot continually lag upward adjustments in the true level of risk. Allowing FEMA to take the best climate projections into account when updating maps and setting premium levels is imperative to ensure the program's long-term solvency.

Even without directly addressing the looming climate deficit in the program, however, fundamental reforms are needed. Simply closing the current loopholes that allow underpriced premiums and increasing participation and building standards would go a long way towards reducing the NFIP's deficit. Such steps also would help improve preparedness for climate change.

Introducing full risk-based rates to properties that have been subsidized will undoubtedly cause significant financial pain to homeowners, some of whom cannot afford the expense and have been led to believe by current pricing practices that their historic rates are appropriate. A separate plan to provide needs-based subsidies with tax dollars, independent of the risk rates, would both communicate to homeowners their risk level as well as ease the burden on low-income homeowners that have unknowingly been subsidized.

More effective enforcement is an obvious way to address the low participation rate in the NFIP but it is unclear whether FEMA has the capacity to take on a greater enforcement role. Another option would be to shift from one-year policies to long-term insurance that is tied to the property. With the current year-long contracts, residents often buy insurance after a major disaster and then do not keep the coverage after a disaster fails to occur for several years. One study of single-family homes in Florida found that one-third of homeowners cancel

their coverage after two years and two-thirds cancel after 5 years.⁶⁷

Long-term insurance would offer a fixed premium for coverage in flood-prone areas and the policy would stay attached to the property even if the homeowner sold, thus ensuring that coverage persists. Thus, long-term insurance (along with tougher enforcement) would increase the pool of participants over which risk would be spread, improving fiscal certainty for the homeowner and for the NFIP program at large. A potential issue with long-term insurance is that uncertain estimates of the true level of long-term risk combined with a non-stationary climate would result in higher premiums to account for these unknowns, while yearly contracts can be continually adjusted. Long-term contracts are difficult to price, and therefore insurers are forced to be conservative (expensive), potentially undermining the uptake of policies in the first place.

However, the strongest argument for enforcing long-term insurance is to tie it to risk-mitigation measures. Currently, mitigation has a high upfront cost with uncertain benefits in the future. If the mitigation measure is cost-effective, a financial deal could be structured such that the annual cost of the loan is less than the discount in the flood insurance premium, thereby lowering the homeowner's net annual costs.⁶⁸ This premium reduction would reflect the lower risk level to taxpayers and increase the value of the property to future owners.⁶⁹ Like the insurance policy, the loan would have to stay attached to the house in the event of a sale, forcing the buyer to share the cost of mitigation with the seller. Using this financial structure, the incentive for homeowners to adapt coincides with a reduction of risk level and a lower burden on the state.

Even without long-term flood insurance, mitigation measures could be enhanced by tightening local building codes and increasing the base flood elevation from the 100-year level to the 500-year level. As a testament to the power of building standards, post-FIRM (after building standards were implemented) premiums average an unsubsidized \$491 while subsidized pre-FIRM premiums average \$1200 per year. Further enhancing building codes to the 500-year level would put additional downward pressure on premium costs. Mitigation is often prohibitively expensive to retrofit on older construction; therefore any building code change would likely only apply to new construction, leaving a considerable stock of

older buildings at risk.

In addition to reducing homeowners' exposure to flood risk, the risk burden on the federal government could be shared with the private sector through reinsurance. With the correct mechanisms, private capital markets should be of sufficient size to absorb the risk.⁷⁰ The NFIP could directly purchase reinsurance from private providers or seek the placement of catastrophe bonds. Catastrophe bonds are securities that are sold to investors through an investment bank. They are generally rated to be highly risky assets, but have high returns as long as catastrophe trigger conditions are not met. In the event that the catastrophe triggers are met, bondholders lose their principal and it is used to pay disaster claims. There is already a market for catastrophe bonds, but the terms surrounding the trigger conditions are generally very specific, meaning that they are most suitable for truly massive events in highly developed locales.⁷¹ A

■ CONCLUSIONS

History is no longer a good guide for future expectations about extreme weather losses and catastrophic losses threaten to increase in frequency. Current problems with the NFIP will only be exacerbated as the climate warms and risk levels increase. Premiums must reflect risk in order to send a strong price signal to homeowners about the level of risk to which they are currently exposed and to incentivize mitigation actions. The reforms proposed above are widely supported in the literature and represent a consensus among academe

combination of traditional reinsurance and catastrophe bonds would likely provide the maximum relief to the NFIP.

In order to enact reinsurance policies, the NFIP would work to provide the market with an evaluation of its risk exposure, while private entities would introduce their own risk assessments and compete to sell reinsurance to the NFIP. Where FEMA found bids from private entities enticing, a deal could be struck to transfer the risk away from taxpayers. Utilizing the private market has the additional benefits of bringing private-sector risk assessment into the NFIP and providing coverage against the catastrophic risk that is to blame for the majority of the deficit. If catastrophic loss were reinsured, the NFIP's average loss accounting would be sufficient to cover claims during normal years, as long as the cost of purchasing reinsurance is fully covered by the premiums.

(Michel-Kerjan, Kunreuther and Kousky), government agencies (GAO, FEMA) and the private sector (Nutter). Longer-term flood insurance and reinsurance are promising options that could both serve to place the NFIP on more solid fiscal ground as well as improve resilience to flooding. In the long run, using the program to create incentives for greater mitigation could substantially reduce federal liability, reduce costs to property owners, increase property values, and reduce the costs of climate change.

■ ENDNOTES

1 Kousky and Kunreuther, (2010, March 1). Improving Flood Insurance and Flood-Risk Management: Insights from St. Louis, Missouri. *Natural Hazards Review*, Vol. 11.

2 Kunreuther and Michel-Kerjan, (2009, January 15). Market and Government Failure in Insuring and Mitigating Natural Catastrophes: How Long-Term Contracts Can Help. Washington D.C., USA: American Enterprise Institute Conference on Private markets and Public Insurance Programs

3 Stephenson, John B., (2007). Financial Risks to Federal and Private Insurers in the Coming Decades Potentially Significant. Washington D.C., USA: United States Government Accountability Office

4 Kunreuther and Michel-Kerjan, Market and Government Failure in Insuring and Mitigating Natural Catastrophes: How Long-Term Contracts Can Help. Op. Cit.

5 Michel-Kerjan, Forges and Kunreuther, (2011). Policy Tenure Under the U.S. National Flood Insurance Program (NFIP). *Risk Analysis*.

6 Dixon, Clancy, Bender and Ehrler, (2007). The Lender-Placed Flood Insurance Market for Residential Properties. Santa Monica, CA, USA: RAND Corporation

7 Ibid.

8 Parrillo, Sandra, (2011, March 11). Statement to House Financial Services Committee hearing on The National Flood Insurance Program. Washington D.C. USA: National Association of Mutual Insurance Companies, Before the House Financial Services Committee on Financial Services Subcommittee on Insurance, Housing and Community Opportunity

⁹ Lehmann, Evan, (2012, June 25). Senate poised to vote on global warming as a consideration in flood insurance. *ClimateWire*, E&E News

10 Gordon, Andrew K., (2009). How the NFIP, Insurance Law and Climate Change Could Cause the Perfect Storm. Retrieved October 4, 2011, from <http://www.riskandinsurance.com/story.jsp?storyId=174286003>

11 Monday, Grill, Esformes and Eng, (2006). An Evaluation of Compliance with the National Flood Insurance Program Part A: Achieving Community Compliance. Washington D.C. USA: American Institutes for Research

12 Ibid.

13 Current (2012) interest rates are lower meaning current payments are below \$400 million

14 Property Casualty Insurers Association of America. National Flood Insurance (NFIP): The Need for Long-Term Solutions. Retrieved October 4, 2011, from <http://bit.ly/oAHfdx>

15 Pew Oceans Commission, (2003). America's Living Ocean, Charting a Course for Sea Change. Washington D.C. USA: Pew Trusts

16 Nutter, Franklin, (2011 March 11). Legislative Proposals to Reform the National Flood Insurance Program. Washington D.C. USA: Reinsurance Association of America, Before the House Financial Services Committee on Financial Services Subcommittee on Insurance, Housing and Community Opportunity

17 Hayes and Neal, (2011 October 1). Actuarial Rate Review In Support of the Recommended October 1, 2011, Rate and Rule Changes. National Flood Insurance Program, FEMA

18 Brown, Orice Williams, (2010). National Flood Insurance Program Continued Actions Needed to Address Financial and Operational Issues. Washington D.C. USA: United States Government Accountability Office

19 Ibid.

20 Ibid.

-
- 21 Tobin and Calfee, (2005). The National Flood Insurance Program's Mandatory Purchase Requirement: Policies, Processes, and Stakeholders. Washington, D.C. USA: American Institutes for Research
- 22 Fugate, Craig, (2011 March 11). Legislative Proposals to Reform the National Flood Insurance Program. Washington D.C. USA: Federal Emergency Management Agency, Before the House Financial Services Committee on Financial Services Subcommittee on Insurance, Housing and Community Opportunity
- 23 Brown, Orice Williams. National Flood Insurance Program Continued Actions Needed to Address Financial and Operational Issues. Op. Cit.
- 24 FEMA, (2010). NFIP Grandfather Rules- A Fact Sheet for Insurance Agents. Retrieved May 2, 2012, from: <http://www.fema.gov/library/viewRecord.do?id=3745>
- 25 Ibid.
- 26 Nutter, Franklin. Legislative Proposals to Reform the National Flood Insurance Program. Op. Cit.
- 27 United States Government Accountability Office, (2011). Options for Addressing the Financial Impact of Subsidized Premium Rates on the National Flood Insurance Program. Washington D.C. USA
- 28 Fugate, Craig. Legislative Proposals to Reform the National Flood Insurance Program. Op. Cit
- 29 Congressional Budget Office, (2009). The National Flood Insurance Program: Factors Affecting Actuarial Soundness. Washington D.C. Congress of the United States
- 30 Nutter, Franklin. Legislative Proposals to Reform the National Flood Insurance Program. Op. Cit.
- 31 Plunkett, Travis, (2011 June 23). Reauthorization of the National Flood Insurance Program. Washington D.C. USA: Consumer Federation of America, Before the Committee on Banking, Housing and Urban Affairs of the United States Senate
- 32 Another issue is that during bad years, private insurers through the "Write-your-own" (WYO) program take as much as 65 percent of premium revenue. This denies the NFIP much needed income, at the time the program most needs resources. Even during good years, the WYO companies absorb a third of premiums, an amount as much as three times losses paid out. Additionally, the WYO program creates a conflict of interest with wind claims, shifting additional costs onto the NFIP. *Testimony of J. Robert Hunter, Director of Insurance, Consumer Federation of America Before The Committee on Banking, Housing and Urban Affairs of the United States Senate Regarding An Examination of the National Flood Insurance Program. (2007)*
- 33 Michel-Kerjan and Kunreuther, (2011 July 22). Redesigning Flood Insurance. Science. Vol. 333
- 34 Congressional Budget Office, The National Flood Insurance Program: Factors Affecting Actuarial Soundness. Op. Cit.
- 35 Hayes and Neal. Actuarial Rate Review. Op. Cit.
- 36 Dixon, Clancy, Seabury and Overton, (2006). The National Flood Insurance Program's Market Penetration Rate. Arlington, VA USA: RAND Corporation
- 37 Tobin and Calfee. The National Flood Insurance Program's Mandatory Purchase Requirement: Policies, Processes, and Stakeholders. Op. Cit.
- 38 Ibid.
- 39 Dixon, Clancy, Seabury and Overton. The National Flood Insurance Program's Market Penetration Rate. Op. Cit.
- 40 Tobin and Calfee. The National Flood Insurance Program's Mandatory Purchase Requirement: Policies, Processes, and Stakeholders. Op. Cit.
- 41 Dixon, Clancy, Seabury and Overton. The National Flood Insurance Program's Market Penetration Rate. Op. Cit.
- 42 Kunreuther and Michel-Kerjan, (2009). Encouraging Adaptation to Climate Change: Long-Term Flood Insurance.

Resources for the Future

43 Tobin and Calfee. The National Flood Insurance Program's Mandatory Purchase Requirement: Policies, Processes, and Stakeholders. Op. Cit.

44 Michel-Kerjan, Forges and Kunreuther. Policy Tenure Under the U.S. National Flood Insurance Program (NFIP). Op. Cit.

45 Ibid.

46 Tobin and Calfee. The National Flood Insurance Program's Mandatory Purchase Requirement: Policies, Processes, and Stakeholders. Op. Cit.

47 Ibid.

48 Ibid.

49 Public Entity Risk Institute. Peri Presidential Disaster Declaration Site. Retrieved October 4, 2011 from <http://www.peripresdecusa.org>

50 Nutter, Franklin. Legislative Proposals to Reform the National Flood Insurance Program. Op. Cit.

51 It should also be noted that 14percent of policies represent 100 percent of losses.

52 Congressional Budget Office. The National Flood Insurance Program: Factors Affecting Actuarial Soundness. Op. Cit.

53 Lehmann, Evan, (2011 July 22). Flood-Prone Land Likely to Increase by 45 percent– a Major Challenge to Federal Flood Insurance Program. Retrieved October 4, 2011, from New York Times: <http://nyti.ms/nRA1Id>.

54 Dixon, Clancy, Seabury and Overton. The National Flood Insurance Program's Market Penetration Rate. Op. Cit.

55 Ibid.

56 Kunreuther and Michel-Kerjan. Encouraging Adaptation to Climate Change: Long-Term Flood Insurance. Op. Cit.

57 Tournier, Brian, (2011 August 25). Municipal Market Comments Natural Disasters Not a Threat to Muni Ratings. Montage Investments

58 Kunreuther, Howard, (2006). Disaster Mitigation and Insurance: Learning from Katrina. Annals of the American Academy of Political and Social Science, Vol. 604

59 Kunreuther and Michel-Kerjan. Encouraging Adaptation to Climate Change: Long-Term Flood Insurance. Op. Cit.

60 Federal Emergency Management Agency. FEMA: Community Rating System. Retrieved October 4, 2011 from <http://www.fema.gov/business/nfip/crs.shtm>

61 Federal Emergency Management Agency Office of Inspector General, (2002). Community Rating System: Effectiveness and Other Issues. Washington D.C. USA

62 Federal Emergency Management Agency, Community Rating System. Retrieved October 4, 2011, from <http://www.fema.gov/library/viewRecord.do?id=3629>

63 Federal Emergency Management Agency Office of Inspector General. Community Rating System: Effectiveness and Other Issues. Op. Cit.

64 Lloyd's , (2008). Coastal Communities and Climate Change: Maintaining Future Insurability. London, United Kingdom: 360 Risk Project

65 Ibid.

66 Ibid

67 Michel-Kerjan and Kousky, (2009). Come Rain or Shine: Evidence on Flood Insurance Purchases in Florida. *Journal of Risk and Insurance*

68 Kunreuther and Michel-Kerjan, (2009 March). The Need for Long-Term Flood Insurance and Mitigation Loans. *Natural Hazards Observer*

69 United States Government Accountability Office, (2009). Flood Insurance Options for Addressing the Financial Impact of subsidized Premium Rates on the National Flood Insurance Program. Washington D.C. USA: Report to the Ranking Member, Committee on Banking, Housing, and Urban Affairs, U.S. Senate

70 Nutter, Franklin. Legislative Proposals to Reform the National Flood Insurance Program. Op. Cit.

71 Keogh, Sues and Westbrook, (2011 April 21). The Trouble with Catastrophe Bonds. Retrieved October 6, 2011, from Bloomberg Businessweek: <http://buswk.co/fdXhEv>



The Center for Climate and Energy Solutions (C2ES) is an independent nonprofit organization working to promote practical, effective policies and actions to address the twin challenges of energy and climate change.

2101 WILSON BLVD. SUITE 550 ARLINGTON, VA 22201 703-516-4146

C2ES.ORG