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THESIS

MORAL HAZARD: HOW THE NATIONAL FLOOD INSURANCE PROGRAM IS LIMITING RISK REDUCTION

by

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Moral hazard occurs when people do not assume the full risk of an action or decision; they are not inclined to make a fully responsible or moral choice. Over the course of the last half-century, federal government involvement in providing disaster assistance has greatly expanded. With this expansion, many believe that in providing disaster assistance, the federal involvement limits risk reduction and contributes to the rise of a moral hazard.

Flooding and flood-related hazards are the most prominent and significant hazards in the United States, accounting for the highest percentage of major disaster declarations and direct economic losses. The National Flood Insurance Program (NFIP) aims to reduce the impact of flooding through hazard identification and risk assessment, floodplain management, and flood insurance.

A study of the NFIP concludes that aspects of the program limit risk reduction, specifically the continued coverage of repetitive loss properties and use of subsidies to desensitize risk. Furthermore, the long-term sustainment and resilience of the program are compromised by failures of policymakers to adjust for catastrophic losses. Identification of these issues provides a framework for consideration of the unintended consequences of federal government involvement in providing disaster assistance.

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MORAL HAZARD: HOW THE NATIONAL FLOOD INSURANCE PROGRAM IS LIMITING RISK REDUCTION

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TABLE OF CONTENTS

LIST OF FIGURES

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LIST OF TABLES

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LIST OF ACRONYMS AND ABBREVIATIONS

BFE	base flood elevation (The elevation of surface water resulting from a flood that has a one percent chance of equaling of exceeding in any given year; sometimes referred to as the 100-year flood elevation.)
BW-12	Biggert-Waters Flood Insurance Reform Act of 2012
CAC	community assistance contact
CAV	community assistance visit
CRMA	Climate Resilient Mitigation Grant
CRS	Community Rating System
DRF	disaster recovery fund
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FIS	flood insurance study/survey
FMA	Flood Management Assistance grant program
FMAG	Fire Management Assistance Grants
FY	fiscal year
GAO	U.S. Government Accountability Office
HFIAA	Homeowner Flood Insurance Affordability Act of 2014
HMGP	Hazard Mitigation Grant Program
ICC	increased cost of compliance (additional NFIP flood insurance coverage that covers structural improvements to bring a property into compliance with floodplain management requirements)
NFIF	National Flood Insurance Fund
NFIP	National Flood Insurance Program
PDM	Pre-Disaster Mitigation Grant Program
PRP	Preferred Risk Policy (NFIP flood insurance policies for moderate to low hazard zones (zones B, C, and X))
RL	repetitive loss
SFHA	Special Flood Hazard Area (the SFHA is comprised of high hazard zones (zones A and V))
SFIP	standard flood insurance policy
WYO	Write Your Own (NFIP)

U.S.	United States
100-year flood	Definition of a flood that statistically has a one percent chance of occurring in any given year; alternatively referred to as the base flood event
500-year flood	Definition of a flood that statistically has a 0.2 percent chance of occurring in any given year

EXECUTIVE SUMMARY

Moral hazard is a concept that originated in the early insurance industry with broad application in economics, law, and policy debate. Moral hazard is defined as when people do not assume the full risk of an action or decision; people are not inclined to make a fully responsible or moral choice; how the redistribution of risk changes people's behavior.[1] Many commentators have asserted that government involvement in providing disaster assistance contributes to the rise of a moral hazard, thus limiting the incentive of people to reduce risk.[2] This thesis seeks to explore how federal involvement in providing disaster assistance limits risk reduction and contributes to the rise of a moral hazard through a study of the National Flood Insurance Program (NFIP).

Flooding and flood-related hazards are the most prominent and significant hazards in the United States and account for the highest percentage of major disaster declarations and direct economic losses. The NFIP was created as a mitigation program with the goal of preventing future loss of life and property from the hazard of flooding. The NFIP consists of three main elements that include flood hazard identification and risk assessment, floodplain management, and flood insurance. As provided by Federal Emergency Management Agency (FEMA), "overall, the program reduces the socio-economic impact of disasters by promoting the purchase and retention of general risk insurance, but also of flood insurance, specifically."[3]

While the NFIP has generally remained fiscally solvent for much of its history, the catastrophic losses associated with the impacts of 2004, 2005, 2008, and 2012 hurricane seasons have generated $24 billion in debt to the U.S. Treasury and revenue is

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1 David Rowell and Luke B. Connelly, "A History of the Term 'Moral Hazard,'" *Journal of Risk and Insurance* 79, no. 4 (2012): 1061.

2 Carolyn Kousky and Leonard Shabman, "The Hazard of the Moral Hazard—Or Not," *Natural Hazards Observer* XXXVII, no. 5 (2013): 1.

3 Federal Emergency Management Agency, "The National Flood Insurance Program," May 20, 2016, https://www.fema.gov/national-flood-insurance-program.

unlikely to cover future catastrophic losses or repay the billions of dollars in debt.[4] Analysis of NFIP program elements that permit repetitive loss and provide flood insurance subsidies underscore policies to limit risk reduction. Furthermore, failures by policymakers to structure the NFIP for catastrophic losses constrains the sustainability of the program.

In participating communities, the NFIP offers structural and content flood insurance coverages, with regulators identifying repetitive losses as a significant concern. FEMA data indicates that from 1978 through 2015, 3.8 percent of policyholders have filed for repetitive losses, accounting for a disproportionate 35.5 percent of flood loss claims and 30.5 percent of claim payments.[5] FEMA estimates that 90 percent of repetitive loss properties receive pre-flood insurance rate map (FIRM) or grandfathered subsidies.[6] Moreover, NFIP policies specifically prevent FEMA from refusing coverage to any policyholder, and FEMA cannot compel property owners to mitigate losses or impose actuarial rates on repetitive loss properties as a penalty.[7]

The majority of flood insurance policies are based on full-risk rates established through FEMA's annual NFIP actuarial rate review. However, approximately 20 percent of policies are based on pre-FIRM subsidized or grandfathered insurance rates and pay 40 to 45 percent of the full-risk premium needed to fund the long-term expectation of loss.[8] Congress authorized the use of subsidized flood insurance rates to encourage participation and prohibits unfairly penalizing homeowners who built before the

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4 U.S. Government Accountability Office, *Forgone Premiums Cannot Be Measured and FEMA Should Validate and Monitor Data System Changes* (GAO-15-111) (Washington DC: U.S. Government Accountability Office, 2014), http://www.gao.gov/assets/670/667413.pdf, 2.

5 Federal Emergency Management Agency, "Policy & Claim Statistics for Flood Insurance," June 7, 2016, https://www.fema.gov/policy-claim-statistics-flood-insurance; Federal Emergency Management Agency Region VI, FEMA NFIP Repetitive Loss Report (Denton, TX: Federal Emergency Management Agency, Region VI, 2016).

6 Rawle O. King, *National Flood Insurance Program: Background, Challenges, and Financial Status* (Washington DC: Congressional Research Service, 2011), https://www.fas.org/sgp/crs/misc/R40650.pdf, 18.

7 Ibid., 18.

8 Thomas L. Hayes and D. Andrew Neal, *National Flood Insurance Program Actuarial Rate Review: In Support of the Recommended October 1, 2011 Rate and Rule Changes* (Washington DC: Federal Emergency Management Agency, 2011), http://www.fema.gov/media-library-data/20130726-1809-25045-6893/actuarial_rate_review2011.pdf, 9, 34.

participation and prohibits unfairly penalizing homeowners who built before the government completed the assessment of flood risk.[9] NFIP policies exempt pre-FIRM properties from compliance with floodplain management regulations unless they are substantially damaged or undergo substantial improvement.[10] The continued coverage of repetitive loss properties and the subsidizing of flood insurance policies represents one of the clearest and most obvious indicators of the NFIP limiting risk reduction and contributing to the rise of a moral hazard.

The NFIP is not structured to withstand claims and losses associated with catastrophic flood events; it relies on the borrowing authority with the U.S. Treasury to cover excessive losses.[11] Significant loss events currently average 64 percent of claims and 84 percent of losses for the NFIP. The impact of significant loss events is clearly a threat to the long-term sustainment of the NFIP. Policymakers must address the fiscal challenges facing the program, placing it on a sounder financial framework to allow for improved management of the program when faced with significant loss events. The shortcomings of policymakers in addressing the sustainment of the NFIP presents a parallel argument that there is moral hazard in the current policymaking environment. It can be argued that when policymakers limit the sustainability of the NFIP to historical average losses versus catastrophic losses, they fail to provide for the long-term resilience of the program.

In conclusion, aspects of the NFIP limit risk reduction and contribute to the rise of a moral hazard. Specifically, NFIP policies that support continued coverage of repetitive loss, use of subsidies to desensitize risk, and failure to adjust for catastrophic losses all impact the sustainability and resilience of the program. These findings have important consequences for the broader domain of evaluating the unintended consequences of

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9 Rawle O. King, *Federal Flood Insurance: The Repetitive Loss Problem* (Washington DC: Congressional Research Service, 2005), https://www.fas.org/sgp/crs/misc/RL32972.pdf, 14.

10 "Substantial Damages and Substantial Improvements," YouTube video, posted by Gary Taylor, October 15, 2014, https://www.youtube.com/watch?v=Wt3lMwCRhd0&list=PLADFiMUo5Nk7ajNQxa8N5s9G1IJ4gRrsZ&index=3.

11 Carolyn Kousky and Leonard Shabman, *Pricing Flood Insurance: How and Why the NFIP Differs from a Private Insurance Company* (Washington DC: Resources for the Future, 2014), http://www.rff.org/files/sharepoint/WorkImages/Download/RFF-DP-14-37.pdf, 9.

federal involvement in providing disaster assistance. While there is an imperative for the government to provide assistance in time of crisis, it is important to evaluate the how that assistance may change behavior; policies designed to limit risk may be actually prolong or increase risk.

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> For from Him and through Him and to Him are all things. To Him be the glory forever! Amen.
>
> —Romans 11:36

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> If I have seen farther than others, it is by standing upon the shoulders of giants.
>
> —Sir Isaac Newton;
> NPS Cohorts 1503/1504 Dedication

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I. INTRODUCTION

A. RESEARCH QUESTIONS

To what extent is the National Flood Insurance Program (NFIP) limiting risk reduction behavior?

What does this tell us about how federal government involvement in disaster assistance might be contributing to the rise of a moral hazard?

B. PROBLEM STATEMENT

Over the course of the last half century, the federal government has undertaken an ever-increasing role in providing disaster assistance. A review of our history shows that federal intervention in disaster recovery before the Great Depression was essentially non-existent and consisted mainly of expressions of sympathy but little financial aid.[1] Since that time, federal involvement in financing recovery has increased to absorbing approximately 60 percent of recovery costs.[2] Has the trend of greater federal involvement in disaster assistance given rise to a moral hazard that has resulted in a disincentive to minimize risk?

Moral hazard is a term adopted by the insurance industry. It refers to how the redistribution of risk changes a person's behavior. When people do not assume the full risk of an action or decision, they are not inclined to make a fully responsible or moral choice.[3] Related to federal involvement in disaster assistance, moral hazard occurs when the public expects the government to intervene to provide recovery from the disaster, regardless of whether they have implemented strategies to minimize risk. As Supreme Court Justice Antonin Scalia opined, "The governmentalization of charity affects not just

[1] Rutherford H. Platt, *Disasters and Democracy: The Politics of Extreme Natural Events* (Washington DC: Island Press, 1999), Kindle ed., 1.

[2] Elizabeth Witham and Steve Bowen, *Financing Recovery from Catastrophic Events: Final Report* (Arlington, VA: Homeland Security Institute, 2007), https://recoverydiva.files.wordpress.com/2013/06/financing_recovery_hsi-2007.pdf, v.

[3] David Rowell and Luke B. Connelly, "A History of the Term 'Moral Hazard,'" *Journal of Risk and Insurance* 79, no. 4 (2012): 1061.

the donor, but also the recipient… The transformation of charity into legal entitlement has produced donors without love and recipients without gratitude."[4] Justice Scalia's viewpoint of how charity is negatively affected when it is institutionalized clearly reflects his Protestant ethics.

In an article for *Homeland Security Affairs*, Naomi Zack presents a counter-application of government's role in disasters based on the social contract theory. She states:

> If property is privately owned or owned by the local community, government does not owe restitution to citizens who have lost their property or had it destroyed. But as part of government's benevolence, it is appropriate that it offer some compensation in those cases, much as a good neighbor might.[5]

She further expounds that according to Rousseau's principle of *common good*, "part of government is to further what is good for society as a whole, in ways that are not necessarily decided by majority rule, or that amount to the greatest well-being of the greatest number."[6] Theories such as these present a view that emergency preparedness is a fundamental obligation of government that should motivate new policies.[7] The question remains though, has disaster recovery, once the domain of charity, become an entitlement for people with little emphasis on personal responsibility or is it a fundamental obligation of government?

The role that expanded federal disaster assistance plays in creating a moral hazard may best be displayed through the NFIP. According to Hayes and Neal, "Floods have been, and continue to be, the nation's most destructive natural hazard in terms of

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[4] Antonin Scalia, "Is Capitalism or Socialism More Conducive to Christian Virtue?" [video], Lanier Theological Library, September 6, 2013, http://www.laniertheologicallibrary.org/videos/, 23:23.

[5] Naomi Zack, "Philosophy and Disaster," *Homeland Security Affairs* 2, article 5 (2006), https://www.hsaj.org/articles/176.

[6] Ibid.

[7] Ibid.

economic loss and life-threatening events."[8] From 1978 through 2015, the NFIP has provided total payments of more than $52 billion, and repeat losses accounted for a third of NFIP flood insurance payments.[9]

The National Flood Insurance Act of 1968 was designed to establish a comprehensive risk management program to:

> (1) reduce suffering and economic losses due to floods through the purchase of flood insurance; (2) promote state and local land-use controls to guide development away from flood-prone areas; and (3) reduce federal expenditures for disaster assistance and flood control.[10]

As Rawle King states, "The NFIP does not operate on the traditional insurance definition of fiscal solvency."[11] This is largely based on the NFIP providing insurance subsidies and grandfathered rates for properties that were constructed prior to the assessment of risk. In the event that premium and investment income is inadequate, the NFIP borrows funds from the U.S. Treasury to cover the losses with clauses for repayment.

The long-term fiscal soundness of the NFIP is questionable, mainly due to extensive flood insurance claims associated with the hurricane impacts in the mid-2000s, especially hurricanes Katrina and Rita in 2005 and Sandy in 2012.[12] As of December 31, 2014, FEMA owed the Treasury $23 billion.[13] The Biggert-Waters Flood Insurance Reform Act of 2012 (BW-12) contained provisions to strengthen the solvency of the

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[8] Thomas L. Hayes and D. Andrew Neal, *National Flood Insurance Program [NFIP] Actuarial Rate Review: In Support of the Recommended October 1, 2011 Rate and Rule Changes* (Washington DC: Federal Emergency Management Agency, 2011), http://www.fema.gov/media-library-data/20130726-1809-25045-6893/actuarial_rate_review2011.pdf, 1.

[9] National Flood Insurance Program Bureau Net, "Loss Statistics Country-wide as of 07/31/2016," July 31, 2016, http://bsa.nfipstat.fema.gov/reports/1040.htm; Rutherford H. Platt, *Disasters and Democracy: The Politics of Extreme Natural Events* (Washington DC: Island Press, 1999), Kindle ed., 38.

[10] Rawle O. King, *Federal Flood Insurance: The Repetitive Loss Problem* (Washington DC: Congressional Research Service, 2005), https://www.fas.org/sgp/crs/misc/RL32972.pdf, 1.

[11] Ibid., 7.

[12] National Research Council, *Affordability of National Flood Insurance Program Premiums* (Report 1) (Washington DC: The National Academies Press, 2015), doi:10.17226/21709, 15.

[13] U.S. Government Accountability Office, *High-Risk Series: An Update* (GAO-15-290) (Washington DC: U.S. Government Accountability Office, 2015), http://www.gao.gov/assets/670/668415.pdf.

program by, among other things, phasing out almost all discounted premiums.[14] However, political resolve to address financial shortcomings of the NFIP was short-lived; the passage of the Homeowner Flood Insurance Affordability Act of 2014 (HFIAA) reinstated a majority of subsidies on primary residences and slowed down rate increases for a majority of policies impacted by the reform provisions of BW-12.[15]

The NFIP is symbolic of decades of flawed national disaster policy that now focuses on maintaining the status quo rather than rebuilding to prevent the next disaster.[16] As Joseph Scanlon points out,

> If change is to happen, it must come quickly. As each day passes, support for dramatic action will weaken. That means that development plans must be ready before disaster strikes. A disaster is not just a calamity but an opportunity, and a manager who is prepared can use it to alter the public agenda.[17]

C. LITERATURE REVIEW

This thesis started with an exploration of the expansion of federal involvement in disaster recovery over the course of the last half century. The research introduced the concept of moral hazard and its application to disaster recovery. As applied in the disaster research, moral hazard is the expectation that government will provide recovery from the disaster, regardless of whether people have implemented risk reduction strategies. A further exploration of disaster research has identified that the concept of moral hazard has broad application as an inevitable byproduct of expanded government involvement in disaster recovery.

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[14] Federal Emergency Management Agency, *Biggert Waters Flood Insurance Reform Act of 2012: Impact of National Flood Insurance Program (NFIP) Changes* [factsheet] (Washington, DC: Federal Emergency Management Agency, 2013), https://www.fema.gov/media-library-data/20130726-1909-25045-0554/bw12_sec_205_207_factsheet4_13_2013.pdf.

[15] Federal Emergency Management Agency, *Homeowner Flood Insurance Affordability Act: Overview* (Washington, DC: Federal Emergency Management Agency, 2014), https://www.fema.gov/media-library-data/1396551935597-4048b68f6d695a6eb6e6e7118d3ce464/HFIAA_Overview_FINAL_03282014.pdf.

[16] Thomas A. Birkland, *Lessons of Disaster: Policy Change after Catastrophic Events* (Washington DC: Georgetown University Press, 2006), Kindle ed., 1275.

[17] T. Joseph Scanlon, "Reaching Out: Getting the Community Involved in Preparedness," in *Emergency Management: Principles and Practice for Local Government*, ed. Thomas E. Drabek and Gerard J. Hoetmer (Washington DC: International City Management Association, 1991), 97.

While the concept of moral hazard resonates as a challenge to government involvement in disaster recovery, what is the extent of its impact on risk reduction behavior? Understanding the origins of the concept of moral hazard and its evolution as part of the lexicon of disaster research is key to further exploration of the issue.

1. The Concept of Moral Hazard

The origins of moral hazard are attributed to the early insurance industry, and aspects of the concept applied to economics, law, and policy debate. As provided within the insurance industry, when people do not assume the full risk of an action or decision, they are not inclined to make a fully responsible or moral choice.[18] Economic literature expands on the concept, providing that the redistribution of risk changes people's behavior; "the tendency for insurance against loss to reduce incentives to prevent or minimize the cost of loss."[19] Writing in the *Journal of Risk and Insurance*, Rowell and Connelly explain, "the term 'moral hazard' when interpreted literally has a strong rhetorical tone, which has been used by stakeholders to influence public attitudes to insurance."[20]

Some authors have taken the social responsibility aspects of the concept to task. In Tom Baker's article "On the Genealogy of Moral Hazard," he explores the concept of moral hazard as an analytical tool applied to social responsibility questions. He asks, "To what extent are those that suffer responsible for their condition?"[21] Baker also asks, "What obligations do we have to prevent or alleviate the suffering of others?"[22]

Baker highlights in an editorial by James Glassman, who states, "What moral hazard means is that, if you cushion the consequences of bad behavior, then you encourage that bad behavior. The lesson of moral hazard is that less is more."[23]

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[18] Rowell and Connelly, "A History of the Term 'Moral Hazard,'" 1061.

[19] Tom Baker, "On the Genealogy of Moral Hazard," *Texas Law Review* 75, no. 2 (1996): 239.

[20] Rowell and Connelly, "A History of the Term 'Moral Hazard,'" 1051.

[21] Baker, "On the Genealogy of Moral Hazard," 237.

[22] Ibid.

[23] James K. Glassman, "Drop Budget Fight, Shift to Welfare," *St. Louis Post-Dispatch*, February 11, 1996, Five Star Lift ed., sec. editorial; Baker, "On the Genealogy of Moral Hazard," 238.

Economist-politician Dick Armey further described this concept as "social responsibility is a euphemism for personal irresponsibility."[24] These types of arguments serve as the basis that behavior is negatively changed through the transfer of risk from one party to another.

As summarized by Baker, the conventional argument has been that "moral hazard signifies the perverse consequences of well-intentioned efforts to share the burdens of life, and it also helps deny that refusing to share those burdens is mean-spirited or self-interested."[25] Baker continues with, "the real lesson of moral hazard should be that the world is a relational web and cannot be reduced to truisms."[26] Given that researchers have liberally applied the concept of moral hazard to federal government involvement in disaster recovery, is the application of the concept of moral hazard justified?[27]

2. Origins of Moral Hazard

The origins of moral hazard can be traced back to the Victorian era dice game of "hazard," which has evolved into the modern game of craps.[28] As described by Baker, hazard was a popular game of chance in both England and the United States.[29] The calculation of the odds of hazard resulted in Pascal's theory of probability, which served as the basis for the early insurance enterprise.[30] In the early nineteenth-century, scientists expanded on the doctrine of chance and hypothesized that observation of the past could predict the future for both moral and physical phenomena.[31]

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[24] David S. Broder, "Armey's Axioms," *The Washington Post*, June 21, 1995, sec. op/ed; Baker, "On the Genealogy of Moral Hazard," 240.

[25] Baker, "On the Genealogy of Moral Hazard," 239.

[26] Ibid., 240.

[27] Carolyn Kousky and Leonard Shabman, "The Hazard of the Moral Hazard—Or Not," *Natural Hazards Observer* XXXVII, no. 5 (2013): 12.

[28] Baker, "On the Genealogy of Moral Hazard," 244–245.

[29] Herbert Asbury, *Sucker's Progress: An Informal History of Gambling in America* (New York: Dodd, Mead & Co., 1938), 45; Baker, "On the Genealogy of Moral Hazard," 244.

[30] Baker, "On the Genealogy of Moral Hazard," 246–247.

[31] John A. Fowler, *History of Insurance in Philadelphia for Two Centuries (1683–1882)* (Philadelphia: Review Publishing and Printing Company, 1888), 393; Baker, "On the Genealogy of Moral Hazard," 247.

The first references to moral hazard come from the nineteenth-century fire insurance trade, when insurers were concerned with an unwholesome mix of bad character and temptation that needed to be controlled.[32] The term moral hazard first appeared in the *Practice of Fire Underwriting* written by Arthur C. Ducat in 1862. As the Late Secretary and Chief Surveyor for the Chicago Board of Underwriters, Ducat wrote,

> The remarks upon the subject of incendiarism, and the moral hazard, may seem, perhaps, of greater length than the subject would seem to warrant; but it is a subject of the greatest importance. There is no one hazard that insurance companies have to guard and contend against as great as this. No premium is adequate, in such-cases; and when the anxiety of a company to do business, or the thirst of an agent for his commission, is so great as to shut their eyes against the fact, inevitable ruin must sooner or later be the result.[33]

As Ducat posits, an insurance policy should not be issued where morally questionable characteristics exist.[34]

Benjamin Hale notes, "talk of moral hazard has been around since as long as the modern insurance industry, which dates based as far as 1662."[35] For nineteenth-century insurers, moral hazard was applied to both the character of people and situations.[36] For the insurance industry, the character of an individual plays a pivotal role in determining the chance that coverage would be needed. Furthermore, the insurance contracts need to be structured to remove the temptation to use the contract.

As defined by Rowell and Connelly, "The essential idea was that the purchase of insurance encouraged moral hazard which could manifest as either (1) a deliberate act of fraud or (2) an act of carelessness."[37] To this day, the basic understanding of moral

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[32] Baker, "On the Genealogy of Moral Hazard," 240.

[33] Arthur C. Ducat, *Practice of Fire Underwriting*, 4th ed. (New York: T. Jones, Jr, Insurance Monitor Office, 1865), 11.

[34] Ibid., 11–12.

[35] Benjamin Hale, "What's So Moral about the Moral Hazard?," *Public Affairs Quarterly* 23, no. 1 (2009): 3.

[36] Baker, "On the Genealogy of Moral Hazard," 250.

[37] Rowell and Connelly, "A History of the Term 'Moral Hazard,'" 1061.

hazard remains virtually unchanged in the insurance industry,[38] and morality remains a fundamental element in the process to determine insurability. The efforts to remove immorality from the insurance trade have played a key role in the transformation of the industry into the mass consumer enterprise that it is today.[39]

Economists argue that market forces seek an optimized equilibrium and play a fundamental role in defining what is acceptable and not acceptable. For instance, economist Kenneth Arrow explains, "when the market fails to achieve an optimal state, society will, to some extent at least, recognize the gap, and nonmarket social institutions will arise attempting to bridge it."[40] He continues with, "The welfare case for insurance policies of all sorts is overwhelming. It follows that the government should undertake insurance in those cases where this market, for whatever reason, has failed to emerge."[41] Basically, Arrow argues that government may need to act when markets are unwilling, regardless of the potential moral hazard implications that are assumed. Arrow summarizes these arguments by stating, "the preference for redistribution expressed in government taxation and expenditure policies and private charity can be reinterpreted as desire for insurance."[42] In essence, the government should consider intervention where the market is unwilling to provide for the societal type of insurance. The economist's viewpoint of moral hazard is more closely aligned with the work of Naomi Zack on disaster ethics and the emergence of a second social contract.

3. The Relation of Moral Hazard to Disaster Recovery

The concept of moral hazard was born out of the insurance industry as a component to ensure the soundness of the insurance transaction. Morality plays a key role in determining insurability as a protection for the insurance provider against chance. These concepts remain in the insurance trade, as noted in an *Aetna Guide*: "excluding

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[38] Baker, "On the Genealogy of Moral Hazard," 265–266.

[39] Ibid., 241.

[40] Kenneth J. Arrow, "Uncertainty and the Welfare Economics of Medical Care," *The American Economic Review* LIII, no. 5 (1963): 947.

[41] Ibid., 961.

[42] Ibid., 947.

morally hazardous applicants and structuring the insurance contract so that no one could make a gain through an insured loss."[43] Moral hazard within the insurance industry is based on the notion that redistribution of risk changes a person's behavior.

Government disaster recovery programs are designed as an extension of or supplement to private insurance.[44] So it is no surprise that the application of moral hazard concepts in disaster recovery aligns with the interpretations of the insurance industry. While many commentators have argued that current federal disaster recovery programs are entitlements that have created a moral hazard, Carolyn Kousky and Leonard Shabman do not believe the evidence of moral hazard in recovery programs for individuals and households is compelling.[45] In an article for the *Natural Hazards Observer*, they argue that federal aid programs are not enough to cover losses from severe damage.[46] However, they do allow that these counter indicators to moral hazard are limited to specific assistance programs.

4. Federal Disaster Recovery Contributing to Moral Hazard

"Where is my FEMA debit card?" became a humorless punchline for disaster relief workers in the aftermath of Hurricane Katrina and the subsequent response to Hurricane Rita. As an assistance measure to displaced individuals, FEMA initiated a $2 billion program to provide $2,000 debit cards to those evacuated from the Gulf Coast.[47] The program was rife with fraud and abuse. While FEMA acknowledged that it was a pilot program and did not work, Congressional members quickly pounced, referring to the program as a "cash cow."[48]

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[43] Baker, "On the Genealogy of Moral Hazard," 260.

[44] Rawle O. King, *Tsunamis and Earthquakes: Is Federal Disaster Insurance in Our Future?* (Washington DC: Congressional Research Service, 2005), https://www.fas.org/sgp/crs/misc/RL32847.pdf.

[45] Kousky and Shabman, "The Hazard of the Moral Hazard—Or Not."

[46] Ibid.

[47] Eric Lipton, "'Breathtaking' Waste and Fraud in Hurricane Aid," *The New York Times*, June 27, 2006, http://www.nytimes.com/2006/06/27/washington/27katrina.html, sec. Washington.

[48] Ibid.

Has the expansion of federal disaster recovery programs contributed to the rise of moral hazard (the assumption that government will take care of recovery)? General Russell Honoré was the U.S. Army officer tasked by President Bush to respond to the failures in New Orleans following Hurricane Katrina. As remarked by General Honoré, every dollar we commit to mitigation and preparedness equates to seven to nine dollars we will spend on response and recovery.[49]

In an article for the Nelson A. Rockefeller Institute of Government, James Fossett argues that the government needs to stop improvising disaster recovery programs. Fossett acknowledged that response to Hurricane Sandy showed significant improvement over the immediate response of Hurricane Katrina. However, the long-term recovery process, starting with how the federal government financed the recovery assistance, remained improvised and fragmented.[50] The supplemental appropriation process used by the federal government to fund the Disaster Recovery Fund (DRF) for Hurricane Sandy required state and local jurisdictions to deal with multiple federal agencies separately, and this fragmented recovery efforts.[51] Also, the supplemental appropriations requiring congressional approval resulted in politics, which delayed assistance. Due to the ongoing deficit reduction debate, supplemental appropriations for Hurricane Sandy were delayed by several months.[52] The resulting impact was that initial flood insurance program payouts were underpaid. In the interim, some assistance was provided to property owners through other programs. As the political stalemate was resolved, FEMA reopened cases to give an opportunity for additional flood insurance payments for Hurricane Sandy

[49] Corey McKenna, "Creating a Culture of Preparedness Is the Best Hope for Disaster Mitigation, Lt. Gen. Russel Honore Says," Emergency Management, May 22, 2009, http://www.emergencymgmt.com/disaster/Creating-a-Culture-of.html; Russel L. Honore, "Leadership: Building a Culture of Preparedness" (presented at 56th IAEM Annual Conference & EMEX 2008, Overland Park, KA, November 2008), http://www.emergencymgmt.com/disaster/Creating-a-Culture-of.html.

[50] James W. Fossett, "Let's Stop Improvising Disaster Recovery," Nelson A. Rockefeller Institute of Government, July 2013, http://www.rockinst.org/observations/fossettj/2013-07-09-Improvising_Disaster_Recovery.aspx.

[51] Ibid.

[52] Ibid.

claims, but the delay had already frustrated many policyholders.[53] As Scanlon has described, disasters present a chance to alter the public agenda with timely, dramatic action to mitigate the next disaster; otherwise, we are destined to return to the status quo.[54]

Since the 1950s, the federal government's role in providing disaster assistance has continued to increase, and it has supplanted charity in this domain. With this expanded role, government policies should be formulated to provide rapid assistance and promote the opportunity to mitigate against the next disaster.

5. Federal Intervention through the NFIP

Aspects of the NFIP provide an example of federal policy contributing to moral hazard and limiting the reduction of risk. The NFIP was created to provide coverage to those that private insurance companies would not insure due to the level of risk. The NFIP includes requirements for communities to meet federal standards for floodplain management, but enforcement of requirements is lax. In addition, repetitive losses account for the disproportionate percentage of NFIP claims. As characterized in the 2011 NFIP *Actuarial Rate Review*, the NFIP is preferable to disaster relief as premiums fund at least part of disaster recovery from flood damage.[55]

Following significant payouts for insurance claims to the hurricane impacts in the late-2000s, especially Hurricanes Katrina and Rita in 2005 and Sandy in 2012, the NFIP is on the verge of fiscal collapse. While Congress acted to shore up the NFIP's financial issues through BW-12, outcry from constituents resulted in the repeal of those policies with the HFIAA. The implementation of these two pieces of legislation illustrates the dynamic political environment surrounding government involvement in disaster recovery. In *The Dictator's Handbook*, Bruce Bueno de Mesquita and Alastair Smith describe,

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[53] Emily Dooley, "New York and New Jersey Area Leaders Urge Feds to Waive Grant-Recoup Rule for Superstorm Sandy Victims," Emergency Management, August 14, 2015, http://www.emergencymgmt.com/disaster/Area-leaders-urge-feds-to-waive-grant-recoup-rule-for-superstorm-Sandy-victims.html.

[54] Scanlon, "Reaching Out," 97.

[55] Hayes and Neal, *NFIP Actuarial Rate Review*, 4.

> The rules governing how people rule inevitably divorce what policies politicians really desire from what they say and do. Not that we doubt that politicians hold sincere views of good and bad public policy—rather those views are not terribly important and, besides, there are few ways to tell the difference between declarations based on opportunistic political expediency and true beliefs.[56]

The application of moral hazard to federal involvement in disaster recovery shares similarities with the interpretations of moral hazard from insurance. Although disaster assistance was once the sole domain of charitable organizations, it has now largely become a function of the government. As federal involvement in disaster assistance has expanded, the incentives to reduce risk are minimized. As risk is transferred from the individual to the government, the incentive for people to engage in meaningful activities to mitigate or prevent risk has waned. Furthermore, the impact of moral hazard has contributed to increased and repetitive disaster losses with increasing recovery costs falling on government.

D. RESEARCH DESIGN

This thesis seeks to explore how federal government's involvement in disaster assistance might contribute to the rise of a moral hazard through a case study of the NFIP. Focus is on the NFIP to identify aspects of the program that may limit risk reduction behavior. NFIP data on claims and costs serve as the primary instrumentation to evaluate potential impacts of program policies and identify findings for application to the broader scope of government disaster assistance programs.

1. Object of Study

The NFIP serves as the subject of a case study to identify aspects of the program that limit risk reduction behavior and contribute to the rise of a moral hazard. Findings from the case study are considered against the broader spectrum of expanded federal government involvement in providing disaster assistance.

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[56] Bruce Bueno de Mesquita and Alastair Smith, *The Dictator's Handbook: Why Bad Behavior Is Almost Always Good Politics* (New York: Public Affairs, 2011), Kindle ed. 135.

2. Study Limitations

A review of disaster research indicates the assumption of moral hazard related to federal government involvement in providing disaster assistance. For this case study, the theory of moral hazard and its application to limiting risk reduction behavior is considered valid. However, this researcher recognizes that this study may also show that moral hazard related to government involvement in providing assistance is a minor issue. While it is understood that other federal government disaster assistance programs may contribute to limiting risk reduction behavior and giving rise to moral hazard, the case study confines itself to an exploration of the NFIP.

3. Instrumentation (Data and Evidence)

The study reviews the origins of moral hazard and the application of the theory of moral hazard to government involvement in disaster assistance to provide a baseline. The NFIP serves as the case study of how government assistance can limit risk reduction behavior. Moreover, NFIP issues related to repetitive loss, program subsidies, and significant loss events are used as instrumentation to demonstrate how government assistance contributes to limiting risk reduction and giving rise to a moral hazard. Finally, data from the NFIP on claims, costs, and significant loss events provide evidence of programmatic elements impacting risk reduction behavior.

4. Steps of Analysis

As defined by Robert Yin in *Case Study Research: Design and Methods*, the case study is structured around five components: the study's question, its propositions, its units of analysis, the logic linking the data to the propositions, and the criteria for interpreting the findings.[57] This case study is a qualitative exploratory theory-building analysis of how the NFIP has contributed to limiting risk reduction behavior and given rise to a moral hazard. Claim and cost data from the NFIP serves as the unit of analysis to link expanded involvement by the federal government in disaster assistance to the rise of moral hazard.

[57] Robert K. Yin, *Case Study Research: Design and Methods*, 5th ed., Applied Social Research Methods Series, vol. 5 (Thousand Oaks, CA: Sage Publications, 2014), 27.

While disaster research has largely accepted the theory of moral hazard related to government involvement in disaster assistance, it is recognized that the theory may not apply to the case study. The study looks for other contributing factors that are related to failures to provide long-term mitigation of flood hazards to determine what role the NFIP may or may not play in the rise of moral hazard.

5. Intended Output

The study seeks to provide a deeper understanding of how expanded federal involvement in disaster assistance contributes to the increase of moral hazard through a case study of the NFIP. From this case study, generalizations can be drawn to other government disaster assistance programs. This provides a better understanding of how federal intervention in disaster assistance can create the unintended consequence of moral hazard.

E. THESIS CHAPTER OUTLINE

Chapter I introduces the research questions to look at how federal involvement in providing disaster assistance limits risk reduction behavior, and it examines the NFIP as an exemplary example to study. Additionally, the chapter provides the problem statement, literature review, and research design as an introduction to the thesis.

Chapter II explores the evolution of federal involvement in providing flood assistance. This chapter includes a summary of the current NFIP related to the three primary program elements of flood hazard identification and risk assessment, floodplain management, and flood insurance. The chapter also includes a summary of significant legislative adjustments that have been implemented to address shortcomings in the NFIP.

Chapter III focuses on addressing the question of does the NFIP limit risk reduction? This chapter explores the NFIP through the issues of repetitive loss properties, the continued use of flood insurance subsidies, and significant flood events as contributing factors to the program limiting risk reduction.

The final chapter, Chapter IV, summarizes the findings associated with the study of the NFIP and seeks to apply them to the research questions. Also, the chapter aims to

apply the concepts presented against the broader spectrum of expanded federal involvement in providing disaster assistance limiting risk reduction.

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II. A STUDY OF FEDERAL INVOLVEMENT IN FLOOD ASSISTANCE

Drabek defines disaster as,

> Accidental or uncontrollable events, actual or threatened, that are "concentrated in time and space, in which a society, or a relatively self-sufficient subdivision of society, undergoes severe danger and incurs such losses to its members and physical appurtenances that the social structure is disrupted and the fulfillment of all or some of the essential functions of society is prevented."[58]

Emergency management has long had a focus on natural hazards as the primary large-scale threat to populations across the globe. At the core of this threat is the hazard of flooding. Whether the impact to a community comes from flash flooding caused by a severe thunderstorm, storm surge from a tropical storm system, or riverine flooding from heavy rains, the destructive power of hydrological hazards has challenged community planners and emergency management doctrine since its inception.

A review of disaster declaration data from FEMA supports these assertions. From 1953 to 2015, natural hazards account for 99.6 percent of all major disaster declarations.[59] Furthermore, the data shows that flooding or flood-related impacts account for 78.2 percent of all major disaster declarations for the same period (see Figure 1).[60] An article by Melanie Gall et al. studied the trends of natural hazard losses in the United States and shows that "since the 1960s, nearly 85 percent of direct economic losses can be attributed to severe atmospheric and hydrological events."[61]

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[58] Charles E. Fritz's 1961 *Contemporary Social Problems*, quoted in Thomas E. Drabek, *Human System Response to Disaster: An Inventory of Sociological Findings* (New York: Springer-Verlag New York Inc., 1986), 7.

[59] Federal Emergency Management Agency, "Disaster Declarations," accessed July 14, 2016, https://www.fema.gov/disasters. See Appendix A, in which major disaster declaration data from 1953 to 2015 is reviewed. Data is limited to major disaster declarations and excludes emergency declarations and fire management assistance grants.

[60] Ibid.

[61] Melanie Gall et al., "The Unsustainable Trend of Natural Hazard Losses in the United States," *Sustainability* 3 (2011): 2164, doi:10.3390/su3112157.

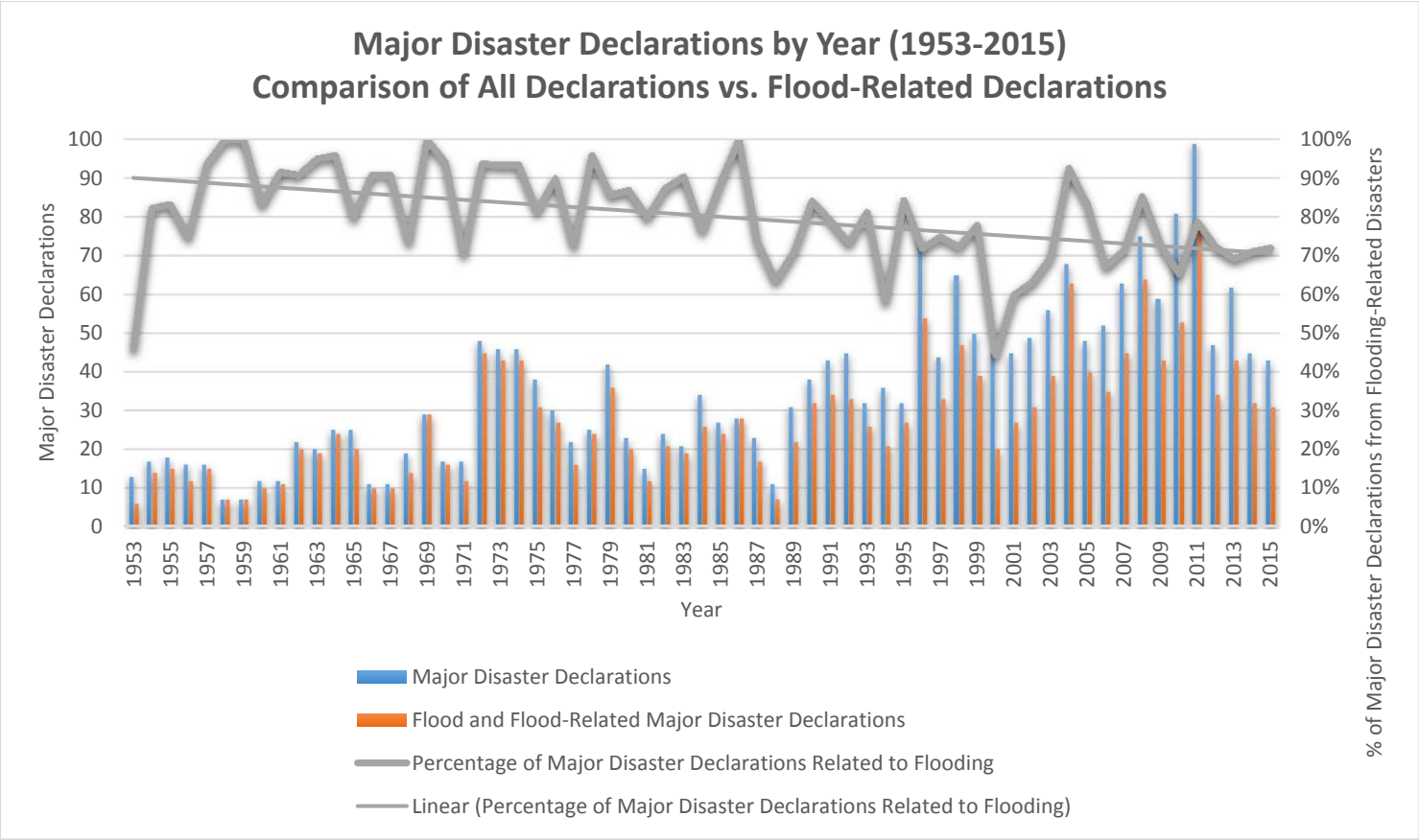

Figure 1. Major Disaster Declarations, 1953–2015[62]

[62] Source: Federal Emergency Management Agency, "Disaster Declarations." See Appendix A. Data is limited to major disaster declarations and excludes emergency declarations and fire management assistance grants.

The threat of natural hazards is not limited to the United States. In a journal article, David Strömberg notes, "between 1980 and 2004, two million people were killed and five billion people cumulatively affected by around 7,000 natural disasters… the direct economic damage from natural disasters between 1980 and 2004 is estimated at around $1 trillion."[63] Data also supports a trend of natural disasters, and specifically flooding, having a greater impact on populations—fueled by expanded development into areas at risk and the enhanced threat of flooding from climate change.

The data clearly demonstrates the prominence of weather-related hazards as the primary source of major disasters in the United States. In response to the impacts of natural hazards, federal government involvement in assisting with the impacts of major disasters has also continued to evolve and expand. Before the 1950s, federal government involvement in disasters was largely limited to expressions of sympathy that sometimes included token financial assistance.[64] The task of response and recovery from disasters was left to local communities with states, churches, and volunteers providing support. The origins of expanded federal involvement in providing disaster assistance can be traced to massive flooding along the lower Mississippi River valley in 1927

A. THE EVOLUTION OF FEDERAL INVOLVEMENT IN FLOODING

For much of our country's history, implementation of measures to control flood waters was the responsibility of individual landowners and state and local governments.[65] The federal government limited its early involvement to clearing obstructions and improving navigation through the U.S. Army Corps of Engineers.[66] However, the role of the federal government was forever changed with major flooding along the lower Mississippi River Valley in the 1920s and 1930s.

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63 David Strömberg, "Natural Disasters, Economic Development, and Humanitarian Aid," *Journal of Economic Perspectives* 21, no. 3 (2007): 199, doi:10.1257/jep.21.3.199.

64 Platt, *Disasters and Democracy*, 137.

65 Greg O'Brien, "Making the Mississippi River over Again: The Development of River Control in Mississippi," Mississippi History Now, March 2002, http://mshistorynow.mdah.state.ms.us/articles/94/making-the-mississippi-river-over-again.

66 Ibid.

Almost as soon as European settlers arrived in the lower Mississippi River Valley, they built levees in an attempt to prevent flooding. Levee construction was not a government-driven effort; rather, it was left to individual landowners along the river valley. The approach lacked comprehensive planning and standards of engineering and construction that resulted in a patchy and inadequate levee system from the upper midwest downstream to New Orleans.[67] By the late 1850s, settlers in Louisiana, Mississippi, and Arkansas had constructed 2,000 miles of levees on both shores of the river to protect the lower Mississippi River Valley.[68] The flood of 1858–1859 showed these efforts to be inadequate as many levees failed, causing extensive flooding in the region.[69] Following the Civil War, levee construction became the responsibility of local boards with taxing authority to raise funds for flood control projects. However, this funding proved to be inadequate as floods continued to destroy river-control efforts, and there were major overflows in 1874, 1882, 1883, 1884, 1890, 1897, 1903, 1912, and 1913.[70] With insufficient flood control funding and the need to understand the river's hydraulics, landowners began to turn to the federal government for assistance.[71]

In the winter of 1927, persistent heavy rains along the tributaries of the Mississippi caused flooding in Oklahoma, Kansas, Illinois, and Kentucky.[72] By mid-April, the initial flooding of the tributaries combined with record rain across Missouri, Illinois, Arkansas, Mississippi, Texas, and Louisiana. It created what Secretary of Commerce Herbert Hoover called "the greatest disaster of peace times in our history" as flooding had dramatic impacts across the entirety of the lower Mississippi River Valley.[73] The flood overwhelmed the levee system throughout the lower Mississippi River Valley,

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67 Ibid.

68 Ibid.

69 Ibid.

70 O'Brien, "Making the Mississippi River;" National Weather Service, "Mississippi River Flood History 1543–Present," October 12, 2011, http://www.weather.gov/lix/ms_flood_history.

71 O'Brien, "Making the Mississippi River."

72 National Weather Service, "Mississippi River Flood History;" Stephen Ambrose, "Man vs. Nature: The Great Mississippi Flood of 1927," *Expedition Journal*, May 1, 2001, http://news.nationalgeographic.com/news/2001/05/0501_river4.html.

73 Ambrose, "Man vs. Nature;" O'Brien, "Making the Mississippi River."

flooding 23,000 square miles, forcing 700,000 people from their homes, and destroying an estimated $400 million worth of property.[74] The influence of a disaster to affect politics is highlighted when President Coolidge chose to do nothing to assist states and communities impacted by the massive flooding.[75] Then Secretary of Commerce Herbert Hoover chaired a special committee to handle the disaster and used the position to garner the publicity that led to his nomination as the 1928 Republican nominee for the presidency.[76]

Major riverine floods resulted in the passage of several flood control acts that expand federal involvement in structural flood-control projects, such as the construction of dams and levees, to protect life and property.[77] Even so, disaster assistance to flood victims remained limited. Despite billions of dollars in federal investments for structural flood-control projects, the impacts on lives and property losses from floods continued to increase.

Historically, the catastrophic nature of flooding limits the ability to develop a rate structure that adequately reflects the full-risk to flood-prone properties.[78] Based on this issue, by the 1950s a private insurance market that could profitably provide flood insurance at an affordable price did not emerge. As highlighted in *Disasters and Democracy*,

> Flood zoning, like almost all that is virtuous, has great verbal support, but almost nothing has been done about it. A few local governments have restricted the use of low-lying lands, but not enough for us to point to any substantial amount of experience or any great degree of progress.[79]

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[74] O'Brien, "Making the Mississippi River."

[75] Ambrose, "Man vs. Nature."

[76] Ibid.

[77] Federal Emergency Management Agency, *National Flood Insurance Program [NFIP]: Program Description* (Washington, DC: Federal Emergency Management Agency, Federal Insurance and Mitigation Administration, 2002), http://www.fema.gov/media-library-data/20130726-1447-20490-2156/nfipdescrip_1_.pdf, 1.

[78] Congressional Budget Office, *The National Flood Insurance Program: Factors Affecting Actuarial Soundness* (Washington DC: Congressional Budget Office, 2009), https://www.cbo.gov/sites/default/files/cbofiles/ftpdocs/106xx/doc10620/11-04-floodinsurance.pdf, 13.

[79] Platt, *Disasters and Democracy*, 210–212.

These issues led to the development of initial proposals for the federal government to provide flood insurance. While not implemented by Congress at the time, it did introduce the concept of federal government support of a flood insurance program.

In 1965, Hurricane Betsy devastated the southeastern United States; this resulted in Congress passing the Southeast Hurricane Disaster Relief Act. The legislation began to redefine federal policies and approaches to flood control, including providing direct financial assistance to flood victims and authorizing a feasibility study of a national flood insurance program.[80] Based on the information from the feasibility study, a task force was formed to advocate for flood control within the context of floodplain development based on the following five major goals:

- Improve basic knowledge about flood hazards;
- Coordinate and plan new development in the floodplain;
- Provide technical services;
- Move toward a practical national program of flood insurance; and
- Adjust federal flood control policy to sound criteria and changing needs.[81]

The combination of the feasibility study and task force report provided the basis for the National Flood Insurance Act of 1968. Expanding on the previously established goals of the task force, the legislation established the NFIP with the purpose of:

- Better indemnify individuals for flood losses through insurance;
- Reduce future flood damages through State and community floodplain management regulations; and
- Reduce Federal expenditures for disaster assistance and flood control.[82]

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[80] Federal Emergency Management Agency, *NFIP: Program Description*, 1.

[81] Gilbert F. White et al., *A Unified National Program for Managing Flood Losses: A Report by the Task Force on Federal Flood Control Policy* (Washington DC: U.S. House of Representatives, 1966), https://www.loc.gov/law/find/hearings/floods/floods89-465.pdf, iv.

[82] Office of the General Council, *All-Hazard Authorities of the Federal Emergency Management Agency: The National Flood Insurance Act of 1968, as Amended, and the Flood Disaster Protection Act of 1973, as Amended; 42 U.S.C. 4001 et Seq.* (Washington, DC: FEMA Office of the General Council, 1997), http://www.fema.gov/media-library-data/20130726-1545-20490-9247/frm_acts.pdf, 1–2.

B. THE NATIONAL FLOOD INSURANCE PROGRAM

The NFIP is designed as a mitigation program with the underlying goal of reducing future loss of life and property from flooding. In Rawle King's view, "Congress established the NFIP to address the nation's flood exposure and challenges inherent in financing and managing flood risks in the private sector."[83] The NFIP consists of three main elements:

- Flood hazard identification and risk assessment: Creation of flood insurance rate maps to identify areas across the nation at risk of flooding;
- Floodplain management: Coordination with local communities to minimize the impact of flooding through floodplain management ordinances based on federally defined minimum standards; and
- Flood insurance: Creation of a federally subsidized insurance program that protects homes and businesses by providing a mechanism to pre-fund the risk from flood losses.[84]

As stated by FEMA, "overall, the program reduces the socio-economic impact of disasters by promoting the purchase and retention of general risk insurance, but also of flood insurance, specifically."[85] While subsidized by the federal government, the program relies on partnerships with private insurance and servicing contractors. The program also encompasses public policy and relies on the cooperation with local communities to adopt and enforce standards. The following sections outline the NFIP components and highlight the legislative initiatives implemented to address shortcomings in the program.

1. Flood Hazard Identification and Risk Assessment

The NFIP establishes policies for the federal government to identify flood-prone areas and map zones at risk for flooding. The common tool for communicating risk to a

[83] Rawle O. King, *National Flood Insurance Program: Background, Challenges, and Financial Status* (Washington DC: Congressional Research Service, 2011), https://www.fas.org/sgp/crs/misc/R40650.pdf, Summary.

[84] Patricia Griggs, "The National Flood Insurance Program," YouTube video, posted by Federal Emergency Management Agency, October 26, 2011, https://www.youtube.com/watch?v=fGYIblbHJQM.

[85] Federal Emergency Management Agency, "The National Flood Insurance Program."

community and its residents is the FIRM,[86] which identifies areas at risk of flooding (see Figure 2 for an example of a FIRM). On a FIRM, areas at risk for flooding are identified as special flood hazard areas (SFHA) that assist in the determination of requirements for flood insurance and establish a flood insurance rate. FIRMs also assist local officials with identifying locations within the community where floodplain management regulations are required to be implemented.

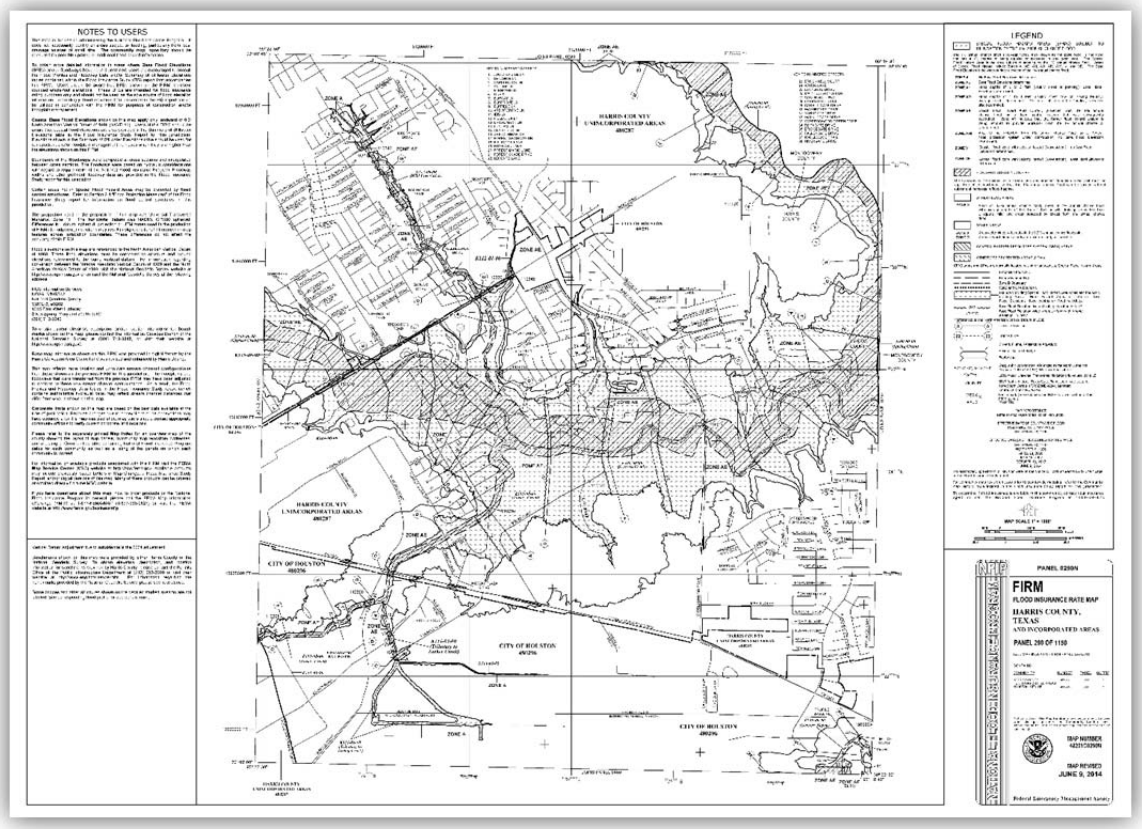

Figure 2. Flood Insurance Rate Map from Harris County, Texas[87]

[86] FIRMs are also referred to as flood maps.

[87] Source: Federal Emergency Management Agency, "NFIP FIRM Harris County, Texas and Incorporated Areas: Panel 290 of 1150—Map 48201C0290N," 2014, http://map1.msc.fema.gov/idms/IntraView.cgi?KEY=12116785&IFIT=1.

An initial challenge to the NFIP was the need to develop flood insurance rate maps for all communities participating in the program. During the early implementation of the NFIP, while FIRMs were being drafted for communities at risk, an emergency program was established that used less detailed maps based on local information that estimated the risk.[88] The emergency program was conceived as a temporary measure to increase participation in the NFIP. However, constant delays kept the program in place through the early 1980s.[89] The delays in the establishment of FIRMs resulted in continued development in at-risk locations. Development that occurred during this timeframe was termed pre-FIRM and was grandfathered into the NFIP with eligibility for subsidized insurance rates not reflective of the level of risk. Properties that were grandfathered into the NFIP have expected losses five times that of properties developed by FIRM criteria.[90] Losses related to pre-FIRM development continue to plague the NFIP and highlight the importance of establishing sound hazard identification and risk assessment information before implementation of floodplain management and flood insurance programs.

The federal government implementation of flood hazard identification and risk assessment is a multi-billion-dollar program that is administered by FEMA. Over 22,000 communities participate in the NFIP with ongoing efforts to modernize and update flood maps.[91] These efforts are currently focused on digitizing map products to improve accessibility to the public. The mapping of flood risk is a dynamic process that must

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The selected FIRM is Panel 290 of 1150 for Harris County, Texas (chosen for the areas extensive history of flooding and it includes the author's childhood home). The FIRM depicts the floodway, 100-year flood zone (zone AE), and 500-year flood zone (zone X) for Cypress Creek located in northern Harris County. Note that some development is located in the floodway, 100-year flood zone, and 500-year flood zone.

88 Adelle Thomas and Robin Leichenko, "Adaptation through Insurance: Lessons from the NFIP," *International Journal of Climate Change Strategies and Management* 3, no. 3 (2011): 257, doi:http://dx.doi.org/10.1108/17568691111153401.

89 Ibid.

90 Dwight M. Jaffee, "Commentary: Should the Government Provide Insurance for Catastrophes?," *Federal Reserve Bank of St. Louis Review* 88, no. 4 (2006): 383.

91 Carolyn Kousky and Erwann Michel-Kerjan, "Examining Flood Insurance Claims in the United States: Six Key Findings," *The Journal of Risk and Insurance* (2015), doi:10.1111/jori.12106, 3.

continually be updated as communities' experience population growth and development, methodologies of evaluation are improved, and changes in climate affect flood risk.

The process to issue or update a FIRM starts with a flood insurance survey (FIS). FEMA defines an FIS as "a compilation and presentation of flood risk data for specific watercourses, lakes, and coastal flood hazard areas within a community."[92] The FIS report contains detailed information on identified floodways and the base flood elevation based on a detailed hydrologic analysis. The base flood is defined as a flood that has a one percent chance of being equaled or exceeded in any given year, sometimes referred to as the 100-year flood standard.[93] The base flood elevation is the primary mechanism to define the SFHA for at-risk zones within a community. Within the SFHA, properties purchased with federally backed or regulated lenders are required to purchase flood insurance through the NFIP.[94] Also, participating communities in the NFIP are mandated to implement federally defined floodplain management standards in SFHA.

At-risk zones identified on FIRMs are based on the type of flood hazard and methodology used to establish the level of flood hazard. Within the SFHA, two types of high-hazard zones are identified, "A" and "V" zones. A zones are subject to inundation from the one percent base flood event. V zones are subject to wave action or storm surge, typically along coastal areas. Flood insurance prices vary by zone and the structural characteristics of the building, most notably the relative height of the lowest floor above the base flood elevation.[95] The NFIP groups similar risks in flood zones and assigns properties located in the zone the same flood insurance rate.[96] FIRMs also identify

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92 Federal Emergency Management Agency, "Flood Insurance Study," accessed April 27, 2016, http://www.fema.gov/flood-insurance-study.

93 National Academies Keck Center, *Reducing Flood Losses: Is the 1% Chance (100-Year) Flood Standard Sufficient* (Washington DC: National Academies Keck Center, 2004), http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/16/nrcs143_009401.pdf, 5. The Department of Housing and Urban Development attempted to begin phasing out the "100-year flood" terminology in 1975, although it remains a common term related to flooding.

94 Carolyn Kousky and Leonard Shabman, *Pricing Flood Insurance: How and Why the NFIP Differs from a Private Insurance Company* (Washington DC: Resources for the Future, 2014), http://www.rff.org/files/sharepoint/WorkImages/Download/RFF-DP-14-37.pdf, 3.

95 Ibid.

96 Ibid.

moderate and low-risk zones. “B” or moderate risk zones are subject to inundation from the 0.2 percent base flood event (sometimes referred to as the 500-year flood zone). “C” or low-risk zones are areas where flood insurance is encouraged, but there are no requirements for it. Also, the NFIP uses an “X” designator for moderate to low risk areas where the flood hazard is undetermined. Appendix B lists each of the zones and methodology used to define the zone under the NFIP.

The flood hazard identification and risk assessment capability developed as part of the NFIP serves as a critical component to communicate flood risk to communities and establish flood insurance rates for participants. Ongoing efforts on the part of FEMA continue to update and modernize the flood-risk information to make it more accessible to the public and improve the accuracy of FIRMs. Information developed out of the flood hazard identification and risk assessment process serves as the basis for identifying locations within a community that are subject to the requirements of the NFIP related floodplain management and flood insurance. Both of these elements will be explored in the following sections.

2. Floodplain Management

One of the goals of the NFIP is to reduce the losses and damages caused by flooding. The primary method used to accomplish this goal is the establishment of floodplain management standards designed to mitigate the flood hazard. Floodplain management standards apply the base flood elevation as the minimum elevation that the lowest level must be set at or above for all new or substantially improved development.[97] The intent of this standard is not to prohibit development, but rather to ensure that development is constructed in such a way as to be protected from a base flood event. Also, floodplain management standards require that management of new developments not to increase the flood hazard within an area.

[97] Federal Emergency Management Agency, *NFIP: Program Description*, 13.

For a community to participate in the NFIP, it must adopt floodplain management ordinances adhering to the minimum standards established at the federal level.[98] The ordinances must apply to all development that might take place in identified SFHA depicted on a FIRM. Development is not merely the construction or modification of buildings but includes the construction of bridges, roads, levees, water treatment facilities, and modifications to land.[99] Any development in an SFHA must be permitted by the local community, with elevation certifications issued by a licensed surveyor or engineer, thus ensuring that development will not be damaged by a base flood event or increase the flood risk in the area.

As identified, pre-FIRM development is a substantial challenge to the NFIP due to the grandfathered status of property developed before the establishment of the base flood elevation. While pre-FIRM development remains a challenge, the NFIP seeks to address pre-FIRM issues through requirements for those properties to come into compliance with floodplain management regulations anytime a pre-FIRM development undergoes substantial improvement or suffers substantial damage. Substantial improvement or substantial damage is based on changes or repairs made to a structure that results in the improvement or repair cost exceeding 50 percent of the market value of the development.[100] While there are exemptions and variances can be requested, the general rule is that the structure must come into compliance with floodplain management requirements. These compliance requirements represent an ongoing effort of the NFIP to address early implementation issues.

The base flood elevation is established based on the 100-year flood standard (i.e., a one percent chance of a flood event for any given year). Since the program's inception,

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98 "Local Floodplain Development Regulations," YouTube video, posted by Gary Taylor, October 15, 2014, https://www.youtube.com/watch?v=o4EJ4qrrkK0&list=PLADFiMUo5Nk7ajNQxa8N5s9G1IJ4gRrsZ&index=1.

99 "Overview of Regulatory Requirements: What Is Development? When Is a Permit Required?," YouTube video, posted by Gary Taylor, https://www.youtube.com/watch?v=S7aI2QRWspA&list=PLADFiMUo5Nk7ajNQxa8N5s9G1IJ4gRrsZ&index=2.

100 "Substantial Damages and Substantial Improvements," YouTube video, posted by Gary Taylor, October 15, 2014, https://www.youtube.com/watch?v=Wt3lMwCRhd0&list=PLADFiMUo5Nk7ajNQxa8N5s9G1IJ4gRrsZ&index=3.

the NFIP has used the 100-year standard as a reasonable level of protection without imposing overly stringent requirements or create excessive costs for property owners.[101] Over the course of the NFIP, critics have questioned if the 100-year standard remained appropriate in light of continued losses due to flooding. Both in 1976 and 1983, the federal government commissioned studies of the 100-year standard to determine its continued appropriateness as the minimum standard within the NFIP.[102] The studies' findings led to the continued use of the 100-year standard.[103]

Regardless, questions remain over whether the 100-year base flood elevation standard is sufficient to mitigate the impact of flooding. On January 30, 2015, President Barack Obama issued an amendment to executive order 11988 originally published in 1977 (floodplain management), to establish a more conservative flood-risk reduction standard for federally funded projects as part of *The President's Climate Action Plan*.[104] The revised standard provides three methodologies for establishing a modified flood risk elevation:

- Use data and methods informed by best available, actionable climate science;
- Build two feet above the 100-year flood elevation for standard projects, and three feet above for critical buildings like hospitals and evacuation centers; or
- Build to the 500-year (0.2 percent annual chance) flood elevation.[105]

While the revised standards apply to federally funded projects, the original NFIP 100-year base flood elevation standard and associated subsidized insurance rates remain in place for the vast majority of the program.[106] Communities do have the option to adopt

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101 National Academies Keck Center, *Reducing Flood Losses*, 113.

102 Ibid., 5–6.

103 Ibid.

104 White House, "Executive Order—Establishing a Federal Flood Risk Management Standard and a Process for Further Soliciting and Considering Stakeholder Input," January 30, 2015, https://www.whitehouse.gov/the-press-office/2015/01/30/executive-order-establishing-federal-flood-risk-management-standard-and-.

105 Ibid.

106 White House, "Fact Sheet: Taking Action to Protect Communities and Reduce the Cost of Future Flood Disasters," January 30, 2015, https://www.whitehouse.gov/node/320041.

stricter flood elevation standards as part of their floodplain management program; this is referred to as freeboard.[107] At the time of the issuance of the executive order in 2015, the White House indicated that at least 350 communities across the country had already met or exceeded the revised standards outlined in the executive order.[108] However, when considered in the context of the participation of over 22,000 communities in the program, the figure represents only a small percentage of communities opting for stricter flood elevation standards.

While floodplain management serves as the primary method to mitigate the impacts of flooding, data to support the effectiveness of the program is limited. FEMA operates a process to assess a community's floodplain management ordinance and enforcement actions through community assistance visits (CAV) and community assistance contacts (CAC).[109] However, given resource limitations, FEMA must use criteria to prioritize communities that are assessed based on known or suspected deficiencies.[110] When violations or compliance issues are identified, communities receive an opportunity to implement corrective actions. A community may be placed on probation or suspension from the NFIP for failure to address violations or program deficiencies. While the CAV/CAC program serves to ensure compliance with the NFIP, results of CAV/CAC findings are not readily available.

Furthermore, Ed Pasterick who served with FEMA for 41 years working in NFIP noted in 1988, "There has never been a comprehensive assessment of the level of compliance nationwide."[111] In 2006, FEMA commissioned a series of evaluations of the NFIP that included an assessment of community compliance with NFIP floodplain management requirements. Researchers findings in the report, "extrapolated that between 70 and 85 percent of NFIP communities nationwide are probably fully compliant or can

[107] Freeboard is an additional elevation requirement above the 100-year base flood elevation standard that provides for a margin of safety against extraordinary or unknown risks.

[108] White House, "Fact Sheet."

[109] Federal Emergency Management Agency, *NFIP: Program Description*, 17–18.

[110] Ibid., 18.

[111] Edward T. Pasterick, "The National Flood Insurance Program," in *Paying the Price: The Status and Role of Insurance against Natural Disasters in the United States*, ed. Howard Kunreuther and Richard J. Roth, Sr. (Washington DC: Joseph Henry Press, 1998), 125–154.

be expected to remedy identified noncompliance within two years."[112] While researchers worked to provide a methodology for their findings, the report admitted uncertainty in what the estimation of compliance indicates.[113] The lack of readily available data creates a deficiency to identify trends and issues that may be common to compliance with the floodplain management requirements of the NFIP.

3. Community Rating System

The Community Rating System (CRS) is a program that was implemented in 1990 as an enhancement to the floodplain management component of the NFIP. The CRS is a voluntary incentive-based program that recognizes communities for implementing proactive floodplain management activities exceeding the NFIP's minimum floodplain management standards.[114] Under the program, FEMA awards points for activities that are used to establish a community's CRS "class" from class 10 (lowest rating) to class 1 (highest rating). There are 19 CRS activities divided among four categories: public information (seven activities), mapping and regulations (five activities), flood damage reduction (four activities), and flood warning and response (three activities). CRS activities are designed to:

- Increase awareness of flood risk;
- Increase awareness of opportunities to protect life and property;
- Enhance public safety;
- Reduce damage to public property and infrastructure; and
- Reduce economic disruption and loss.[115]

Communities participating in the CRS program can receive discounts from five to 45 percent on standard flood insurance policies.

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[112] Jacquelyn L. Monday et al., *An Evaluation of Compliance with the National Flood Insurance Program Part A: Achieving Community Compliance* (Washington, DC: American Institutes for Research, 2006), http://www.fema.gov/media-library-data/20130726-1602-20490-1461/nfip_eval_community_compliance_a.pdf, 32.

[113] Ibid.

[114] "The Community Rating System," YouTube video, posted by Gary Taylor, October 15, 2014, https://www.youtube.com/watch?v=VydwGGrIie0.

[115] Ibid.

While the CRS program is recognized as a strong enhancement to the NFIP, FEMA continues to look for enhancements for the CRS program as a core objective of the program's strategic plan.[116] The strategic plan outlined five objectives and numerous strategies for the sustainment and continuous improvement of the CRS.[117] As of May 2016, FEMA indicated that only five percent of the over 22,000 NFIP communities were participating in the CRS. While seemingly a low percentage of participation, these communities represent more than 69 percent of all flood insurance policies with an average standard flood insurance policy discount of 11.4 percent.[118]

4. Flood Insurance

Private insurance has long steered away from the developing a flood insurance market because of the difficulties associated with accurately assessing the highly variable risk of flood hazards. The lack of private insurance options serves as the basis for the development of the flood insurance component of the NFIP. As provided in section 1304 of the National Flood Insurance Act of 1968, the NFIP "will enable interested persons to purchase insurance against loss resulting from physical damage to or loss of real property or personal property related thereto arising from any flood."[119] NFIP flood insurance provides the mechanism to compensate policyholders for flood damages and lessens the impact on taxpayers, who would otherwise be called upon to assist through federal disaster assistance programs.[120]

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116 Federal Emergency Management Agency, *National Flood Insurance Program, Community Rating System: A Strategic Plan for the Community Rating System, Fiscal Year 2008–2013* (Washington, DC: Federal Emergency Management Agency, 2008), http://crsresources.org/files/other/CRS_Strategic_Plan_2008-2013.pdf, ii.

117 Ibid., iii.

118 Federal Emergency Management Agency, *Fact Sheet: Community Rating System* (Washington, DC: Federal Emergency Management Agency, 2016), http://www.fema.gov/media-library-data/1469718823202-3519e082e89a8c780670bb03f167bbae/NFIP_CRS_Fact_Sheet_May_03_2016.pdf; Jared T. Brown, *Introduction to FEMA's National Flood Insurance Program (NFIP)* (Washington DC: Congressional Research Service, 2016), http://www.fas.org/sgp/crs/homesec/R44593.pdf, 17.

119 Office of the General Council, *All-Hazard Authorities*, 7.

120 Federal Emergency Management Agency, *NFIP: Program Description*, 22.

NFIP flood insurance is based on a public/private partnership between FEMA and private insurance providers. While FEMA administers the program, the sale and service of flood insurance is facilitated by private insurance providers.[121] NFIP flood insurance is available for business and residential structural and content protection.[122] Approximately 85 percent of NFIP flood insurance policies are sold to property owners in participating NFIP communities through a program known as "Write Your Own" (WYO).[123] Currently, 73 private insurance providers write the WYO policies and process claims in exchange for a fee from the NFIP.[124] The remainder of NFIP flood insurance policies is purchased through a FEMA contractor.[125]

The NFIP includes several varieties of policy options. For example, the Standard Flood Insurance Policy (SFIP) specifies the terms and conditions of the agreement between FEMA and the WYO provider.[126] SFIP provides flood insurance coverage for partial or complete inundation from inland and tidal waters, accumulation of surface waters from any source, or impacts from mudflows.[127] The SFIP is mandatory for all properties located in the SFHA that are purchased through a mortgage from a federally backed or regulated lender.[128] Also, some lenders require the purchase of flood insurance for properties located outside of the SFHA to manage risk. Properties located outside of the SFHA in moderate to low hazard zones (zones B, C, and X) are eligible for lower-cost preferred risk policies (PRP).[129] The NFIP also provides increased cost of compliance (ICC) coverage for properties that may be required to implement structural improvement measures to come into compliance with local floodplain management

121 Ibid., 22–23.

122 "Flood Insurance: Is Purchase Required? What Can Be Insured?," YouTube video, posted by Gary Taylor, , October 15, 2014, https://www.youtube.com/watch?v=MM9q39B3M-4.

123 Kousky and Shabman, *Pricing Flood Insurance*, 3.

124 Federal Emergency Management Agency, "Write Your Own Flood Insurance Company List," accessed August 26, 2016, http://www.fema.gov/wyo_company.

125 Kousky and Shabman, *Pricing Flood Insurance*, 3.

126 Federal Emergency Management Agency, *NFIP: Program Description*, 23.

127 Ibid.

128 Kousky and Shabman, *Pricing Flood Insurance*, 3.

129 FEMA Flood Smart, "What Is the Preferred Risk Policy (PRP)?," accessed August 25, 2016, https://www.floodsmart.gov/floodsmart/pages/faqs/what-is-the-preferred-risk-policy.jsp.

requirements.[130] NFIP flood insurance does not provide coverage for land, property, and belongings outside of the main building or most self-propelled vehicles, and it does not cover finished basements, buildings entirely over water, or buildings principally underground.[131] Table 1 outlines the insurance coverage limits set by the NFIP for structures and contents.

Table 1. NFIP Flood Insurance Coverage Limits[132]

Coverage Type	Structure Limit	Content Limit
Residential (1–4 Family Home)	$250,000	$100,000
Other Residential	$500,000	$100,000
Business	$500,000	$500,000
Renter (Contents Only)	------	$100,000

NFIP flood insurance revenue is maintained in an authorized account called the National Flood Insurance Fund (NFIF).[133] The NFIF is funded through three methods:

- Flood insurance policy premiums, fees, and surcharges (as of December 31, 2015, the NFIP has approximately 5.2 million policies in force with $3.45 billion in annual earned premiums);[134]
- Direct annual appropriations for specific components of the NFIP; and
- Borrowing from the U.S. Treasury when the NFIF is insufficient to pay flood insurance claims.[135]

130 FEMA Flood Smart, "What Is Increased Cost of Compliance (ICC) Coverage?," accessed August 25, 2016, https://www.floodsmart.gov/floodsmart/pages/faqs/what-is-increased-cost-of-compliance-coverage.jsp.

131 "Flood Insurance: Is Purchase Required?"

132 FEMA Flood Smart, "How Much Flood Insurance Coverage Is Available?," accessed August 25, 2016, https://www.floodsmart.gov/floodsmart/pages/faqs/how-much-flood-insurance-coverage-is-available.jsp.

133 Brown, *Introduction to FEMA's National Flood Insurance*, 19.

134 Federal Emergency Management Agency, "Policy & Claim Statistics for Flood Insurance," June 7, 2016, https://www.fema.gov/policy-claim-statistics-flood-insurance.

135 Brown, *Introduction to FEMA's National Flood Insurance*, 19.

Up until the mid-2000s, The NFIP has generally been able to cover its costs, needing to borrow only limited amounts from the U.S. Treasury and repaying the loans with interest.[136] However, Hurricanes Charley, Frances, Ivan, and Jeanne in 2004, Hurricanes Katrina and Rita in 2005, Hurricane Ike in 2008, and Hurricane Sandy in 2012 all resulted in massive flood insurance claims that bankrupted the program and required over $30 billion from the U.S. Treasury.[137] The majority of the hurricane debt will likely never be repaid by the NFIP.

The majority of NFIP flood insurance policies are based on full-risk rates established through FEMA's annual NFIP actuarial rate review (an estimated 80 percent of policies).[138] FEMA's annual evaluation of insurance rates is based on hydrological modeling resulting from using a tool developed by the U.S. Army Corps of Engineers.[139] However, approximately half of properties charged full-risk rates are located outside of SFHAs about which not enough data is available to use modeling.[140]

It should be noted that FEMA had regularly published the annual NFIP actuarial rate review every year through 2011; however, no rate review has been posted since the October 1, 2011 rate review and there is no identifiable explanation. Also, a review of the annual NFIP actuarial rate review shows that the NFIP claims expenditures associated the impacts of Hurricanes Katrina and Rita in 2005 have been excluded from calculations.[141] It is recognized by the researcher that this methodology of rate calculation provides balance to the actuarial rate setting process wherein an extreme event would skew the determinations. However, the discontinuation of publishing the annual NFIP actuarial rate review coincides with the additional impact of Hurricane Sandy in 2012. In light of the string of extreme hurricane-related flooding impacts to the NFIP, perhaps the

136 Ibid., 24.

137 Ibid.

138 Flood Insurance Subcommittee, *The National Flood Insurance Program: Past, Present... and Future?* (Washington DC: American Academy of Actuaries, 2011), https://www.actuary.org/files/publications/AcademyFloodInsurance_Monograph_110715.pdf, 6.

139 Ibid.

140 Ibid.

141 Hayes and Neal, *NFIP Actuarial Rate Review*.

extraordinary implications of the hurricane seasons in 2004, 2005, 2008, and 2012 demonstrate the limitations of the FEMA actuarial rate setting process.

While the majority of NFIP flood insurance policies are based on full-risk rates, approximately 20 percent of policies are based on pre-FIRM subsidized rates.[142] Pre-FIRM properties were built in the SFHA before FEMA published the FIRM (generally, FIRMs were published between 1974 and 1983).[143] Pre-FIRM properties are considered "grandfathered" policies, which allows for a subsidized premium to continue for a property, even if a new FIRM indicates a higher level of flood risk.[144] The pre-FIRM program was created to encourage participation and designed to not unfairly penalize homeowners with high rates who built before the program was established.[145] On average, the pre-FIRM subsidized policies pay between 40 to 45 percent of the full-risk premium needed to fund the long-term expectation of loss.[146] The NFIP does not include provisions for FEMA to recoup the lost revenue from claims associated with pre-FIRM properties.[147] While progress has been made to reduce the number of pre-FIRM properties through requirements placed on properties that undergo substantial improvement or substantial damage and phasing out of discounts for second homes, business, and repetitive loss properties, pre-FIRM policies continue to account for a significant percentage of NFIP losses.[148]

A considerable item of concern within the flood insurance component of the NFIP is coverage of repetitive loss properties. FEMA defines repetitive loss and a subgroup referred to as severe repetitive loss as follows:

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142 Ibid., 34.

143 Carolyn Kousky and Erwann Michel-Kerjan, "A Look at 35 Years of Flood Insurance Claims," *Resources*, no. 191 (Winter 2016): 43.

144 National Research Council, *Affordability* (Report 1), 44–45.

145 Kousky and Shabman, *Pricing Flood Insurance*, 6.

146 Hayes and Neal, *NFIP Actuarial Rate Review*, 9.

147 Kousky and Shabman, *Pricing Flood Insurance*, 6.

148 Ibid.

- Repetitive loss: "Insured properties with two or more flood losses greater than $1,000 within any 10-year period."[149]
- Severe repetitive loss: "Insured properties that have incurred four or more flood-related losses of at least $5,000 each, or at least two separate claims with the cumulative amount of the building payments exceeding the value of the structures on the property."[150]

The NFIP is structured to prevent FEMA from refusing coverage to any policyholder in a participating community and cannot directly compel property owners to mitigate losses or arbitrarily impose actuarial rates on repetitive loss properties.[151]

An analysis of data provided by FEMA related to repetitive losses indicates that approximately 3.8 percent of NFIP policies have experienced a repetitive loss claim with an average of 2.98 claims per repetitive loss property.[152] Table 2 highlights the disproportionate share of claims and costs associated with repetitive loss properties versus the NFIP as a whole. In addition, there is a clear connection between repetitive losses and establishment of FIRM. FEMA has estimated that 90 percent of all repetitive loss properties were constructed before the publishing of a FIRM for those locations, highlighting the unintended consequences of not phasing out the grandfathered status of pre-FIRM properties.[153]

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[149] Office of the Inspector General, *FEMA's Implementation of the Flood Insurance Reform Act of 2004* (Washington DC: U.S. Department of Homeland Security, Office of the Inspector General, 2009), https://www.oig.dhs.gov/assets/Mgmt/OIG_09-45_Mar09.pdf, 2.

[150] Ibid.

[151] Kousky and Michel-Kerjan, "Examining Flood Insurance Claims," 6; King, *National Flood Insurance Program*, 18.

[152] The 3.8-percent of NFIP policies experiencing repetitive loss claims was determined based on the number of repetitive loss properties divided by the number of active policies for 2015. FEMA has indicated that repetitive loss properties account for 1-percent of NFIP insured properties, but does not provide a methodology for comparison.

[153] King, *National Flood Insurance Program*, 18.

Table 2. Repetitive Losses Claims and Payments (1978–2015)

	Number of Claims	Claim Payments
NFIP Flood Insurance Totals[154]	1,637,394	$ 52,175,519,500
Repetitive Loss Property Totals[155]	580,967	$ 15,901,034,599
Percent of Total NFIP Claims/Costs	35.5%	30.5%

The significance of repetitive loss properties to the NFIP goes beyond the substantial cost to the program. As noted by the American Association of Actuaries in a July 2011 report, a major concern is, "the question of whether the NFIP should continue to insure properties that are likely to have further losses and whether these properties are being subsidized by the rest of the NFIP insureds."[156]

FEMA has started several initiatives to address the repetitive loss issues. Initial efforts were focused on inventorying repetitive loss properties to pursue actions to mitigate future losses through reconstruction, elevation, or flood proofing.[157] More recent actions have included efforts to phase out premium subsidies through grant-based voluntary buyouts or imposition of full actuarially based rates for property owners who refused to accept mitigation of flood hazards.[158] As the NFIP approaches its fiftieth anniversary, it is clear that the impacts of early implementation continue to plague the long-term viability of the program.

5. Mitigation Programs as an Extension of the NFIP

During President Clinton's administration, FEMA Director James Lee Witt worked to transform the agency based on a foundation of mitigation and prevention of

154 Federal Emergency Management Agency, "Policy & Claim Statistics."

155 Federal Emergency Management Agency [FEMA] Region VI, *FEMA NFIP Repetitive Loss Report* (Denton, TX: FEMA, Region VI, 2016).

156 Flood Insurance Subcommittee, *The National Flood Insurance Program*, 23.

157 King, *National Flood Insurance Program*, 18.

158 Ibid.

hazards.[159] Congress tasked the agency to do a cost-benefit analysis of mitigation programs implemented in response to the Great Flood of 1993 that affected the majority of the midwestern United States. The analysis indicated that for every dollar spent on mitigation, it saved anywhere from $3 to $5 on future losses.[160] This type of analysis makes a powerful argument for focusing federal disaster assistance programs on mitigation of hazards before disaster strikes. However, as highlighted in a Congressional Research Service report in 2011, increases in losses are outpacing FEMA mitigation efforts by a factor of 10 to 1.[161] Regardless, the federal government has implemented numerous programs to promote mitigation.

In 1988, Congress passed the Robert T. Stafford Disaster Relief and Emergency Assistance Act, commonly referred to as the Stafford Act. The Stafford Act is the statutory authority for federal involvement in providing disaster assistance. A major component of mitigation efforts implemented as part of the Stafford Act is the Pre-Disaster Mitigation (PDM) Grant Program and the Hazard Mitigation Grant Program (HMGP). Both programs provide funding to state and local jurisdictions to develop mitigation plans and implement mitigation projects for all hazards that could impact a community.

The current fiscal year (FY) 2016 PDM grant program provides $90 million to state and local jurisdictions.[162] Current priorities are the development of mitigation plans and projects and the funding of projects that are identified as climate resilient mitigation activities (CRMA), wildfire mitigation activities, non-flood mitigation activities, flood mitigation activities, and emergency power for critical facilities.[163] The HMGP differs from other programs in that funding is connected to the amount of federal disaster

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159 Tim Mangini, "Interview—James Lee Witt," *Frontline*, PBS, November 22, 2005, http://www.pbs.org/wgbh/pages/frontline/storm/interviews/witt.html.

160 Ibid.

161 King, *National Flood Insurance Program*, 18.

162 Federal Emergency Management Agency, *FY2016 Pre-Disaster Mitigation (PDM) Grant Program Fact Sheet* (Washington, DC: Federal Emergency Management Agency, 2016), http://www.fema.gov/media-library-data/1455711373912-17d561db31cc299667dc5c60811165d1/FY16_PDM_Fact_Sheet.pdf, 1.

163 Ibid., 4.

assistance funding allocated under a major disaster declaration. Under the HMGP, 15 to 20 percent of federal public assistance and individual assistance dollars are allocated to mitigation projects.[164] The majority of HMGP dollars should be assigned to projects associated with the type of disaster resulting in the major disaster declaration. However, a percentage may be used for all-hazard projects.

While numerous initiatives were launched to address the mitigation of all hazards, the Flood Mitigation Assistance (FMA) Grant Program was focused on the mitigation of flood hazards. The FMA Grant Program was authorized as part of the National Flood Insurance Reform Act of 1994.[165] The initial FMA Grant Program provided $20 million a year with a 75/25 cost share for eligible projects that dealt with the elevation, acquisition, relocation, and demolition of flood-prone structures.[166] The Biggert-Waters Flood Insurance Reform Act of 2012 greatly expanded the program with a renewed focus on mitigating repetitive loss and severe repetitive loss properties.[167] The current allocation for the FY2016 FMA Grant Program is $199 million with cost sharing percentages remaining in place.[168]

Each of these mitigation grant programs demonstrates a commitment by the federal government to address the reduction of all-hazards. The question is how much more is needed to change the long-term trajectory of disaster impacts effectively?

C. SUMMARY OF LEGISLATIVE ADJUSTMENTS TO THE NFIP

The previous sections have outlined the current NFIP and highlighted several of the issues and challenges that the program faces. Since the original passage of the National Flood Insurance Act of 1968, which created the NFIP, the program has

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164 Federal Emergency Management Agency, *NFIP: Program Description*, 35.

165 Federal Emergency Management Agency, "Flood Mitigation Assistance Grant Program," accessed May 31, 2016, https://www.fema.gov/flood-mitigation-assistance-grant-program.

166 Federal Emergency Management Agency, *NFIP: Program Description*, 33.

167 Federal Emergency Management Agency, *FY2016 Flood Mitigation Assistance (FMA) Grant Program Fact Sheet* (Washington, DC: Federal Emergency Management Agency, 2016), http://www.fema.gov/media-library-data/1455710459301-048a67862580037b30cd640a802a9053/FY16_FMA_Fact_Sheet.pdf, 1.

168 Ibid.

undergone numerous changes, generally in response to catastrophic flood-related disasters that exposed weaknesses in the NFIP. The following sections outline the significant legislative changes that have been implemented to address identified shortcomings and strengthen the program for future disasters.

1. Flood Disaster Protection Act of 1973

In June 1972, Tropical Storm Agnes tracked from Yucatan Peninsula, across Florida, and settled over the northeastern United States. The storm produced widespread rains of six to 12 inches with some areas receiving 14 to 19 inches and resulted in widespread flood across Pennsylvania, Virginia, New York, Maryland, and Ohio.[169] The storm was responsible for 122 deaths and $2.1 billion in damage, mainly in the northeast.[170] At the time, the storm cost more in disaster assistance than any previous disaster had. The significance of the financial losses was largely attributed to weak participation by communities in the NFIP as most were relying on federal disaster assistance to provide for recovery.

As a result of Tropical Storm Agnes, Congress moved to strengthen provisions of the National Flood Insurance Act through the passage of the Flood Disaster Protection Act of 1973. The act prohibited federal agencies from aiding construction projects for communities that did not participate in the NFIP and established mandatory flood insurance requirements for properties purchased with federally-backed mortgages located in SFHA.[171] The result of these changes was a dramatic increase in communities participating in the NFIP; it went from 2,200 communities in 1973 to 15,000 communities by 1977.[172] Also, individual policies rose from 100,000 policies in 1972 to 1,200,000 policies by 1979.[173]

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169 National Hurricane Center, "Hurricanes in History," accessed August 5, 2016, http://www.nhc.noaa.gov/outreach/history/#agnes.

170 Ibid.

171 "History and Purpose of the National Flood Insurance Program," YouTube video, posted by Gary Taylor, October 15, 2014, https://www.youtube.com/watch?v=bs1GxuksrFw.

172 Ibid.

173 Ibid.

2. National Flood Insurance Reform Act of 1994

In 1993, major riverine flooding along the Mississippi and Missouri Rivers caused major flooding across North Dakota, South Dakota, Nebraska, Kansas, Minnesota, Iowa, Missouri, Wisconsin, and Illinois and resulted in 50 deaths and nearly $15 billion in damage.[174] At the time, the disaster was considered to be one of the most significant and damaging natural disasters to impact the United States. The following year, Congress passed the National Flood Insurance Reform Act of 1994 to decrease the financial burden of flooding through increased participation in the NFIP. The following elements were implemented to address the objective of the legislation:

- Established fines for mortgage lenders that failed to ensure the mandatory purchase of flood insurance on properties located in special flood hazard areas;
- Increased the coverage limits of National Flood Insurance Program flood insurance policies;
- Provided supplemental increased cost of compliance coverage to assist property owners with the cost of bringing flood-damaged properties into compliance with local ordinances;
- Established the flood mitigation grant program to help states and communities develop and implement mitigation measures that reduce future flood damage;
- Codified the National Flood Insurance Program Community Rating System, which rates communities and provides them financial incentives to adopt floodplain management standards above those set by the National Flood Insurance Program; and
- Required FEMA to assess its flood hazard map inventory at least once every five years.[175]

3. Flood Insurance Reform Act of 2004

The Flood Insurance Reform Act of 2004 was established by Congress to address repetitive loss claims within the NFIP. Two grant programs were created to address both

[174] Lee W. Larson, "The Great USA Flood of 1993" (presented at IAHS Conference, Anaheim, CA, June 1996), http://www.nwrfc.noaa.gov/floods/papers/oh_2/great.htm.

[175] Office of the Inspector General, *FEMA's Implementation*, 2.

repetitive loss properties and severe repetitive loss properties through acquisition, demolition, relocation, or structurally elevation of structures.

As FEMA described:

> The severe repetitive loss grant program is designed to reduce or eliminate claims under the National Flood Insurance Program through project activities that will result in the greatest savings to the National Flood Insurance Fund in the shortest period of time.[176]

The severe repetitive loss grant program differed from other mitigation grant programs due to penalties that could be imposed on property owners who declined mitigation assistance through increases in NFIP premium rates.[177] The program required participation by the local community with requirements for both enforcement of floodplain management ordinances and a local match of federal grant funds.

The act also called for the implementation of a repetitive loss mitigation grant program designed to promote mitigation measures to reduce flood damages to insured properties that have had more than one claim to the NFIP. The repetitive loss grant program differs from the severe repetitive loss grant program in that it does not require local matching funds.

The repetitive loss and severe repetitive loss grant programs represented the primary initiatives of the 2004 NFIP reform act. Other initiatives included boosting policyholder awareness about individual flood insurance policies, increasing the availability of policyholder information on guidance about the flood insurance claims process, and establishing training requirements for insurance professionals.[178]

4. The Biggert-Waters Flood Insurance Reform Act of 2012

The disastrous losses associated with the hurricane seasons in the mid-2000s severely impacted the fiscal solvency of the NFIP. The U.S. Government Accountability Office (GAO) concluded that the NFIP "is unlikely to generate sufficient revenue to

[176] Ibid., 6.

[177] Ibid.

[178] Bunning-Bereuter-Blumenauer Flood Insurance Reform Act of 2004, 42 U.S.C. § 4016 (a), 2004, http://www.fema.gov/media-library-data/20130726-1748-25045-4942/fira2004.pdf.

cover future catastrophic losses or repay the billions of dollars borrowed from the Department of Treasury."[179] To strengthen the fiscal solvency of the NFIP, Congress passed the Biggert-Waters Flood Insurance Reform Act of 2012 (BW-12). Key provisions of the legislation required implementation of changes to the NFIP that would phase out subsidized NFIP flood insurance premiums and raise rates to reflect the true flood risk. Also, the legislation called for changes in how FEMA published updated FIRMs, including provisions for improved communication to impacted policyholders.

As noted by FEMA, approximately 20 percent of policies receive subsidies under the NFIP (commonly referred to as pre-FIRM properties).[180] For subsidized non-primary/secondary residences, properties that have experienced repetitive losses, and business/non-residential properties in the SFHA changes were implemented to increase NFIP flood insurance premium rates by 25 percent annually until the rates reflected the true risk.[181] Primary residences in SFHAs would keep subsidized rates until the property was sold, the policy lapsed, the property suffered repetitive or significant flood losses, or a new policy was purchased, at which time full-risk rates would apply.[182] Also, "grandfathered" rates would be phased out at a 20 percent increase per year when new or updated FIRMs were adopted by a local community.[183] FEMA was also tasked with conducting a study on the affordability of the NFIP; it was completed by the National Academies of Sciences in 2015 and 2016.[184]

As changes to NFIP flood insurance rates were being initiated, property owners who had received the benefit of subsidized flood insurance rates rallied against the implemented changes. In particular, coastal communities were quick to petition congressional representatives to delay the implementation of adjustments to flood insurance rates. They claimed the changes would gut housing markets and devastate local

[179] U.S. Government Accountability Office, *High-Risk Series*, 385.

[180] National Research Council, *Affordability of National Flood Insurance Program Premiums* (Report 2) (Washington DC: National Academies Press, 2016), doi:10.17226/21848, 8.

[181] Federal Emergency Management Agency, *Biggert Waters Flood*, 1.

[182] Ibid., 1–2.

[183] Ibid., 2.

[184] National Research Council, *Affordability* (Report 1), 150.

economies, which were already reeling from the impacts of recent hurricanes.[185] Congressional resolve to improve the NFIP fiscal solvency through the measures required by BW-12 quickly began to dissolve as constituents voiced their concerns. In response, through the Consolidated Appropriations Act of 2014, Congress included provisions to prohibit implementation of certain flood insurance rate increases while a new law was developed.[186]

5. Homeowner Flood Insurance Affordability Act of 2014

As a permanent measure to address the controversial components of the BW-12, Congress implemented the Homeowner Flood Insurance Affordability Act of 2014 (HFIAA), which repealed or modified certain provisions enacted in 2012 and made additional changes to the NFIP program. Those provisions included the following:

- Refunds: A refund program was initiated for certain flood insurance policies that were affected by the pre-FIRM subsidy elimination. Pre-FIRM subsidized rates were reinstated for those policies impacted by the provisions of BW-12.
- Premium rates for subsidized policies: Provisions to increase subsidized flood insurance policies to full-risk rates were reduced under the HFIAA. With few exceptions, rate increases were reduced to 18 percent annually versus the original provision for increases of 25 percent annually. Also, pre-FIRM rates can be transferred to a new owner when a property is sold, pending additional provisions from FEMA.
- New surcharge on all policies: As a new provision, implemented a surcharge on all NFIP flood insurance policies. A surcharge of $25 is applied to policies on primary residences and $250 on all other policies. The surcharge will remain in effect until all pre-FIRM subsidies are eliminated.

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185 Steve Scalise, "Protect Louisiana Homeowners, Reform Biggert-Waters Flood Insurance Act," *The Times-Picaynne*, February 23, 2014, http://www.nola.com/opinions/index.ssf/2014/02/protect_louisiana_homeowners_r.html, sec. Op-Ed; Phil Hall, "Dangerous When Wet: The Biggert-Waters Act's Impact," *Servicing Management* 24, no. 10 (2013), http://www.mortgageorb.com/online/issues/SVM1305/FEAT_06_Dangerous_When.html; Joseph Palmisano, "American Flood Insurance: The Biggert-Waters Act and Beyond," Law Street, February 21, 2015, http://lawstreetmedia.com/issues/energy-and-environment/can-biggert-waters-act-save-american-flood-insurance/.

186 Federal Emergency Management Agency, *National Flood Insurance Program and the Consolidated Appropriations Act of 2014: Fact Sheet* (Washington, DC: Federal Emergency Management Agency, 2014), http://www.fema.gov/media-library-data/1392062928758-80537fe9ad63607837d8a29f04280492/BW12_consolidated_app_2014.pdf.

- Grandfathering: Repealed the provisions of BW-12 that required the phasing out of grandfathered NFIP flood insurance properties.
- Flood insurance advocate: Requires FEMA to designate flood insurance advocate to advocate for NFIP policyholders.[187]

The HFIAA includes additional provisions to continue to address issues associated with the NFIP. One of those provisions that will likely result in additional enhancements of the NFIP is the requirement for development of an NFIP affordability framework. Under the provisions of the HFIAA, FEMA is required to develop the affordability framework within 18 months of completion of the affordability study provisioned under BW-12.[188] Guidance in the legislation for the framework is focused on improved communication of flood risk, targeted financial assistance for low-income populations, additional focus on mitigation actions, and considerations of the impact of increases in premium rates and updates to FIRMs.[189]

D. CHAPTER SUMMARY

It is important to understand why federal policymakers chose to expand the role of government to provide insurance for flood losses. Federal disaster assistance data clearly indicates the prominence of flooding and flood-related hazards as the most significant hazard in the United States. It accounts for 78.2 percent of all major disaster declarations from 1953 through 2015.[190] A review of the nation's early history indicates flooding has always been a significant issue, especially along the major rivers that play a prominent role in agriculture, industry, and commerce. For example, the Great Mississippi River Flood of 1927 served as a turning point for federal policymakers to initiate multibillion-dollar flood control programs to tame the nation's major rivers. As highlighted in the book *Disasters and Democracy*:

> Few natural events have had a more lasting impact on our engineering concepts, economic thought, and political policy in the field of floods.

187 Federal Emergency Management Agency, *Homeowner Flood Insurance*, 2–4.

188 Ibid., 4.

189 Ibid.

190 Federal Emergency Management Agency, "Disaster Declarations."

> Prior to 1927 control of floods in the United States was considered largely a local responsibility. Soon after 1927, the control of floods became a national problem and a federal responsibility.[191]

Despite the increased role of the federal government in managing flood control measures, "disaster assistance was viewed as a moral responsibility of neighbors, churches, charities, and communities."[192] By the 1950s, private insurance for flood losses was largely non-existent and efforts to limit development in floodplains was given little more than verbal support.[193] Federal support for flood victims of Hurricane Betsy served as a turning point for expanded government involvement in assisting communities and individuals with flood hazards. The passage of the National Flood Insurance Act of 1968, which established the NFIP, initiated a new era of federal government involvement in identifying, managing, and assisting communities and individuals from the threat of flooding.

The primary components of the NFIP seek to provide for the hazard identification and risk assessment of flood hazards, minimize the impact of flooding through floodplain management, and they have the underlying objective of insurance as "the preferred mechanism for disaster assistance."[194] Each of these components contributes to reducing the risk and impact from flood hazards on communities and individuals. However, nearly 50 years after passage of the NFIP, flooding remains the most significant and costly hazard in the United States and requires seemingly never ending support from the federal government to manage risk and provide recovery assistance.

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[191] Platt, *Disasters and Democracy*, 151–153.

[192] Ibid., 154–155.

[193] Kousky and Shabman, *Pricing Flood Insurance*, 2; Platt, *Disasters and Democracy*, 211.

[194] Hayes and Neal, *NFIP Actuarial Rate Review*, 2.

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III. DOES THE NFIP LIMIT RISK REDUCTION?

The previous chapter outlined the evolution of federal involvement in flood disasters that resulted in the creation of the NFIP, outlined the current scope of the NFIP programs, and highlighted some of the critical issues that continue to compromise the program. This chapter seeks to apply our understanding of the NFIP to the question, to what extent is the NFIP limiting risk reduction and serving as an example of a federal disaster assistance program contributing to the rise of a moral hazard?

As previously outlined, the concept of moral hazard is based on how the redistribution of risk negatively changes behavior—that the transfer of risk will result in the "tendency to take risks or alter behavior, because the negative costs or consequences that could result will not be felt by the person taking the risk."[195] It is worth examining what components of the NFIP potentially limit risk reduction and contribute to a moral hazard. Three components offer insight on limitations of the program to meet its objective to prevent future loss of life and property from the hazard of flooding. Repetitive loss properties, pre-FIRM subsidized policies, and the inability of the program to absorb the impact of significant flood events are all elements that hinder the ability of the program to meet its long-term objective. Examining each of these identified factors in relation to the concept of moral hazard can provide insight on whether the NFIP limits risk reduction.

A. REPETITIVE LOSS PROPERTIES

Repetitive loss properties are insured properties that have filed multiple NFIP flood insurance claims due to repetitive flood losses. The continued coverage of repetitive loss properties represents one of the clearest and most obvious indicators of the NFIP limiting risk reduction and contributing to the rise of a moral hazard. As provided in the definitions of moral hazard from insurance and economics, allowing for repetitive

[195] Aaron Hill, "Moral Hazard in Economics: Definition & Examples," accessed January 9, 2016, http://study.com/academy/lesson/moral-hazard-in-economics-definition-examples.html.

loss in the NFIP is indicative of the "tendency for insurance against loss to reduce incentives to prevent or minimize the cost of loss."[196]

FEMA's administration of the NFIP identifies repetitive loss properties and a subset of those properties, identified as severe repetitive loss properties, as a critical issue with special attention applied to mitigating flood hazards for those properties. FEMA NFIP flood insurance claim and loss data indicates that while repetitive loss properties only account for approximately 3.8 percent of NFIP policies (as outlined in Appendix C) they account for 35.5 percent of claims and 30.5 percent of claim payments.[197] FEMA has also estimated that 90 percent of repetitive loss properties were constructed before the publishing of FIRMs for those locations, which gives an indication of the high-risk the program assumed without a clear methodology to mitigate the risk in the long-term.[198] NFIP policies specifically prevent FEMA from refusing coverage to any policyholder in a participating NFIP community and cannot compel property owners to mitigate losses or impose actuarial rates on repetitive loss properties; these represent policies that would never be supported by private insurance providers.[199] The policy elements that allowed for the insuring of properties without an understanding of risk, automatic coverage without the requirement to reduce the risk, and provide a guaranteed coverage without risk of cancellation, all demonstrate an asymmetric transfer of risk from the property owner to the government. Each of these policy elements creates a framework in which moral hazard can exist and risk reduction is not incentivized.

Part of the underlying inquiry related to the NFIP limiting risk reduction is a determination of whether policyholders truly understand the risk of a flood impacting their property. Related to repetitive loss properties, the answer appears obvious given that once a property suffers a loss from a flood, it would remain at risk unless some action was taken to reduce future risk. This supports the moral hazard argument that individuals

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196 Baker, "On the Genealogy of Moral Hazard," 239.

197 Federal Emergency Management Agency, "Policy & Claim Statistics;" FEMA Region VI, *FEMA NFIP Repetitive Loss Report.*

198 King, *National Flood Insurance Program*, 18.

199 Kousky and Michel-Kerjan, "Examining Flood Insurance Claims," 6; King, *National Flood Insurance Program*, 18.

have the full understanding of the risks they face. However, as explained by Kousky and Shabman:

> If individuals fully understood disaster risks, however, they would be aware of the many costs of disasters not covered by aid or insurance: the suffering and worry; the time lost to recovery and rebuilding; the loss of irreplaceable items, particularly those that may carry sentimental value, such as family photographs; not to mention the possibility of injury or even loss of life.[200]

As noted, 90 percent of repetitive loss properties are pre-FIRM properties that were constructed before the risk was assessed and communicated.[201] While properties that suffer repetitive losses should have an understanding of the risk of flooding, the question remains: are those property owners in a position to adjust the risk of flooding through mitigation measures?

FEMA has continuously attempted to address the issue of repetitive loss properties through developing methods to mitigate flood losses and providing mitigation grant funding for the acquisition, demolition, relocation, or flood proofing of properties. Congress has supported these efforts through various mitigation grants and the Flood Insurance Reform Act of 2004, which was specifically implemented based on the issues associated with repetitive loss properties. Despite these efforts, "the annual increase in new repetitive loss properties is outpacing FEMA mitigation efforts by a factor of 10 to 1."[202] Furthermore, as highlighted by Erwann Michel-Kerjan, "many residents living in hazard-prone areas not only lack interest in purchasing natural hazard insurance and keeping it, they also rarely undertake voluntary loss-prevention measures to protect their property."[203] Many factors contribute to the failure of individuals to mitigate the risk, including "a lack of accurate knowledge about risk; budget constraints; and myopia."[204] Mitigation of flood risk—specifically, elevating high-risk properties above the base flood

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[200] Kousky and Shabman, "The Hazard of the Moral Hazard—Or Not," 14.

[201] King, *National Flood Insurance Program*, 18.

[202] Ibid.

[203] Erwann O. Michel-Kerjan, "Catastrophic Economics: The National Flood Insurance Program," *Journal of Economic Perspectives* 24, no. 4 (2010): 414.

[204] Ibid.

elevation—has been demonstrated to be an effective risk reduction measure.[205] However, elevating an existing structure comes with a significant cost that would only be paid back over an extended period; this leaves little incentive to make such an investment over the short-term.[206] While the evidence supports that mitigation measures are an effective methodology to reduce flood risk, they require a long-term perspective that investment in reducing the risk is preferred to maintaining the status quo provided through the insurance program that would only require those measures in the most extreme circumstances.

An analysis of NFIP flood insurance claims shows that repetitive losses have remained a constant percentage of total flood insurance claims throughout the history of the NFIP, regardless of what actions have been initiated to reduce repetitive loss. Figures 3 and 4 provide an annual comparison of total NFIP flood insurance claims and costs in relation to repetitive loss property claims and costs. The percentage of claims associated with repetitive loss properties has remained relatively steady over the course of the flood insurance program. However, the percentage of costs related to repetitive loss properties has shown a general downward trend. Of note is the relatively small percentage of claims and costs associated with repetitive loss properties in the historical loss years of 2005 (Hurricanes Katrina and Rita), 2008 (Hurricane Ike), and 2012 (Hurricane Sandy). A probable explanation for this anomaly is the massive scope of impacts from these hurricanes extending well beyond areas identified as high-risk for flooding. The evidence indicates that repetitive loss claims remain an ongoing problem for the NFIP. That public policy has not reduced those properties that remain at a high risk of repeatedly being impacted by flooding. Conversely, trends also indicate that losses associated with repetitive loss properties are declining; this is perhaps indicative that the NFIP is reducing the magnitude of impacts from flood events.

[205] Erwann O. Michel-Kerjan and Carolyn Kousky, "Come Rain or Shine: Evidence on Flood Insurance Purchases in Florida," *The Journal of Risk and Insurance* 77, no. 2 (2010): 394, doi:10.1111 /J.1539-6975.2009.01349.X.

[206] Michel-Kerjan, "Catastrophic Economics," 414.

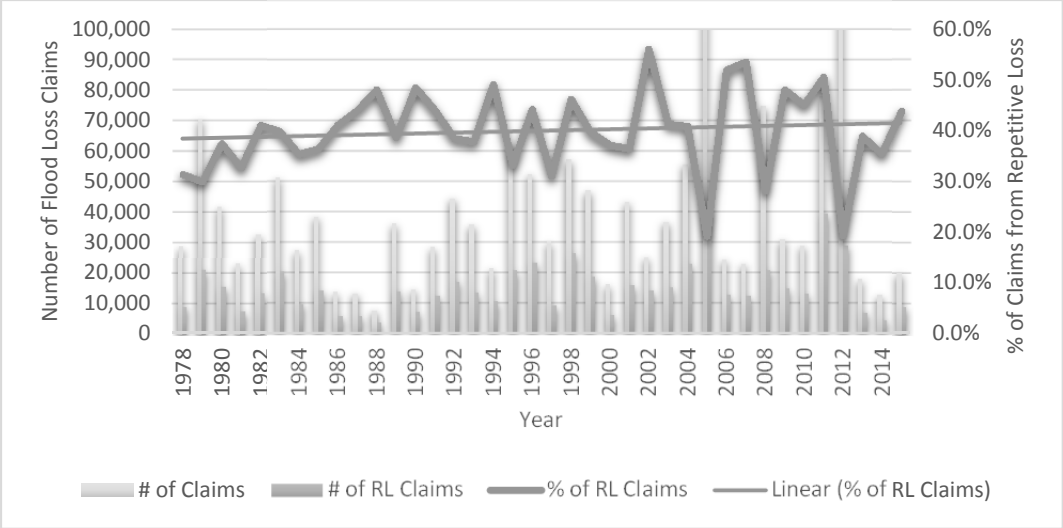

Figure 3. Flood Insurance Loss Claims (1978–2015), Total Claims versus Repetitive Loss Claims[207]

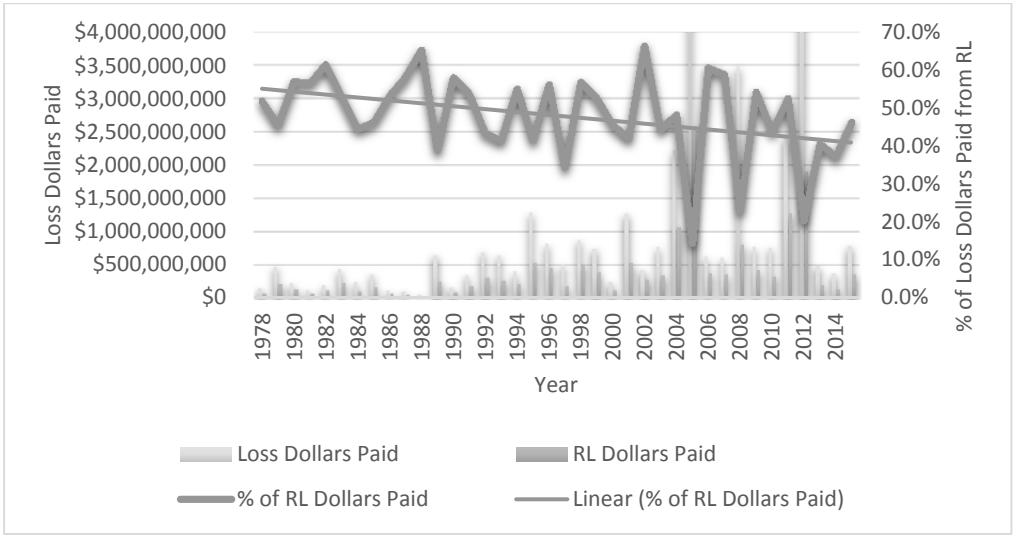

Figure 4. Flood Insurance Loss Dollars Paid (1978–2015), Total Losses versus Repetitive Losses[208]

[207] Adapted from: Federal Emergency Management Agency, "Policy & Claim Statistics;" FEMA Region VI, *FEMA NFIP Repetitive Loss Report*. Note: The scale for the "number of loss claims" was capped at 100,000 to improve the display of the information; 2005 claims totaled 213,587 and 2012 claims totaled 150,832.

[208] Adapted from: Federal Emergency Management Agency, "Policy & Claim Statistics;" FEMA Region VI, *FEMA NFIP Repetitive Loss Report*. Note: The scale for the "number of loss dollars paid" was capped at $4,000,000 to improve the display of the information; 2005 loss dollars totaled $17,770,118,000 and 2012 loss dollars totaled $9,266,395,000.

Moral hazard is an important element in considering the issue of repetitive loss properties[209] since they are documented as a clear and obvious issue for the NFIP. While repetitive loss properties account for a small percentage of flood insurance policies, they account for a disproportionately significant number of claims and associated costs. The data shows that generally these properties are located in high-risk areas and were constructed before the assessment of risk through the NFIP mapping process. As a result, the vast majority of repetitive loss properties pay subsidized pre-FIRM flood insurance rates.[210] Whereas the implementation of mitigation measures has proven to be effective at reducing vulnerability, research indicates that most property owners are indifferent to mitigation programs due to "a lack of accurate knowledge about risk; budget constraints; and myopia."[211] Furthermore, NFIP policies that provide insurance coverage without the requirement to reduce risk and that guarantee coverage without risk of cancellation limit the incentive to reduce risk.

B. PRE-FIRM SUBSIDIZED POLICIES

Historically, the catastrophic nature of flooding limits the ability to develop a rate structure that adequately reflects the full risk to flood-prone properties.[212] Based on this issue, a private insurance market that can profitably provide flood insurance at an affordable price has not emerged. This lack of a market has pressed the government to undertake a "public program that encompasses social goals" where a private market failed to emerge.[213] It also created the economic challenge of government management of a flawed market model. Given the correlated risk of property owners located in high-risk flood zones, the use of traditional insurance principles to gather a large pool of independent risks to reduce the risk to the insurance program was not possible.[214] These

[209] Michel-Kerjan, "Catastrophic Economics," 415.

[210] King, *National Flood Insurance Program*, 18.

[211] Michel-Kerjan, "Catastrophic Economics," 414.

[212] Congressional Budget Office, *The National Flood Insurance Program*, 13.

[213] Flood Insurance Subcommittee, *The National Flood Insurance Program*, 5.

[214] King, *National Flood Insurance Program*, 8.

circumstances give rise to the government using flood insurance subsidies to build and maintain participation in the NFIP.

Similar to the continued coverage of repetitive loss properties, the use flood insurance subsidies appears to represent a clear indicator of the NFIP limiting risk reduction and contributing to the rise of moral hazard. Flood insurance provided by the NFIP is based on two general classes of properties: those insured at full actuarial rates and those insured at subsidized rates.[215] Congress authorized subsidized rates for structures constructed before the effective date of a FIRM as an important aspect of the NFIP's startup process to encourage participation and to avoid unfairly penalizing homeowners who built before the program was established.[216] The NFIP includes grandfathered premiums that allow a subsidized rate class to continue even if a new FIRM indicates a higher level of flood risk.[217] Regulators believed these policies would be phased out over time as properties were lost to age or flooding. An initial estimate in a 1966 housing and urban development report predicted subsidies would be needed for about 25 years.[218] However, the useful life of buildings has been significantly extended by modern construction techniques, with at least one FEMA report estimating the need for subsidies continuing until 2050.[219] According to FEMA, subsidized and grandfathered rates have declined from 75 percent of policies in 1978 to the current estimated 20 percent of policies; this currently equates to over one million policies.[220]

Pre-FIRM subsidized and grandfathered policies typically pay 40 to 45 percent of the full actuarial rates charged to other policyholders.[221] Pre-FIRM properties are exempt from many of the NFIP's floodplain management requirements unless they are

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[215] King, *Federal Flood Insurance*, 14.

[216] Ibid.

[217] National Research Council, *Affordability* (Report 1), 5–6.

[218] Kousky and Shabman, *Pricing Flood Insurance*, 6; Pasterick, "The National Flood Insurance Program," 142.

[219] Pasterick, "The National Flood Insurance Program," 142; Gilbert M. Gaul and Anthony R. Wood, "A Flawed Program Facilitates Building in Hazardous Areas," *Philadelphia Inquirer*, March 7, 2000, https://marine.rutgers.edu/cool/education/coast08.htm.

[220] King, *Federal Flood Insurance*, 15; Hayes and Neal, *NFIP Actuarial Rate Review*, 34.

[221] Hayes and Neal, *NFIP Actuarial Rate Review*, 9.

substantial damaged or undergo substantial improvements.[222] The NFIP attempts to recoup lost revenue from pre-FIRM subsidized policies through post-FIRM revenues and cover grandfathered policies by charging higher premiums across all other policies in the shared flood zone.

A private insurance provider would not share the government policies that establish and maintain the pre-FIRM discounts. As stated by the American Academy of Actuaries, "At times, Congress and FEMA have prioritized societal and marketing goals, such as increasing the policies in force and gaining acceptance of new FIRMs by affected communities, over developing and maintaining full-risk rates."[223] FEMA's actuarial rate review justifies public policy providing insurance at less than full-risk rates as an extension of disaster assistance:

> It was anticipated that very high premiums would cause great resistance to insurance purchase. However, with reasonable premiums, property owners purchasing insurance at less than full-risk rates would still be funding at least part of their recovery from flood damage. This was considered preferable to the previous arrangement of disaster relief that came solely from taxpayer funding.[224]

These elements are consistent with social contract theory and economics view of moral hazard: the theory that government should intervene when a market is unwilling to provide societal insurance, thus providing for the "common good." While federal policymakers have worked to reduce subsidies and move the flood insurance program towards the goal of being actuarial sound, there will always remain a percentage of policyholders who would not be protected except for government intervention.

Similar to repetitive loss properties, pre-FIRM discounted policies represent a significant disproportionate percentage of claims and costs. The GAO has estimated that pre-FIRM discounted policies experience up to five times more flood damage than properties built in compliance with NFIP regulations.[225] Common sense seems to dictate

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[222] "Substantial Damages and Substantial Improvements."

[223] Flood Insurance Subcommittee, *The National Flood Insurance Program*, 6.

[224] Hayes and Neal, *NFIP Actuarial Rate Review*, 4.

[225] Kousky and Shabman, *Pricing Flood Insurance*, 6.

that higher numbers of claims and losses should have been anticipated. By their very definition, pre-FIRM properties were constructed before the assessment of risk through the NFIP mapping process and the implementation of floodplain management requirements. Although assistance to reduce the risk of flooding through mitigation programs is available for pre-FIRM properties, as previously outlined research indicates, most property owners are indifferent to mitigation programs.[226] As posited by Kunreuther and others, "[subsidies] undermine the incentives for policyholders to carry out mitigation measures… because the subsidized rates are not affected by such measures."[227] While progress has been made to reduce the number of pre-FIRM properties, a significant number of high-risk properties remain in high-risk zones.

FEMA uses the combination of subsidized and full-risk premiums to generate revenue sufficient to cover a "historical average loss year."[228] By authorizing and continuing to use pre-FIRM subsidized and grandfathered policies, "it is impractical for the NFIP to be actuarially sound in the aggregate."[229] While FEMA has worked to address the impacts of discounted premiums, its continued use limits the ability of the NFIP to maintain fiscal solvency when faced with catastrophic losses.[230] As a result of the catastrophic loss years of 2005 (Hurricanes Katrina and Rita) and 2008 (Hurricane Ike), FEMA requested 18 short-term funding extensions of the NFIP resulting in close to $18 billion in debt to the U.S. Treasury.[231] Given the fiscal bankruptcy of the NFIP, political forces from across the spectrum petitioned Congress to improve the financial sustainability of the NFIP.[232] The result was a sweeping reform of the NFIP with the

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[226] Michel-Kerjan, "Catastrophic Economics," 414.

[227] Congressional Budget Office, *The National Flood Insurance Program*, 6; Howard C. Kunreuther and Erwann O. Michel-Kerjan, *At War with the Weather: Managing Large-Scale Risks in a New Era of Catastrophes* (Cambridge, MA: MIT Press, 2009), 256–261.

[228] Hayes and Neal, *NFIP Actuarial Rate Review*, 5; King, *National Flood Insurance Program*, 16.

[229] Hayes and Neal, *NFIP Actuarial Rate Review*, 5.

[230] Ibid.

[231] Bjorn Philip Beer and Johanna Hoffman, "Underwater," *Earth Island Journal* 29, no. 4 (2015): 39; Ben Berkowitz and Roberta Rampton, "Superstorm Sandy Will Test Federal Flood Insurance Program," *Insurance Journal*, November 2, 2012, http://www.insurancejournal.com/news/national/2012/11/02/269253.htm.

[232] Beer and Hoffman, "Underwater," 39.

overwhelming bipartisan passage of the Biggert-Waters Flood Insurance Reform Act of 2012 (BW-12).[233]

BW-12 initiated the phasing out of subsidized and grandfathered policies in addition to other program changes.[234] FEMA maintained that 81 percent of NFIP policyholders already pay actuarial rates and would not be directly impacted by BW-12.[235] The remaining 19 percent of policyholders that pay discounted premiums were affected by BW-12 based on the classification of their property. For the approximate five percent of policies for non-primary residences, businesses, and repetitive loss properties, BW-12 initiated an immediate 25 percent increase annually until flood insurance rates reflect the full risk.[236] For the approximate 10 percent of subsidized primary residences, BW-12 would not impact the subsidies until the property was sold or the policy lapsed.[237] The remaining four percent of properties, including subsidized multifamily structures, were placed in a hold status until additional guidance could be developed.[238] BW-12 also phased out grandfathered rates with a 20 percent annual increase until full-risk rates were achieved.[239] The provisions of BW-12 to phase out subsidies and grandfathering provisions of the NFIP were aimed at restoring the NFIP to solid financial health.[240]

As the provisions of BW-12 began to take effect, the backlash against the rate increases associated with the legislation was swift. In 2013 reports began surfacing of massive premium increases for policyholders in high-risk areas that redefined flood

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233 Ibid., 40.

234 National Research Council, *Affordability* (Report 1), 4.

235 Federal Emergency Management Agency, *Biggert Waters Flood Insurance Reform Act of 2012: Who Will Be Impacted by Rate Increases Nationally under Section 205?* [*Who Will Be Impacted?*] (Washington, DC: Federal Emergency Management Agency, 2013), https://www.fema.gov/media-library-data/20130726-1910-25045-4019/bw12_impact_fs_04092013_natl_508.pdf, 1.

236 Federal Emergency Management Agency, *Who Will Be Impacted?*, 1; Federal Emergency Management Agency, *Biggert Waters Flood*, 1.

237 Federal Emergency Management Agency, *Who Will Be Impacted?*, 1.

238 Ibid., 2.

239 Federal Emergency Management Agency, *Biggert Waters Flood*, 2.

240 Scott Gabriel Knowles and Jamelle Bouie, "Flood Zone Foolishness," *Slate*, March 23, 2014, http://www.slate.com/articles/health_and_science/science/2014/03/biggert_waters_and_nfip_flood_insurance_should_be_strengthened.html.

insurance reform arguments away from the long-term sustainability of the NFIP.[241] In addition, local grassroots efforts combined with support from lobbying organizations worked to "reframe the issue away from sound environmental policy and fiscal prudence… [to] now revolve around the plight of local economies, homeowners, and the still-recovering housing market."[242] In response, Congress was quick to respond to the outcry with a reversal of the strongest provisions of BW-12.[243]

In early 2014, Congress reinstated the discounts for most policyholders and slowed the increase for others with the passage of the HFIAA. The interaction between Congress and policyholders exemplifies the core essence of moral hazard; when people do not assume the full risk of an action or decision, they are not inclined to make a fully responsible or moral choice. As the economic argument for moral hazard declares, "people never would have flocked to the Jersey shore or Florida coast… had the government not offered the phony protection of subsidized insurance."[244] As further explained by Justice Scalia, these interactions help to show that the govermentalization of charity leads to the transformation of charity into legal entitlement.[245] The continuation of NFIP subsidies and grandfathered discounted premiums has effectively transformed the program into a legal entitlement for many policyholders; this limits the options for decision makers. As summarized by Bjorn Beer,

> Biggert-Waters represented a rare moment when fiscal and environmental common sense overlapped just long enough for policymakers to look beyond the horizon of a 30-year mortgage. The undoing of these reforms proves that our political system can't even see past the horizon of the next election. Perhaps it is all a reflection of what behavioral scientists say is *Homo sapiens'* hard-wired myopia. We've evolved an excellent ability to

[241] Beer and Hoffman, "Underwater," 42; National Research Council, *Affordability* (Report 1), 15; Alicia Puente Cackley, *Flood Insurance: Status of FEMA's Implementation of the Biggert-Waters Act, as Amended* (Washington DC: U.S. Government Accountability Office, 2015), http://www.gao.gov/assets/670/668578.pdf, 9.

[242] Beer and Hoffman, "Underwater," 42.

[243] Knowles and Bouie, "Flood Zone Foolishness."

[244] Ibid.

[245] Scalia, "Is Capitalism or Socialism More Conducive."

> notice short-term dangers like a spike in our insurance, but we're lousy at seeing long-term threats like sea level rise.[246]

C. SIGNIFICANT FLOOD EVENTS

The NFIP is not structured to withstand claims and losses associated with a catastrophic loss year; it uses the borrowing authority with the U.S. Treasury to cover excessive losses.[247] On the contrary, the NFIP has been structured to cover claims associated with a "historical average loss year."[248] Nevertheless, before Hurricane Katrina, the NFIP had generally remained fiscally solvent, only needing to borrow funds from the U.S. Treasury four times since the mid-1980s and repaid the debt each time.[249] In many ways, this is a testament to the sound management and administration of the program.

Unfortunately, the catastrophic losses associated with the 2004, 2005, 2008, and 2012 hurricane seasons created a fiscal crisis requiring intercession. Should the catastrophic losses of these historic hurricane seasons serve as an indictment of the failures of the program to prepare for repeated significant losses or simply be written off as an anomaly that should be covered as federal disaster assistance? Perhaps the answer is that both assertions are correct. The NFIP is conceived as a social program that is legislatively limited when it comes to addressing the potential for catastrophic losses.[250] This creates a mechanism by which policymakers have undermined the ability of the program to achieve actuarial soundness required to address catastrophic losses.[251] In addition, the NFIP is an extension of federal disaster assistance programs.[252] The severe hurricane impacts from 2004 through 2012 represent one of the most costly disaster periods in United States history. In particular, Hurricanes Katrina and Sandy pushed all

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[246] Beer and Hoffman, "Underwater," 42–43.

[247] Kousky and Shabman, *Pricing Flood Insurance*, 9.

[248] Hayes and Neal, *NFIP Actuarial Rate Review*, 5.

[249] Ibid., 6.

[250] Flood Insurance Subcommittee, *The National Flood Insurance Program*, 5–6.

[251] Kousky and Shabman, *Pricing Flood Insurance*, 9.

[252] Hayes and Neal, *NFIP Actuarial Rate Review*, 4.

aspects of government, private, and non-profit disaster assistance programs beyond the breaking point; the NFIP was no exception.

A review of the history of federal involvement in responding to floods shows that every time government intervention has been challenged by disaster, programs are adjusted to meet the emerging challenge. Figure 5 provides a “cause and effect” chain of major flood-related disasters and the legislative response to those disasters. It also highlights the limitations of policymakers, who have difficulty seeing past the scope of the current disaster to plan for the potentially greater impact of future disasters.

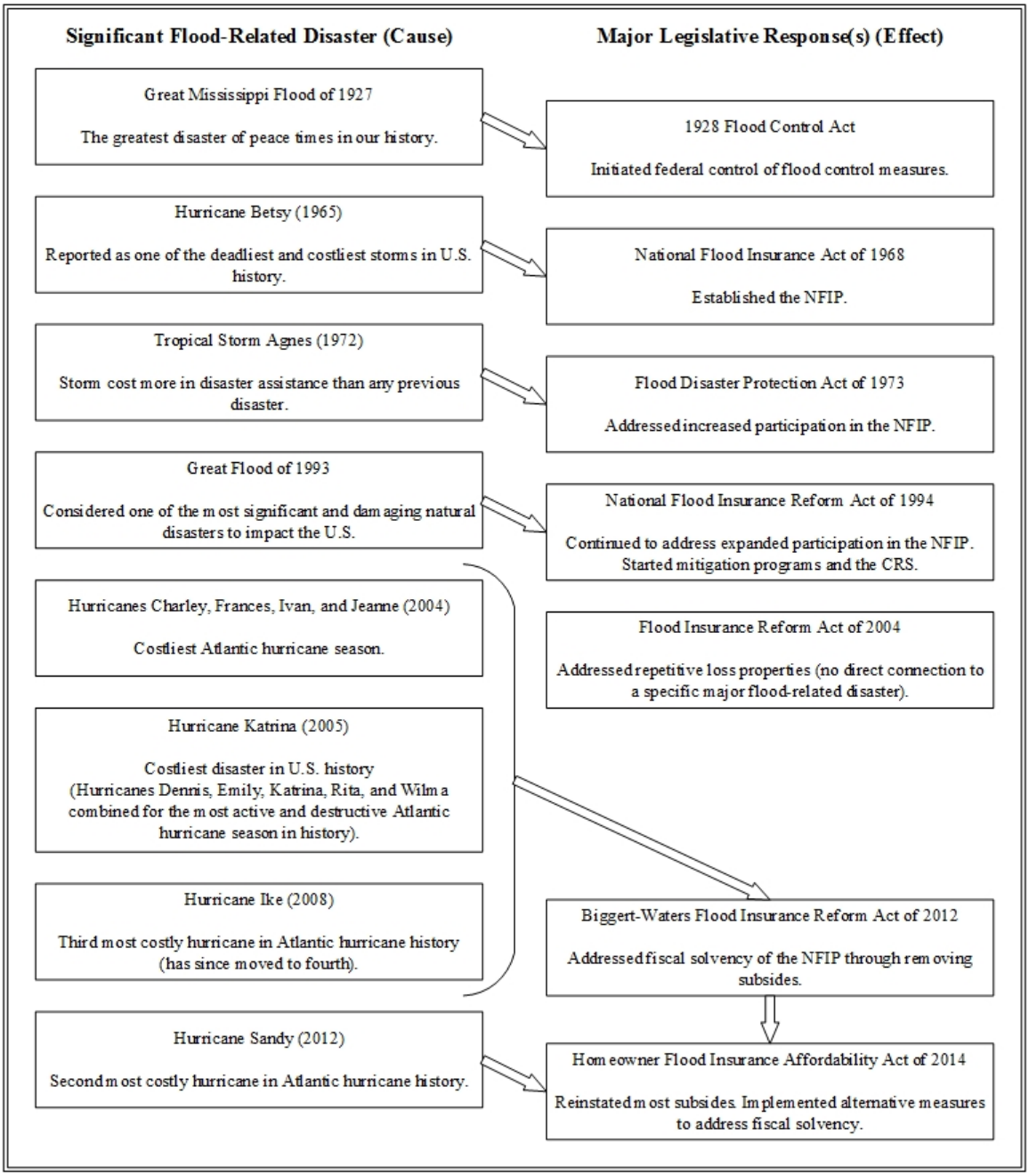

Figure 5. Diagram Depicting the Cause and Effect Relationship between Significant Flood Disasters and the Resulting Legislation

Throughout the history of the NFIP, significant loss events have accounted for a greater and greater percentage of flood insurance claims and losses (see Figures 6 and 7). While the numbers vary significantly from year-to-year pending on impacts from disasters, significant loss events currently average 64 percent of claims and 84 percent of

losses for the NFIP.[253] Given that the NFIP was never designed to fund catastrophic losses, it should not be surprising that the program could not fiscally manage the historic hurricane impacts of 2004 through 2012. Kousky and Shabman acknowledge that even if the program were fully funded at actuarial rates, it would not be able to absorb those catastrophic losses.[254] From this perspective, policymakers should recognize the limitations of how the program is formulated and simply write off these catastrophic losses as part of federal disaster assistance.

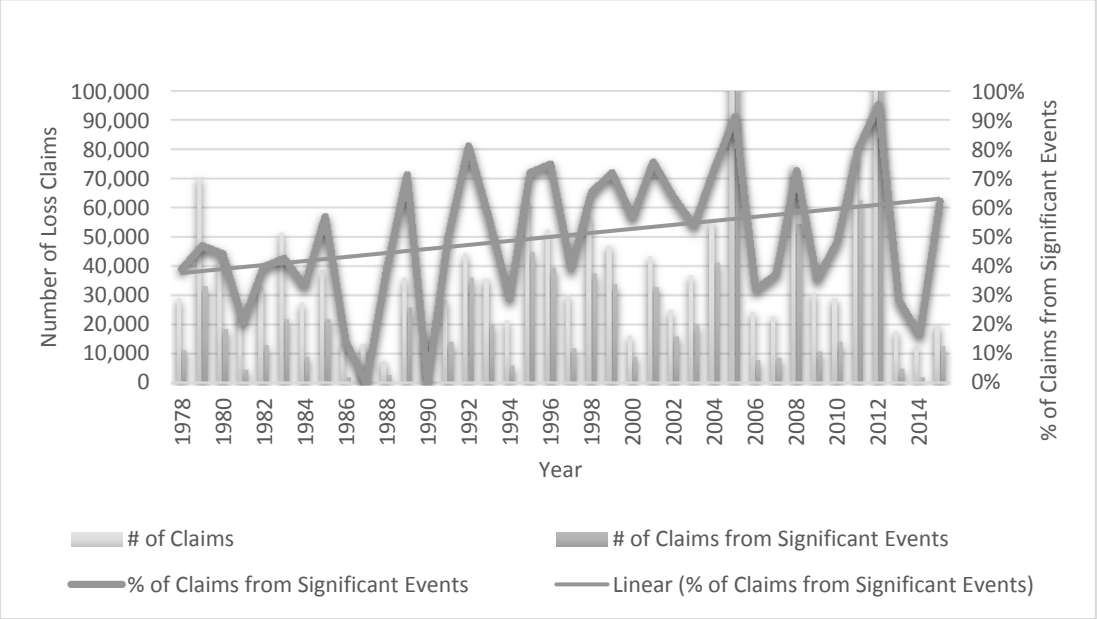

Figure 6. Flood Insurance Loss Claims (1978–2015) Total Claims versus Significant Event Claims[255]

[253] Federal Emergency Management Agency, "Policy & Claim Statistics;" Federal Emergency Management Agency, "Significant Flood Events," accessed August 17, 2016, https://www.fema.gov/significant-flood-events.

[254] Kousky and Shabman, *Pricing Flood Insurance*, 9.

[255] Adapted from: Federal Emergency Management Agency, "Policy & Claim Statistics;" Federal Emergency Management Agency, "Significant Flood Events."

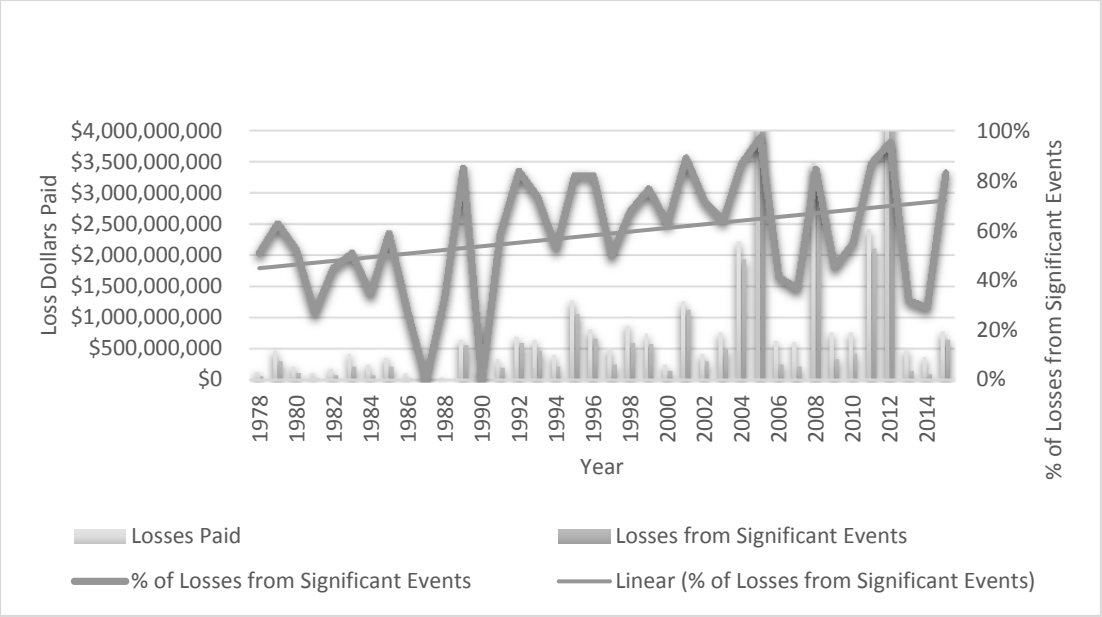

Figure 7. Flood Insurance Loss Dollars Paid (1978–2015) Totals Losses versus Significant Event Losses[256]

However, addressing the catastrophic impacts of recent disasters may only represent the tip of the iceberg for the issue of significant loss events. Given the predicted impacts of climate change related to the threat of flooding, significant loss events are forecasted to become far more widespread, and they may represent the single greatest threat to the long-term sustainment of the NFIP. A study completed for FEMA on the impacts of climate change indicates that by the year 2100, the average increase in SFHA nationally may be approximately 40 to 45 percent, and no significant decreases in the floodplain depth and SFHA are anticipated in any region of the United States.[257] Also, the study indicates that the need for NFIP flood insurance policies may increase by 80 to

[256] Adapted from: Federal Emergency Management Agency, "Policy & Claim Statistics;" Federal Emergency Management Agency, "Significant Flood Events."

[257] Federal Emergency Management Agency, *The Impact of Climate Change and Population Growth on the National Flood Insurance Program through 2100* (Arlington, VA: Federal Emergency Management Agency, 2013), http://www.acclimatise.uk.com/login/uploaded/resources/FEMA_NFIP_report.pdf, 6-1-6–2,

100 percent due to both population growth in SFHAs (by 30 percent) and climate change increasing the size of SFHAs (by 70 percent).[258]

The impact of significant loss events is clearly a threat to the long-term sustainability of the NFIP. Policymakers must continue to address the fiscal challenges facing the program by placing it in a more financial sound framework that allows for improved management of the program when faced with significant loss events. Furthermore, hazard identification and floodplain management policies must start to address the estimated impacts of climate change increasing the threat of flooding. Finally, policymakers must proactively deal with the emerging challenge of climate change or risk the collapse of the NFIP from sustained significant loss event impacts.

[258] Ibid., 6-2.

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IV. CONCLUSION

A. THE MORAL HAZARD ARGUMENT

Moral hazard is a concept originalting in the early insurance industry with broad application in economics, law, and policy debate. Moral hazard is defined as when people do not assume the full risk of an action or decision, they are not inclined to make a fully responsible or moral choice; how the redistribution of risk adversely changes people's behavior.[259] With the expansion of federal government involvement in providing disaster assistance, many commentators have asserted that government involvement contributes to the rise of moral hazard and reduces incentives to reduce risk.[260]

Does federal involvement in provision of disaster assistance limit risk reduction and contribute to the rise of a moral hazard? Though I concede that moral hazard cannot be universally applied to all disaster assistance programs, many of these programs share commonalities with insurance, wherein the concept of moral hazard originated. It is from this perspective that an examination of the NFIP can provide insight into the unintended consequences of government involvement in providing disaster assistance may not only limit risk reduction but also may give rise to a moral hazard.

1. The Challenge of Floods

It has been argued that flooding and flood-related hazards are the most prominent and significant hazards in the United States. A review of the historical impacts of flooding demonstrates the lasting impact that flooding has historically had on the nation's "engineering concepts, economic thought, and political policy."[261] The initiation point for federal involvement in providing disaster assistance can traced to the transition of flood control measures from a local community responsibility to a federal government responsibility following the Great Mississippi River Flood of 1927. The evolution of federal government providing disaster assistance continued to expand with the significant

[259] Rowell and Connelly, "A History of the Term 'Moral Hazard,'" 1061.

[260] Kousky and Shabman, "The Hazard of the Moral Hazard—Or Not," 1.

[261] Platt, *Disasters and Democracy*, 151–153.

impacts of Hurricane Betsy in 1965, which resulted in the passage of the Southeast Hurricane Disaster Relief Act. This act included provisions to conduct a feasibility study of the federal government providing a national program for flood insurance. Findings from that study resulted in the passage of the National Flood Insurance Act of 1968, which created the NFIP and tasked the federal government with the responsibility of conducting flood hazard identification and risk assessment, coordinating floodplain management, and providing flood insurance.

Over the course of the last half-century, the federal government role has continued to expand and evolve with the government taking an ever-increasing role in providing disaster assistance. While government programs are designed to address all hazards, flooding and flood-related impacts account for the vast majority of direct economic losses as well as for 78.2 percent of all major disaster declarations.[262] Given that the NFIP is the principal federal program designated to address the hazard of flooding, it provides a model example for the study of how government involvement can limit risk reduction. Furthermore, findings may provide perspective on how government involvement in disaster assistance might contribute to the rise of a moral hazard.

2. The Role of the NFIP in Reducing Risk

The NFIP was created as a mitigation program with the goal of preventing future loss of life and property from the hazard of flooding. Policymakers have used the NFIP as an extension of disaster recovery, noting "[flood insurance] was considered preferable to the previous arrangement of disaster relief that came solely from taxpayer funding."[263] The NFIP consists of three main elements: flood hazard identification and risk assessment, floodplain management, and flood insurance.

Through the NFIP flood hazard identification and risk assessment component, the federal government identifies flood-prone areas and maps zones at risk for flooding. The standard tool for communicating risk to a community and its residents is the FIRM. Areas

[262] Federal Emergency Management Agency, "Disaster Declarations;" Gall et al., "The Unsustainable Trend," 2164–2165.

[263] Hayes and Neal, *NFIP Actuarial Rate Review*, 4.

at high risk for flooding are identified as SFHAs, based on the 100-year base flood elevation in areas prone to flood water inundation or based on wave action or storm surge in coastal areas. Additional flood hazard information is communicated on FIRMs to provide a graphic assessment of the total flood hazard present in a community. The flood hazard identification and risk assessment information are used to determine requirements for floodplain management and flood insurance.

The NFIP goal to reduce losses and damages caused by flooding is primarily addressed through the establishment of floodplain management standards, which are designed to mitigate the flood hazard. For a community to participate in the NFIP, it must adopt floodplain management ordinances that adhere to the minimum standards established at the federal level.[264] The intent of these standards is not to prohibit development, but rather to ensure that development is constructed in such a way as to be protected from a base flood event. While the federal government establishes the standards, the land-use authority required to regulate floodplain development is a power reserved by the Constitution to states and delegated to the respective state's political subdivisions (local jurisdictions).[265] Hence, while the federal government establishes the standards for floodplain management, state and local jurisdictions must adopt and enforce the standards to mitigate the hazard. The federal government further promotes the adoption of best practices by state and local jurisdictions through the CRS program, which incentivizes these actions by offering flood insurance discounts.

The NFIP indemnifies individuals from flood losses through the flood insurance program providing coverage for business and residential structures as well as content protection.[266] The flood insurance program is considered an extension of disaster assistance funded by policyholders to lessen the impact on taxpayers who would

[264] "Local Floodplain Development Regulations."

[265] "Written Testimony of FEMA Federal Insurance & Mitigation Administration Assistant Administrator for Mitigation Michael Grimm for a House Committee on Transportation and Infrastructure Hearing Titled 'Examination of FEMA's Limited Role in Local Land Use Development Systems,'" U.S. Department of Homeland Security, September 21, 2016, https://www.dhs.gov/news/2016/09/21/written-testimony-fema-house-committee-transportation-and-infrastructure-hearing.

[266] "Flood Insurance: Is Purchase Required?"

otherwise be called upon to assist through other federal disaster assistance programs.[267] The flood insurance program is administered through a partnership between FEMA and private insurance providers, which facilitate the sale and servicing of flood insurance. Flood insurance premiums are set on the basis of covering the "historical average loss year" versus collecting premiums sufficient to cover claims from catastrophic losses with provisions to borrow from the U.S. Treasury when the NFIF has insufficient funds to pay claims.[268]

To summarize, the NFIP is designed as a flood mitigation program that identifies and assesses flood hazards, coordinates floodplain management, and provides flood insurance. The NFIP currently has over 22,000 communities participating with more than 5.2 million policies in force providing total coverage in excess of $1.2 trillion.[269] The NFIP has generally remained fiscally solvent for much of its history.[270] However, the catastrophic losses associated with the impacts of 2004, 2005, 2008, and 2012 hurricane seasons has generated $24 billion in debt to the U.S. Treasury with revenue unlikely to cover future catastrophic losses or repay the billions of dollars in debt.[271] Given the current fiscal crisis facing the program, analysis of program elements hampering the sound administration of the program can provide insight into program elements that limit risk reduction.

B. NFIP STUDY FINDINGS

The following section highlights findings from the case study of the NFIP and applies those findings to the broader scope of federal government involvement in providing disaster assistance.

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[267] Federal Emergency Management Agency, *NFIP: Program Description*, 22.

[268] Hayes and Neal, *NFIP Actuarial Rate Review*, 16; Kousky and Shabman, *Pricing Flood Insurance*, 9; Brown, *Introduction to FEMA's National Flood Insurance*, 19.

[269] Federal Emergency Management Agency, "Statistics by Calendar Year," (accessed May 11, 2016, https://www.fema.gov/statistics-calendar-year.

[270] Hayes and Neal, *NFIP Actuarial Rate Review*, 6.

[271] U.S. Government Accountability Office, *Forgone Premiums Cannot Be Measured and FEMA Should Validate and Monitor Data System Changes* (GAO-15-111) (Washington DC: U.S. Government Accountability Office, 2014), http://www.gao.gov/assets/670/667413.pdf, 2.

1. How the NFIP Limits Risk Reduction

I am of two minds about the NFIP's role in limiting risk reduction. On the one hand, the program provides a framework for the identification and assessment of flood risk, provides a methodology to reduce risk through the establishment of floodplain management standards, provides flood insurance to indemnify individuals for flood losses where a private insurance market failed to emerge, and offers mitigation programs to reduce overall risk. On the other hand, the program allows for repetitive loss without mechanisms to refuse future coverage, compel policyholders to mitigate against future loss, or impose actuarial rates as a penalty for repetitive claims. Moreover, nearly 50 years after initiation of the NFIP, the program continues to provide pre-FIRM subsidies and grandfathered rates for high-risk properties that undermine the use of mitigation measures to effectively reduce long-term risk.

When it comes to the topics of the repetitive loss and pre-FIRM subsidies, most of us would readily agree these policies weaken the fiscal solvency of the NFIP, which requires taxpayers to accept greater financial risk from future catastrophic losses. Where the agreement usually ends, however, is the question of how to effectively address policy shortcomings. Whereas some are convinced that these policies must be phased out to provide for the long-term sustainability of the NFIP, others maintain that elimination of these policies would reduce participation in the NFIP and negatively impact local economies and housing markets.

By focusing on the implications of sustainability and fiscal solvency, the continuation of these policies overlooks the deeper problem of limiting risk reduction. The majority of repetitive loss and pre-FIRM properties are located in high-risk areas. While losses associated with flooding have significant impacts beyond the physical damage to structures and belongings, many chose to rebuild and remain because there is little concern of losing their flood insurance coverage or being required to implement costly mitigation measures against future losses. Furthermore, the use of subsidized rates for pre-FIRM or grandfathered policies removes the incentive to mitigate or reduce the risk as the implementation of those measures does little to change the cost of flood insurance. Ultimately, what is at stake here is that these policies allow for life and

property to be placed at greater risk of experiencing loss from flooding. In the end, the transfer of risk from the policyholder to the government has resulted in a disincentive to reduce risk and promoted the rise of a moral hazard.

2. Failure to Prepare for Future Disasters

In Chapter III, it is outlined how the NFIP has not been structured to withstand claims and losses associated with catastrophic losses; instead relying on its borrowing authority with the U.S. Treasury to cover excessive losses.[272] A review of the history of federal involvement in provision of assistance for flooding shows a cause and effect pattern in which major flood-related disasters exceed existing government response capabilities, which requires the paradigm to be reset for the next disaster. The pattern highlights the limited view of policymakers, who focus on disasters of the past versus promotion of resilience to enhance protections for future threats.

NFIP claim and loss data support the notion that significant loss events represent the most significant challenge to the long-term sustainment of the program. Furthermore, trend patterns and studies of the potential impacts of climate change provide an indication of these impacts continuing to increase. It should be no surprise that the NFIP is financially compromised; it is not structured for catastrophic losses and is repeatedly tested by significant loss events. Whereas losses associated with significant loss events provide ample evidence that the NFIP is fiscally flawed, it does little to support the argument that the NFIP limits risk reduction for individual policyholders. Nevertheless, it highlights the shortcomings of policymakers to address an emerging issue that will further compromise the NFIP.

The shortcomings of policymakers to address the sustainment of the NFIP presents a parallel argument that there is moral hazard in the current policymaking environment. It can be argued that when policymakers limit the sustainability of the NFIP to historical average losses versus catastrophic losses, they fail to provide for the long-term resilience of the program. The legacy of these shortcomings is that the NFIP will

[272] Kousky and Shabman, *Pricing Flood Insurance*, 9.

continue to be challenged by significant loss events and will not be prepared to deal with the emerging hazard of climate change.

3. Broader Implications of Federal Involvement

This inquiry looked to explore the extent the NFIP limits risk reduction. While the NFIP clearly seeks to reduce risk through each of the main program elements, the evidence indicates aspects of the program limit risk reduction, primarily through the funding of repetitive loss and use of subsidies. Furthermore, from a broader policy perspective, the failure of policymakers to enhance the resilience of the program to absorb catastrophic losses has a limiting effect on the long-term sustainability of the program.

What does this perspective tell us about how federal involvement in disaster assistance might contribute to the rise of a moral hazard? An important takeaway is that federal involvement does not arbitrarily mean that behavior is negatively altered. However, it is important to evaluate the extent to which a policy provides benefits beyond what would be considered reasonable, thus creating incentives to limit risk reduction.

Kousky and Shabman assert, "there is no compelling evidence for a moral hazard in disaster relief programs for households."[273] This is supported by their review of available disaster relief for individuals, providing an indication that programs are designed to minimize moral hazard through limitations placed on the aid provided.[274] Although I agree with Kousky and Shabman related to individual assistance programs, public assistance programs provide an alternative to federal involvement contributing to a moral hazard.

Through the Stafford Act, the federal government provides public assistance to state and local communities impacted by major disasters. While jurisdictions must exceed a per capita impact to qualify for a major disaster declaration, once issued, at least 75

[273] Kousky and Shabman, "The Hazard of the Moral Hazard—Or Not," 12.

[274] Ibid.

percent of the recovery expense for emergency response measures and restoration of public infrastructure is shifted to the federal government—with no cap set on assistance.[275] The transference of disaster recovery costs offers a similar dynamic to the NFIP reducing resolve to minimize risk. From a practitioner's perspective, this is best exhibited through the emphasis that state and local jurisdictions place on preparedness and response, while often neglecting mitigation and recovery readiness. Policymakers have begun to recognize the need to adjust policy given the substantial financial commitments transferred to the federal government when public assistance is included in a major disaster declaration (note that 94 percent of major disaster declarations include public assistance versus the 45 percent that include individual assistance).[276] In response to calls from Congress, the GAO, and the Department of Homeland Security's Office of Inspector General, FEMA is exploring the use of a disaster deductible as a means to reform how the federal government supports states following a disaster.[277]

These findings have important consequences for the broader domain of evaluating the unintended consequences of federal involvement in providing disaster assistance. While there is an imperative for the government to provide disaster assistance, it is important to evaluate whether that assistance negatively alters the risk reduction approach of those at risk from the disaster. A continued focus on reducing risk and promoting resilience should be at the core of government disaster assistance.

C. RECOMMENDATIONS

Based on the thesis findings, the following section touches on recommendations for resolving policy shortcomings, enhancing the resiliency of the NFIP in the era of climate change, and identifies areas for future research.

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[275] Robert T. Stafford Disaster Relief and Emergency Assistance Act, Public Law 93-288, as Amended, 42, vol. 5121 et seq., 1988, https://www.fema.gov/media-library-data/1383153669955-21f970b19e8eaa67087b7da9f4af706e/stafford_act_booklet_042213_508e.pdf.

[276] William O. Jenkins, *Federal Disaster Assistance: Improved Criteria Needed to Assess a Jurisdiction's Capability to Respond and Recover on Its Own* (Washington DC: U.S. Government Accountability Office, 2012), http://www.gao.gov/assets/650/648162.pdf, 17.

[277] Federal Emergency Management Agency, "Disaster Deductible," accessed May 24, 2016, https://www.fema.gov/disaster-deductible.

1. Resolve Policy Shortcomings

In conclusion, as I have suggested, aspects of the NFIP limit risk reduction and contribute to the rise of a moral hazard. Specifically, NFIP policies that support continued coverage of repetitive loss, use of subsidies to desensitize risk, and failure to adjust for catastrophic losses all impact the sustainability and resilience of the program. Measures included in BW-12 demonstrate a resolve to enhance the sustainability and resilience of the NFIP following the catastrophic losses of the late 2000s. Unfortunately, that resolve was short-lived, and many of the major components that addressed those shortcomings rolled back with the passage of the HFIAA. Congresswomen Maxine Waters, who sponsored both the original reform and reversal, was quick to blame FEMA for the legislative backlash with what she termed "bungled management" of the reform.[278] While it is true that BW-12 resulted in public outcry regarding the rapid removal of flood insurance subsidies (phased out over a four- to five-year cycle), it does not necessarily follow that these measures were inappropriate. In an analysis of the matter in 2010 by Michel-Kerjan, he explains, "It would make sense also to reduce gradually the subsidy currently given to these homeowners, perhaps over a period of 10 or 15 years so it is easier to do politically."[279] In short, Michel-Kerjan suggested a far more gradual phase out of subsidies that may have avoided the political backlash.

As these issues are inherent to the original implementation of the NFIP, it is important for policymakers to consider adjustments in an incremental manner to enhance the sustainability of the program while minimizing the public's resistance. Such are the terms needed to reverse the establishment of a moral hazard.

2. Enhancing Resiliency of the NFIP in the Era of Climate Change

The United Kingdom has adopted legislation and incorporated policies into its national frameworks to address climate change as an emerging hazard. The United States should mirror the efforts utilized by the United Kingdom to map out the forecasted impacts of climate change and require communities to address the emerging hazard.

[278] Beer and Hoffman, "Underwater," 42.

[279] Michel-Kerjan, "Catastrophic Economics," 416.

Current U.S. efforts have implemented some of these elements into recovery programs for Hurricane Sandy, such as a $50 billion investment to address climate change mitigation strategies. While a positive step, this effort also highlights the reactive nature of current U.S. policy. To require plans to be developed in advance will create a proactive framework for investment before disaster strikes.

3. Areas for Future Research

Given the NFIP's substantial financial issues and other challenges, there is an extensive library of research available for review. While it is hoped that this thesis contributes to the analysis of the NFIP, further research of the program is warranted. For example, a 2010 floodplain management report published by the Association of State Floodplain Managers, identified evaluation of state floodplain management programs as a glaring deficiency.[280]

Another area that warrants inquiry is the financial arrangement between the NFIP and WYO insurance services. A 2014 GAO report identifies that WYO expenses account for 12 percent and commissions account for 14 percent of NFIP premium expenses.[281] While these percentages may be reasonable, further evaluation may reveal alternatives to control these costs.

[280] Association of State Floodplain Managers, *Floodplain Management 2010: State and Local Programs* (Washington, DC: Association of State Floodplain Managers, 2011), http://floods.org/ace-files/Projects/FPM2010/FPM2010_Final_Report_Print.pdf, 60.

[281] U.S. Government Accountability Office, *Forgone Premiums*, 14.

APPENDIX A. FEMA DISASTER DECLARATION DATA

FEMA disaster declaration data was compiled from the FEMA's online disaster declaration database (https://www.fema.gov/disasters).[282] The Stafford Act provides for major disaster declarations (incident that exceeds the capabilities of state and local governments) and emergency declarations (supplemental assistance to state and local governments).[283] An extension of FEMA public assistance programs is the Fire Management Assistance Grant (FMAG) program, which provides financial assistance to assist in reimbursement for equipment, supplies, and personnel to any declared fire that meets the FMAG requirements.[284] To get the results on Table 3, this researcher applied filters to the FEMA incident descriptions to determine natural hazard, non-natural hazard, and flood/flood-related disasters.

[282] Federal Emergency Management Agency, "Disaster Declarations."

[283] Federal Emergency Management Agency, *Fact Sheet: Disaster Declaration Process* (Washington, DC: Federal Emergency Management Agency, 2011), https://www.fema.gov/pdf/media/factsheets/dad_disaster_declaration.pdf, 2.

[284] Federal Emergency Management Agency, *Fire Management Assistance Grant Program Guide* (FEMA P-954) (Washington, DC: Federal Emergency Management Agency, 2014), https://www.fema.gov/media-library-data/1394820975537-a279bff2a4a300676b870154acec922b/FMAG%20Guide%20Feb%202014_508.pdf, 8.

Table 3. FEMA Disaster Declarations (1953–2015)[285]

Year	Major Disaster Declarations	Natural Hazard Related Major Disaster Declarations	Non-Natural Hazard Major Disaster Declarations	Flood and Flood-Related Major Disaster Declarations	Percentage of Major Disaster Declarations Related to Flooding	Emergency Declarations	Fire Management Assistance Grants (FMAG)	Total Declarations (Major, Emergency, FMAG)
1953	13	13	0	6	46%	0	0	13
1954	17	17	0	14	82%	0	0	17
1955	18	18	0	15	83%	0	0	18
1956	16	16	0	12	75%	0	0	16
1957	16	16	0	15	94%	0	0	16
1958	7	7	0	7	100%	0	0	7
1959	7	7	0	7	100%	0	0	7
1950s	**94**	**94**	**0**	**76**	**81%**	**0**	**0**	**94**
1960	12	12	0	10	83%	0	0	12
1961	12	12	0	11	92%	0	0	12
1962	22	20	2	20	91%	0	0	22
1963	20	20	0	19	95%	0	0	20
1964	25	25	0	24	96%	0	0	25
1965	25	25	0	20	80%	0	0	25
1966	11	11	0	10	91%	0	0	11
1967	11	11	0	10	91%	0	0	11
1968	19	19	0	14	74%	0	0	19
1969	29	29	0	29	100%	0	0	29
1960s	**186**	**184**	**2**	**167**	**90%**	**0**	**0**	**186**
1970	17	17	0	16	94%	0	2	19
1971	17	17	0	12	71%	0	3	20
1972	48	48	0	45	94%	0	0	48
1973	46	46	0	43	93%	0	9	55

[285] Adapted from Federal Emergency Management Agency, "Disaster Declarations."

Year	Major Disaster Declarations	Natural Hazard Related Major Disaster Declarations	Non-Natural Hazard Major Disaster Declarations	Flood and Flood-Related Major Disaster Declarations	Percentage of Major Disaster Declarations Related to Flooding	Emergency Declarations	Fire Management Assistance Grants (FMAG)	Total Declarations (Major, Emergency, FMAG)
1974	46	46	0	43	93%	5	2	53
1975	38	38	0	31	82%	6	1	45
1976	30	30	0	27	90%	8	7	45
1977	22	22	0	16	73%	34	5	61
1978	25	25	0	24	96%	14	2	41
1979	42	42	0	36	86%	10	7	59
1970s	**331**	**331**	**0**	**293**	**89%**	**77**	**38**	**446**
1980	23	23	0	20	87%	6	2	31
1981	15	13	2	12	80%	0	3	18
1982	24	24	0	21	88%	3	0	27
1983	21	21	0	19	90%	1	2	24
1984	34	34	0	26	76%	4	4	42
1985	27	27	0	24	89%	0	9	36
1986	28	28	0	28	100%	0	1	29
1987	23	23	0	17	74%	1	7	31
1988	11	11	0	7	64%	0	5	16
1989	31	31	0	22	71%	0	1	32
1980s	**237**	**235**	**2**	**196**	**83%**	**15**	**34**	**286**
1990	38	38	0	32	84%	0	5	43
1991	43	43	0	34	79%	0	2	45
1992	45	44	1	33	73%	2	6	53
1993	32	31	1	26	81%	19	7	58
1994	36	36	0	21	58%	1	20	57
1995	32	31	1	27	84%	2	4	38
1996	75	75	0	54	72%	8	75	158
1997	44	44	0	33	75%	0	3	47

Year	Major Disaster Declarations	Natural Hazard Related Major Disaster Declarations	Non-Natural Hazard Major Disaster Declarations	Flood and Flood-Related Major Disaster Declarations	Percentage of Major Disaster Declarations Related to Flooding	Emergency Declarations	Fire Management Assistance Grants (FMAG)	Total Declarations (Major, Emergency, FMAG)
1998	65	65	0	47	72%	9	54	128
1999	50	50	0	39	78%	20	40	110
1990s	**460**	**457**	**3**	**346**	**75%**	**61**	**216**	**737**
2000	45	45	0	20	44%	6	63	114
2001	45	43	2	27	60%	11	44	100
2002	49	49	0	31	63%	0	70	119
2003	56	56	0	39	70%	19	48	123
2004	68	68	0	63	93%	7	43	118
2005	48	48	0	40	83%	68	39	155
2006	52	52	0	35	67%	5	86	143
2007	63	63	0	45	71%	13	60	136
2008	75	75	0	64	85%	17	51	143
2009	59	59	0	43	73%	7	49	115
2000s	**560**	**558**	**2**	**407**	**73%**	**153**	**553**	**1266**
2010	81	81	0	53	65%	9	18	108
2011	99	99	0	78	79%	29	114	242
2012	47	47	0	34	72%	16	49	112
2013	62	61	1	43	69%	5	28	95
2014	45	45	0	32	71%	6	33	84
2015	43	43	0	31	72%	2	34	79
Totals	***2245***	***2235***	***10***	***1756***	***78.2%***	***373***	***1117***	***3735***

APPENDIX B. FEMA NFIP FLOOD ZONE DEFINITIONS

The following zones (in Table 4) comprise the special flood hazard area (SFHA). FEMA defines these commonly used terms in floodplain management.[286]

Table 4. High-Risk Flood Areas

ZONE	DESCRIPTION
A	High hazard areas subject to inundation by the one percent annual chance flood event generally determined using approximate methodologies. Because detailed hydraulic analyses have not been performed, no base flood elevations or flood depths are shown.
AE and A1-30	High hazard areas subject to inundation by the one percent annual chance flood event determined by detailed methods. Base flood elevations are shown.
AH	High hazard areas subject to inundation by one percent annual chance shallow flooding (usually areas of ponding) where average depths are between one and three feet. Base flood elevations are derived from detailed hydraulic analyses are shown in this zone.
AO	High hazard areas subject to inundation by one percent annual chance shallow flooding (usually sheet flow on sloping terrain) where average depths are between one and three feet. Average flood depths derived from detailed hydraulic analyses are shown in this zone. Some Zone AO have been designated in areas with high flood velocities such as alluvial fans and washes. Communities are encouraged to adopt more restrictive requirements for these areas.
AR	High hazard areas that result from the decertification of a previously accredited flood protection system that is determined to be in the process of being restored to provide base flood protection.

[286] Federal Emergency Management Agency, "Flood Zones," accessed April 27, 2016), http://www.fema.gov/flood-zones.

ZONE	DESCRIPTION
A99	High hazard areas subject to inundation by the one percent annual chance flood event, but which will ultimately be protected upon completion of an under-construction Federal flood protection system. These are areas of special flood hazard where enough progress has been made on the construction of a protection system, such as dikes, dams, and levees, to consider it complete for insurance rating purposes. Zone A99 may only be used when the flood protection system has reached specified statutory progress toward completion. No base flood elevations or depths are shown.
V	High hazard areas along coasts subject to inundation by the one percent-annual-chance flood event with additional hazards associated with storm-induced waves. Because detailed hydraulic analyses have not been performed, no base flood elevations or flood depths are shown.
VE and V1-30	High hazard areas subject to inundation by the one percent annual chance flood event with additional hazards due to storm-induced velocity wave action. Base flood elevations are derived from detailed hydraulic analyses are shown.

The following zones (in Table 5) comprise areas outside of the SFHA. FEMA defines these commonly used terms in floodplain management.[287]

Table 5. Moderate to Low Risk Flood Areas

ZONE	DESCRIPTION
B or X	Moderate hazard areas subject to inundation by the 0.2 percent annual chance flood event (500-year flood zone). Areas identified as moderate flood hazard are recommended to purchase flood insurance.
C or X	Low or undetermined hazard areas with flood insurance encouraged, but no requirement.

[287] Ibid.

APPENDIX C. FEMA NFIP FLOOD INSURANCE CLAIM AND LOSS DATA (REPETITIVE LOSS COMPARISON)

Table 6 provides a comparison of NFIP flood insurance claims and loss dollars paid between the full NFIP program and repetitive loss properties.

Table 6. NFIP Losses and Claims (Comparison of Totals versus Repetitive Loss)[288]

Year	NFIP Flood Insurance Policies in Force	Number of Flood Insurance Loss Claims	Number of Repetitive Loss Claims	% of Claims from Repetitive Loss	Total Loss Dollars Paid	Loss Dollars Paid for Repetitive Loss	% of Loss Dollars Paid for Repetitive Loss
1978	1,446,354	29,122	9,176	31.5%	$147,719,000	$76,676,217	51.9%
1979	1,843,441	70,613	21,235	30.1%	$483,281,000	$219,743,242	45.5%
1970s		**99,735**	**30,411**	**30.5%**	**$631,000,000**	**$296,419,459**	**47.0%**
1980	2,103,851	41,918	15,750	37.6%	$230,414,000	$131,319,138	57.0%
1981	1,915,065	23,261	7,639	32.8%	$127,118,000	$71,854,885	56.5%
1982	1,900,544	32,831	13,520	41.2%	$198,296,000	$121,889,553	61.5%
1983	1,981,122	51,584	20,617	40.0%	$439,455,000	$233,014,629	53.0%
1984	1,926,388	27,688	9,814	35.4%	$254,643,000	$113,542,105	44.6%
1985	2,016,785	38,676	14,117	36.5%	$368,239,000	$170,266,051	46.2%
1986	2,119,039	13,789	5,686	41.2%	$126,385,000	$67,262,331	53.2%
1987	2,115,183	13,400	5,906	44.1%	$105,432,000	$61,394,724	58.2%
1988	2,149,153	7,758	3,740	48.2%	$51,023,000	$33,330,976	65.3%
1989	2,292,947	36,245	14,077	38.8%	$661,658,000	$257,873,072	39.0%
1980s		**287,150**	**110,866**	**38.6%**	**$2,562,663,000**	**$1,261,747,464**	**49.2%**
1990	2,477,861	14,766	7,177	48.6%	$167,897,000	$97,386,942	58.0%
1991	2,532,713	28,549	12,589	44.1%	$353,682,000	$190,264,875	53.8%
1992	2,623,406	44,648	17,217	38.6%	$710,225,000	$308,285,133	43.4%

[288] Adapted from: Federal Emergency Management Agency, "Policy & Claim Statistics;" FEMA Region VI, *FEMA NFIP Repetitive Loss Report.*

Year	NFIP Flood Insurance Policies in Force	Number of Flood Insurance Loss Claims	Number of Repetitive Loss Claims	% of Claims from Repetitive Loss	Total Loss Dollars Paid	Loss Dollars Paid for Repetitive Loss	% of Loss Dollars Paid for Repetitive Loss
1993	2,828,558	36,044	13,669	37.9%	$659,059,000	$273,273,143	41.5%
1994	3,040,198	21,584	10,632	49.3%	$411,075,000	$226,476,161	55.1%
1995	3,476,829	62,441	20,791	33.3%	$1,295,578,000	$538,817,089	41.6%
1996	3,693,076	52,678	23,343	44.3%	$828,039,000	$465,331,421	56.2%
1997	4,102,416	30,338	9,452	31.2%	$519,537,000	$179,297,721	34.5%
1998	4,235,138	57,353	26,564	46.3%	$886,352,000	$504,077,505	56.9%
1999	4,329,985	47,248	18,832	39.9%	$754,950,500	$397,183,092	52.6%
1990s		**395,649**	**160,266**	**40.5%**	**$6,586,394,500**	**$3,180,393,082**	**48.3%**
2000	4,369,087	16,362	6,096	37.3%	$251,721,000	$114,743,051	45.6%
2001	4,458,470	43,601	15,921	36.5%	$1,276,957,000	$537,229,725	42.1%
2002	4,519,799	25,347	14,244	56.2%	$433,649,000	$287,911,901	66.4%
2003	4,565,491	36,931	15,290	41.4%	$780,776,000	$346,528,911	44.4%
2004	4,667,446	55,908	22,898	41.0%	$2,232,421,000	$1,078,091,106	48.3%
2005	4,962,011	213,587	41,114	19.2%	$17,770,118,000	$2,590,287,505	14.6%
2006	5,514,895	24,629	12,827	52.1%	$640,797,000	$388,271,066	60.6%
2007	5,655,919	23,189	12,439	53.6%	$614,014,000	$361,669,877	58.9%
2008	5,684,275	74,907	21,121	28.2%	$3,487,967,000	$807,410,672	23.1%
2009	5,700,235	31,033	14,955	48.2%	$779,898,000	$423,153,535	54.3%
2000s		**545,494**	**176,905**	**32.4%**	**$28,268,318,000**	**$6,935,297,349**	**24.5%**
2010	5,645,436	29,155	13,174	45.2%	$773,575,000	$338,757,540	43.8%
2011	5,646,144	78,183	39,612	50.7%	$2,427,274,000	$1,275,904,553	52.6%
2012	5,620,017	150,832	29,216	19.4%	$9,266,395,000	$1,904,871,322	20.6%
2013	5,568,642	18,101	7,060	39.0%	$491,415,000	$199,825,828	40.7%
2014	5,406,725	12,887	4,575	35.5%	$376,648,000	$140,309,235	37.3%
2015	5,206,241	20,208	8,882	44.0%	$791,837,000	$367,508,767	46.4%
Totals		***1,637,394***	***580,967***	***35.5%***	***$52,175,519,500***	***$15,901,034,599***	***30.5%***

APPENDIX D. FEMA NFIP FLOOD INSURANCE CLAIM AND LOSS DATA (SIGNIFICANT LOSS EVENTS COMPARISON)

Table 7 provides a comparison of NFIP flood insurance claims and loss dollars paid between the full NFIP program and significant loss events.

Table 7. NFIP Losses and Claims (Comparison of Totals versus Significant Events)[289]

Year	Total Number of Loss Claims	Number of Significant Loss Events	Number of Loss Claims from Significant Events	% of Loss Claims from Significant Events	Total Loss Dollars Paid	Loss Dollars Paid from Significant Events	% of Loss Dollars Paid from Significant Events
1978	29,122	3	11,424	39%	$147,719,000	$75,502,369	51%
1979	70,613	8	33,281	47%	$483,281,000	$304,197,758	63%
1970s	**99,735**	**11**	**44,705**	**45%**	**$631,000,000**	**$379,700,127**	**60%**
1980	41,918	3	18,626	44%	$230,414,000	$120,889,969	52%
1981	23,261	2	4,883	21%	$127,118,000	$34,372,935	27%
1982	32,831	5	13,105	40%	$198,296,000	$89,713,741	45%
1983	51,584	2	22,099	43%	$439,455,000	$224,222,522	51%
1984	27,688	3	9,221	33%	$254,643,000	$88,087,128	35%
1985	38,676	4	22121	57%	$368,239,000	$217,273,478	59%
1986	13,789	1	2,003	15%	$126,385,000	$34,838,406	28%
1987	13,400	0	0	0%	$105,432,000	0	0%
1988	7,758	1	3,003	39%	$51,023,000	$17,124,219	34%
1989	36,245	5	25,903	71%	$661,658,000	$563,179,707	85%
1980s	**287,150**	**26**	**120,964**	**42%**	**$2,562,663,000**	**$1,389,702,105**	**54%**
1990	14,766	0	0	0%	$167,897,000	0	0%
1991	28,549	3	14,281	50%	$353,682,000	$208,698,143	59%
1992	44,648	4	36,293	81%	$710,225,000	$596,307,287	84%

[289] Adapted from: Federal Emergency Management Agency, "Policy & Claim Statistics;" Federal Emergency Management Agency, "Significant Flood Events."

Year	Total Number of Loss Claims	Number of Significant Loss Events	Number of Loss Claims from Significant Events	% of Loss Claims from Significant Events	Total Loss Dollars Paid	Loss Dollars Paid from Significant Events	% of Loss Dollars Paid from Significant Events
1993	36,044	2	20,312	56%	$659,059,000	$485,415,616	74%
1994	21,584	1	6,226	29%	$411,075,000	$217,628,440	53%
1995	62,441	3	45,096	72%	$1,295,578,000	$1,065,441,979	82%
1996	52,678	8	39,565	75%	$828,039,000	$680,367,023	82%
1997	30,338	2	11,927	39%	$519,537,000	$260,570,775	50%
1998	57,353	9	37,570	66%	$886,352,000	$602,462,889	68%
1999	47,248	2	34,121	72%	$754,950,500	$580,185,168	77%
1990s	**395,649**	**34**	**245,391**	**62%**	**$6,586,394,500**	**$4,697,077,320**	**71%**
2000	16,362	1	9,276	57%	$251,721,000	$158,283,182	63%
2001	43,601	2	33,089	76%	$1,276,957,000	$1,139,831,924	89%
2002	25,347	4	16,184	64%	$433,649,000	$311,366,397	72%
2003	36,931	1	19,938	54%	$780,776,000	$500,265,018	64%
2004	55,908	4	41,253	74%	$2,232,421,000	$1,944,634,409	87%
2005	213,587	5	195,055	91%	$17,770,118,000	$17,323,459,933	97%
2006	24,629	2	7,935	32%	$640,797,000	$266,554,094	42%
2007	23,189	1	8,640	37%	$614,014,000	$225,928,476	37%
2008	74,907	3	54,609	73%	$3,487,967,000	$2,953,956,144	85%
2009	31,033	3	11,040	36%	$779,898,000	$354,639,962	45%
2000s	**545,494**	**26**	**397,019**	**73%**	**$28,268,318,000**	**$25,178,919,539**	**89%**
2010	29,155	2	14,210	49%	$773,575,000	$425,235,345	55%
2011	78,183	5	62,804	80%	$2,427,274,000	$2,117,240,479	87%
2012	150,832	3	144,045	96%	$9,266,395,000	$8,846,074,481	95%
2013	18,101	2	5,126	28%	$491,415,000	$157,764,848	32%
2014	12,887	1	2,137	17%	$376,648,000	$110,441,909	29%
2015	20,208	3	12,605	62%	$791,837,000	$658,629,902	83%
Totals	***1,637,394***	***113***	***1,049,006***	***64%***	***$52,175,519,500***	***$43,960,786,055***	***84%***

APPENDIX E. FEMA NFIP SIGNIFICANT FLOOD EVENTS

FEMA significant flood event data was compiled from the FEMA's online database (see Table 8). FEMA defines a "significant flood event" as an event, such as a major hurricane, with 1,500 or more paid losses or a flood event that is otherwise significant.[290]

Table 8. FEMA Significant Flood Events[291]

FEMA Event Designation	Year	Number of Loss Claims from Significant Flood Event	Loss Dollars Paid for Significant Flood Event	Average Loss Dollars per Claim
Massachusetts Flood Feb. 1978	February 78	2,202	$20,145,418	$9,149
Louisiana Flood May 1978	May 78	7,343	$43,422,439	$5,913
WV, IN, KY, OH Floods Dec 1978	December 78	1,879	$11,934,512	$6,352
PA, CT, MA, NJ, NY, RI Floods	January 79	8,826	$31,487,015	$3,568
ND, MN Floods	April 79	2,141	$10,360,266	$4,839
Texas Flood April 1979	April 79	1,954	$20,131,418	$10,303
Florida Flood April 1979	April 79	1,488	$2,029,163	$1,364
Tropical Storm Claudette	July 79	9,664	$147,295,363	$15,242
Hurricane Frederic	September 79	2,947	$45,809,311	$15,544
Texas Flood September 1979	September 79	6,261	$47,085,222	$7,520
NJ, CT and NY Floods April 1980	April 80	2,159	$7,156,481	$3,315
Louisiana Flood April 1980	April 80	12,831	$86,279,354	$6,724
Hurricane Allen	August 80	3,636	$27,454,134	$7,551
Texas Flood Event June 1981	June 81	2,143	$13,414,893	$6,260
Texas Flood August 1981	August 81	2,740	$20,958,042	$7,649
Louisiana Flood April 1992	April 82	3,187	$20,785,522	$6,522
RI, MA, CT Floods June 1982	June 82	2,189	$15,684,431	$7,165

[290] Ibid.

[291] Adapted from: Federal Emergency Management Agency, "Policy & Claim Statistics;" Federal Emergency Management Agency, "Significant Flood Events."

FEMA Event Designation	Year	Number of Loss Claims from Significant Flood Event	Loss Dollars Paid for Significant Flood Event	Average Loss Dollars per Claim
The “No-Name Storm”	June 82	2,921	$10,474,435	$3,586
MO, IL Floods December 1982	December 82	3,172	$29,851,938	$9,411
Louisiana Flood December 1982	December 82	1,636	$12,917,415	$7,896
Louisiana Flood April 1983	April 83	11,581	$104,833,841	$9,052
Alicia	August 83	10,518	$119,388,681	$11,351
New Jersey Flood March 1984	March 84	4,096	$22,163,537	$5,411
New Jersey Flood April 1984	April 84	2,471	$33,300,119	$13,476
Kentucky Flood May 1984	May 84	2,654	$32,623,472	$12,292
Elena	August 85	8,234	$81,322,383	$9,876
Gloria	September 85	6,088	$39,194,422	$6,438
Isabel October 1985	October 85	1,612	$5,769,195	$3,579
Juan	October 85	6,187	$90,987,478	$14,706
California Flood February 1986	February 86	2,003	$34,838,406	$17,393
Louisiana Flood April 1988	April 88	3,003	$17,124,219	$5,702
Texas Flood May 1989	May 89	2,562	$59,020,120	$23,037
Tropical Storm Allison 1989	June 89	3,127	$39,303,958	$12,569
Hurricane Chantel	August 89	2,919	$39,510,677	$13,536
Hugo	September 89	12,840	$376,433,739	$29,317
Louisiana Flood November 1989	November 89	4,455	$48,911,213	$10,979
Louisiana Flood June 1991	June 91	1,919	$15,832,141	$8,250
Bob	August 91	2,821	$49,707,690	$17,621
Halloween	October 91	9,541	$143,158,312	$15,005
DE, NJ, PR Floods January 1992	January 92	3,211	$30,087,521	$9,370
Texas Flood March 1992	March 92	2,353	$50,956,063	$21,656
Andrew	August 92	5,587	$169,113,347	$30,269
Nor’easter 1992	December 92	25,142	$346,150,356	$13,768
March Storm	March 93	9,840	$212,596,101	$21,605
Midwest Flood	June 93	10,472	$272,819,515	$26,052
Texas Flood October 1994	October 94	6,226	$217,628,440	$34,955
CA Flood January 1995	January 95	3,410	$74,842,843	$21,948

FEMA Event Designation	Year	Number of Loss Claims from Significant Flood Event	Loss Dollars Paid for Significant Flood Event	Average Loss Dollars per Claim
Louisiana Flood	May 95	31,343	$585,071,593	$18,667
Opal	October 95	10,343	$405,527,543	$39,208
Northeast Flood Jan 1996	January 96	12,523	$186,623,944	$14,902
Northwest Flood	February 96	2,329	$61,903,974	$26,580
Bertha	July 96	1,166	$10,388,364	$8,909
Fran	September 96	10,315	$217,843,972	$21,119
Hortense	September 96	1,382	$20,465,346	$14,808
Josephine	October 96	6,512	$102,604,272	$15,756
Northeast Flood Oct 1996	October 96	3,480	$40,837,392	$11,735
California Flood December 1996	December 96	1,858	$39,699,759	$21,367
South Central Flood	February 97	4,529	$100,469,721	$22,184
Upper Midwest Flood	April 97	7,398	$160,101,054	$21,641
Pineapple Express	January 98	4,227	$57,680,410	$13,646
Nor'easter	February 98	3,212	$28,011,201	$8,721
Hurricane Bonnie	August 98	2,675	$23,073,621	$8,626
Texas Flood September 1998	September 98	4,876	$78,402,842	$16,079
Louisiana Flood September 1998	September 98	5,176	$50,999,758	$9,853
Hurricane Georges (Keys)	September 98	3,437	$43,208,306	$12,572
Hurricane Georges	September 98	9,097	$154,169,745	$16,947
Hurricane Georges (Panhandle)	September 98	1,679	$23,137,642	$13,781
Texas Flood October 1998	October 98	3,191	$143,779,364	$45,058
Hurricane Floyd	September 99	20,439	$462,326,389	$22,620
Hurricane Irene	October 99	13,682	$117,858,779	$8,614
Florida Flood October 2000	October 00	9,276	$158,283,182	$17,064
Tropical Storm Allison 2001	June 01	30,671	$1,105,003,344	$36,028
Tropical Storm Gabrielle	September 01	2,418	$34,828,580	$14,404
Texas Flood July 2002	July 02	1,897	$70,901,720	$37,376
Tropical Storm Isadore	September 02	8,467	$114,160,392	$13,483
Hurricane Lili	September 02	2,569	$37,269,589	$14,507
Texas Flood October 2002	October 02	3,251	$89,034,696	$27,387

FEMA Event Designation	Year	Number of Loss Claims from Significant Flood Event	Loss Dollars Paid for Significant Flood Event	Average Loss Dollars per Claim
Hurricane Isabel	September 03	19,938	$500,265,018	$25,091
Hurricane Charley	August 04	2,609	$50,914,481	$19,515
Hurricane Frances	September 04	4,966	$153,488,029	$30,908
Hurricane Ivan	September 04	28,297	$1,612,196,806	$56,974
Hurricane Jeanne	September 04	5,381	$128,035,093	$23,794
Hurricane Dennis	July 05	3,808	$119,867,428	$31,478
Hurricane Katrina	August 05	167,984	$16,318,248,752	$97,142
Hurricane Rita	September 05	9,529	$474,740,062	$49,821
Tropical Storm Tammy	October 05	4,116	$44,773,505	$10,878
Hurricane Wilma	October 05	9,618	$365,830,186	$38,036
PA, NJ, NY Floods June 2006	June 06	6,428	$229,292,230	$35,671
Hurricane Paul	October 06	1,507	$37,261,864	$24,726
Nor'easter April 2007	April 07	8,640	$225,928,476	$26,149
Torrential Rain June 2008	June 08	3,405	$144,684,258	$42,492
Hurricane Gustav	September 08	4,544	$112,393,983	$24,735
Hurricane Ike	September 08	46,660	$2,696,877,903	$57,798
Torrential Rain March 2009 TX	March 09	3,303	$127,530,808	$38,611
Torrential Rain Sept 2009 GA	September 09	2,067	$124,241,069	$60,107
Tropical Storm IDA VA	November 09	5,670	$102,868,085	$18,143
2010 Nor’easter	March 10	10,094	$194,837,326	$19,302
Torrential Rain TN	April 10	4,116	$230,398,019	$55,976
Torrential Rain NJ	March 11	1,873	$36,428,863	$19,449
Mid-Spring Storms	April 11	4,342	$145,807,074	$33,581
Late-Spring Storms	June 11	2,433	$134,607,082	$55,326
Hurricane Irene	August 11	44,266	$1,339,910,797	$30,270
Tropical Storm Lee	September 11	9,890	$460,486,663	$46,561
Tropical Storm Debbie	June 12	1,792	$42,694,074	$23,825
Tropical Storm Isaac	August 12	12,039	$554,103,065	$46,026
Superstorm Sandy	October 12	130,214	$8,249,277,342	$63,352
IL Flooding April 2013	April 13	3,394	$89,202,227	$26,282

FEMA Event Designation	Year	Number of Loss Claims from Significant Flood Event	Loss Dollars Paid for Significant Flood Event	Average Loss Dollars per Claim
Colorado Flooding Sept 2013	September 13	1,732	$68,562,621	$39,586
Florida Flooding April 2014	April 14	2,137	$110,441,909	$51,681
Texas Flooding May Jun 2015	May 15	6,687	$446,484,271	$66,769
South Carolina Flooding Oct 2015	October 15	3,836	$131,413,037	$34,258
2015 Early Midwest Winter Storms	December 15	2,082	$80,732,594	$38,776
Totals:		***1,049,006***	***$43,960,786,055***	

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