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Rising Tides, Rising Premiums

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ABSTRACT

Insuring flood-prone properties is a complex insurance problem. Attempts by the U.S. federal government to step in and correct perceived private market failures have often exacerbated the problem by artificially subsidizing building and rebuilding activity in low-lying areas. This article describes the fundamental problems inherent in the design of the National Flood Insurance Program (NFIP) by analyzing the program through the lens of the insurance concepts of moral hazard and adverse selection. It also provides a comparative view of flood insurance schemes globally, and suggests possible reforms.

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I. INTRODUCTION

In November 2018 the town of Paradise, California burned to the ground.[1] The town, located in the wildland-urban interface of the mountains northeast of Chico, was consumed after electrical equipment maintained by Pacific Gas and Electricity (PG&E) malfunctioned, sparked, and ignited the fire which then spread by fast-moving winds.[2] The conflagration killed 85 people, caused $16.5 billion in damages, and led to the eventual bankruptcy and restructuring of PG&E, the California utility "whose equipment was involved in some of the worst wildfires to ravage California in recent years."[3]

As one of the most destructive catastrophes in memory, the fire that destroyed Paradise is frequently cited as a harbinger of the increasing risks to life and property along the climate change-wracked margins of our built environment.[4] The impact on insurers is equally serious. In the wake of the Paradise fire, primary insurers dropped policies

1. The Indicator from Planet Money, *Rebuilding Paradise*, NPR (Sept. 29, 2021), https://www.npr.org/transcripts/1041641733 [https://perma.cc/8SKN-J799]. For a book-length treatment of first-hand accounts of the fire, see LIZZIE JOHNSON, PARADISE: ONE TOWN'S STRUGGLE TO SURVIVE AN AMERICAN WILDFIRE (2021).
2. Press Release, California Department of Forestry and Fire Protection, CAL FIRE Investigators Determine Cause of the Camp Fire (May 15, 2019); *NIST Investigation of the California Camp Fire*, U.S. DEP'T OF COM., NAT'L INST. OF STANDARDS AND TECH. (March 5, 2019), https://www.nist.gov/el/fire-research-division-73300/wildland-urban-interface-fire-73305/nist-investigation-california (Feb. 8, 2021) [https://perma.cc/YM84-4NMK].
3. Ivan Penn & Peter Eavis, *PG&E's Plan to Resolve Bankruptcy Wins Court Approval*, N.Y. TIMES, https://www.nytimes.com/2020/06/19/business/energy-environment/pge-bankruptcy-court-approval.html (July 28, 2020) [https://perma.cc/VZS9-7H6R]; *see* CAL FIRE Investigators Determine Cause, *supra* note 2; Gireesh Shrimali, *In Fire-Prone California, Many Residents Can't Afford Wildfire Insurance*, THE CONVERSATION, https://theconversation.com/in-fire-prone-california-many-residents-cant-afford-wildfire-insurance-119451 (Sept. 10, 2020) [https://perma.cc/NY4Q-7SAP].
4. *See e.g.*, Don Jergler, *Actuaries: Climate Change, WUI Building Led to Worsening Wildfires in U.S. and California*, INS. J. (March 17, 2022), https://www.insurancejournal.com/news/west/2022/03/17/658598.htm [https://perma.cc/VK37-55DS]. The author cites a discussion by the Extreme Events and Property Lines Committee of the American Academy of Actuaries, who concluded that the two factors driving the increase in destruction are "climate change, which have [sic] had a hand in increasing winds and drought, and urban conflagration (more homes in the wildland-urban interface)." *Id.*

covering similarly situated towns and created further reliance on the state as an insurer of last resort for fire-threatened properties.[5]

Fire is not the only threat to life and property in the United States, nor the only area where governments have had to backstop insurance coverage for citizens. Both the United States federal government and state governments are large providers of social insurance, including Medicare and Medicaid for health insurance,[6] unemployment insurance,[7] disability insurance,[8] and Social Security for retirement income.[9]

In circumstances of private market failure, the federal government may feel both capable of and responsible for supplying private goods such as insurance. Since 1968, the federal government has provisioned the vast majority of flood insurance for private property through the National Flood Insurance Program (NFIP).[10] The NFIP, as envisioned, would cover a market failure in the private insurance market, while

5. Ron Cassesso, *States' Insurer of Last Resort Should Not Become the Primary Insurance Market*, CAL MATTERS, https://calmatters.org/commentary/my-turn/2020/05/states-insurer-of-last-resort-should-not-become-the-primary-insurance-market (June 23, 2020) [https://perma.cc/MYU6-RBS8]; *see also* Press Release, California Dep't of Ins., New Data Shows Insurance Companies Non-Renewed Fewer Homeowners in 2020 while FAIR Plan 'Insurer of Last Resort' Policies Increased (Dec. 20, 2021), https://www.insurance.ca.gov/0400-news/0100-press-releases/2021/release117-2021.cfm [https://perma.cc/Y3MT-KCJS] (noting an increase of over 49,000 consumers who resorted to FAIR as an insurer of last resort in 2020, with continued growth expected).

6. RYAN J. ROSSO, CONG. RSCH. SERV., IF10830, U.S. HEALTH CARE COVERAGE AND SPENDING (2023), https://sgp.fas.org/crs/misc/IF10830.pdf [https://perma.cc/7P6C-6R6G]. The Service estimates that 68.4% of Americans are covered under private group or non-group health insurance, while 44.2% of Americans are covered by Medicare, Medicaid/CHIP, and military coverage, either TRICARE or VA Care. Note that these categories are not mutually exclusive and add up to more than 100%. Medicare alone spent $756 billion in 2021 on health consumption expenditures. *Id.* at 2 & fig.2; *see also Facts + Statistics: Flood Insurance*, INS. INFO. INST., https://www.iii.org/fact-statistic/facts-statistics-flood-insurance (last visited Oct. 2, 2023) [https://perma.cc/KF8S-G5M3] (discussing flood insurance costs, events, and providers).

7. CHAD STONE & WILLIAM CHEN, INTRODUCTION TO EMPLOYMENT INSURANCE, CTR. ON BUDGET AND POL'Y PRIORITIES, https://www.cbpp.org/research/introduction-to-unemployment-insurance [https://perma.cc/H8EE-8CYZ] (last updated July 30, 2014). The states run unemployment insurance programs, which in turn are overseen the U.S. Department of Labor. "Although states are subject to a few federal requirements, they are generally able to set their own eligibility criteria and benefit levels." *Id*. at 1.

8. Richard Hemp et al., *U.S. Disability Services and Spending*, 24 NAT'L CONF. OF STATE LEGISLATURES LEGISBRIEF, no. 18, May 2016.

9. *Historical Background and Development of Social Security*, SOC. SEC. ADMIN., https://www.ssa.gov/history/briefhistory3.html (last visited Oct. 2, 2023) [https://perma.cc/QUV6-LT47]. Social Security was largely created in response to the dramatic increase in elderly poverty due to the Great Depression, and insufficient private market mechanisms to alleviate this poverty. *Id.*

10. *The National Flood Insurance Program*, FED. EMERGENCY MGMT. AGENCY, NAT'L FLOOD INS. PROGRAM, https://www.floodsmart.gov/about (last visited Oct. 2, 2023)

simultaneously encouraging states and local governments to better understand and mitigate their risks and encourage development in areas not prone to flooding.[11]

However, far from solving the problem of coastal development and flood damage, the NFIP may have provided a safety net via an implicit subsidy and thereby exacerbated the long-term problem. As with houses built on the wildland-urban interface in California, many commentators have questioned the wisdom of public subsidies for properties and new housing developments built near coasts, in floodplains, and on wetlands; these commentators have further pointed to the NFIP's chronic inability to remain solvent as a key factor in this questionable pattern.[12]

This paper applies the concepts of moral hazard and adverse selection to the NFIP. Part II provides background of the NFIP and current efforts to reform the flood insurance industry, while also discussing moral hazard and adverse selection principles. Part III provides analysis, and specifically applies moral hazard and adverse selection to the NFIP. The same Part also discusses comparative flood insurance globally and the outlook for possible NFIP reforms. Part IV briefly concludes.

II. BACKGROUND

A. Context of Flood-Threatened Real Estate

Flooding is the "most common and most expensive natural disaster in the United States."[13] In the decades since the introduction of the NFIP, property damage from flooding events, and in particular

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[https://perma.cc/4LLS-V4H5]; *see also* 42 U.S.C. §§ 4001–4131 (providing statutory framework for NFIP).

11. *See* 42 U.S.C. §§ 4001, 4012, 4012a.
12. *See, e.g.,* Melissa Tier, *Overcoming Contemporary Reform Failure of the National Flood Insurance Program to Accelerate Just Climate Transitions*, PRINCETON J. PUB. & INT'L AFFS. (May 5, 2021), https://jpia.princeton.edu/news/overcoming-contemporary-reform-failure-national-flood-insurance-program-accelerate-just-climate [https://perma.cc/KP7F-EJZQ]; Jen Schwartz, *National Flood Insurance is Underwater Because of Outdated Science*, SCI. AM. (March 23, 2018), https://www.scientificamerican.com/article/national-flood-insurance-is-underwater-because-of-outdated-science [https://perma.cc/M5WA-TTBJ]; Alicja Grzadkowska, *Failures of NFIP Continue to Leave Millions Exposed to Floods*, INS. BUS. (Aug. 6, 2019), https://www.insurancebusinessmag.com/us/news/ catastrophe/ failures-of-nfip-continue-to-leave-millions-exposed-to-floods-174571.aspx [https://perma.cc/6QX7-HLAT].
13. Federal Emergency Management Agency, *Defining a Property's Unique Flood Risk*, YOUTUBE (May 12, 2021), https://www.youtube.com/watch?v=oi2g-0GfgMk. Indeed, nine of the costliest natural catastrophes in U.S. history, including eight hurricanes, have occurred in the time since Hurricane Katrine hit the Gulf Coast in 2005. *See Facts + Statistics: Flood Insurance*, *supra* note 6.

wind and water damage from hurricanes, has become more common,.[14] Simultaneously, a scientific consensus has arisen over the relationship between climate change and the increasing frequency and severity of catastrophic weather events.[15]

Hurricanes and flooding create tragedy whenever life is lost. But perhaps the most pernicious result of these disasters is the possibility of recurring flooding damage, which hangs like a pall over American life in coastal and riparian zones and creates a financial burden to rebuild and protect from future events.

The public expenditure to mitigate current and future flood risk is large and examples abound. In Miami and Miami Beach, coastal developments are threatened by sunny day flooding from so-called king tides, which are expected to increase from a few days per year currently to possibly sixty days a year by 2030.[16] The sea level in Boston has already risen by more than a foot from historical norms and is expected to keep rising, leading the city to deploy tactical fixes such as portable flood barriers and raised street levels.[17]

New York City has been debating whether to build a six-mile sea barrier to protect against storm surges such as the one that flooded lower Manhattan during 2012's Hurricane Sandy.[18] These efforts are particularly important when considering the value of the existing built-up infrastructure, as well as the disproportionate amount of national economic activity that east coast metro areas produce.[19] Finally, the

14. *Facts + Statistics: Flood Insurance*, *supra* note 6.
15. *Billion-Dollar Weather and Climate Disasters*, NOAA NAT'L CTRS. FOR ENV'T INFO., https://www.ncei.noaa.gov/access/monitoring/billions/ (last visited Oct. 2, 2023) [https://perma.cc/2UTN-WYD8]. Internationally, drought and storms were the most catastrophic events over the last 50 years in terms of loss of life. *See Climate and Weather Related Disasters Surge Five-Fold over 50 Years, but Early Warnings Save Lives – WMO Report*, UNITED NATIONS (Sept. 1, 2021), https://news.un.org/en/story/2021/09/1098662 [https://perma.cc/CDB3-LLVP].
16. Jim Carroll, *The Damage in Florida from Rising Sea Levels Already Is Here | Commentary*, ORLANDO SENTINEL (Feb. 8, 2021), https://www.orlandosentinel.com/opinion/guest-commentary/os-op-florida-sea-level-rise-damage-here-20210208-3mibpyp6ivhclacigj5pnycqgq-story.html [https://perma.cc/6JN6-HNMH].
17. Steven Mufson, *Boston Harbor Brings Ashore a New Enemy: Rising Seas*, WASH. POST (Feb. 19, 2020), https://www.washingtonpost.com/climate-solutions/2020/02/19/boston-prepares-rising-seas-climate-change [https://perma.cc/UNR3-6XBK].
18. Anne Barnard, *The $119 Billion Sea Wall that Could Defend New York . . . or Not*, N.Y. TIMES, https://www.nytimes.com/2020/01/17/nyregion/the-119-billion-sea-wall-that-could-defend-new-york-or-not.html (Aug. 21, 2021) [https://perma.cc/W5ZU-AYET].
19. Richard Florida, *The Dozen Regional Powerhouses Driving the U.S. Economy*, BLOOMBERG (Mar. 12, 2014), https://www.bloomberg.com/news/articles/2014-03-12/the-dozen-regional-powerhouses-driving-the-u-s-economy [https://perma.cc/PJ7Q-ANPT]. The Boston-Washington corridor has a population of 56.5 million people and an annual economic output of $3.75 trillion, greater than the annual economic output of Germany. Much of the highest-value, most-productive real estate in this

Gulf Coast not only stands to suffer damage to its urban areas, but some counties and parishes could also see "economic damages representing between two and twenty percent of their annual income under a no-change, business-as-usual carbon emissions scenario."[20]

One canary in the coal mine is the increasing unavailability of the standard thirty-year mortgage. In risky areas, banks are reportedly requiring higher down payments—up to forty percent—and are increasingly "shifting mortgages with flood risk off their books and over to organizations like Fannie Mae and Freddie Mac, government-sponsored entities whose debts are backed by taxpayers."[21]

Beyond damage to infrastructure and the economy, flooding is also a private tragedy, destroying property and forcing the difficult decision to move or struggle through years of rebuilding in the same place, possibly for it all to happen again. The main way homeowners have historically guarded against flooding is through insurance. However, flood damage is a standard exclusion under nearly all homeowner's and renter's insurance policies.[22] While the NFIP is a nominal alternative and putatively required to qualify for federally backed mortgages, one study has found that "only thirty percent of homes in the highest-risk areas have flood coverage."[23]

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region is in the urban core of New York, Boston, Washington D.C., and Philadelphia, all areas that stand to endure increasing inundation from rising seas and storm surges. *Id.*

20. Mark Schleifstein, *'Gulf Coast Will Take a Massive Hit,' Scientist in Climate Change Study Says*, NOLA.COM, https://www.nola.com/news/environment/article_4bbfa832-76cc-55a2-849d-e7dc0ef1acd1.html (July 7, 2021) [https://perma.cc/H257-QDFX]. The author cites to a study estimating climate change-induced economic damage, particularly among those areas that are already socioeconomically worse off than the national average. *Id.* For further details about projected sea level rises through 2150, see *2022 Sea Level Rise Technical Report*, NOAA, https://oceanservice.noaa.gov/hazards/sealevelrise/ sealevelrise-tech-report.html (last visited Oct. 2, 2023) [https://perma.cc/3UJA-6WZC].
21. Christopher Flavelle, *Rising Seas Threaten an American Institution: The 30-Year Mortgage*, N.Y. TIMES, https://www.nytimes.com/2020/06/19/climate/climate-seas-30-year-mortgage.html (March 2, 2021). The author cites to a peer-reviewed study by Professor Amine Ouazad, who found that "the share of homes [in flood-prone areas] with fixed-rate, 30-year mortgages has declined sharply—to less than 80 percent, as of 2016—in areas most exposed to storm surges." *Id.* "In the rest of the country, the rate has stayed constant, at about 90 percent of home loans." *Id.* Professor Ouazad also found a higher incidence of interest-only loans in such areas – 10% compared with a rate of 2.3% in other zip codes. *Id.*
22. *Facts + Statistics: Flood Insurance, supra* note 6.
23. *Spotlight on: Flood Insurance*, INS. INFO. INST. (Dec. 6, 2022), https://www.iii.org/article/spotlight-on-flood-insurance [https://perma.cc/7ABT-U9S8]. The authors cite the Risk Management and Decision Processes Center at the University of Pennsylvania's Wharton School for this data. Other studies estimate the rate to be between 12 to 14 percent, while a survey of homeowners themselves returned a self-reported rate of coverage at 27 percent, a number which is both difficult to believe and still likely too low for the number of homes which may experience flood damage, depending on where the respondents lived. *Id.*

Though the NFIP was created in response to a perceived market failure on the part of private insurers, a small private flood insurance market exists, often for amounts above the NFIP's maximum coverage of $250,000 in building coverage and $100,000 for personal property.[24] In 2018, for instance, private flood insurance premiums totaled $644 million, as compared with the $3.5 billion in NFIP premiums for that same year.[25] As with California's fire insurance policies, the U.S. federal government is effectively the nation's flood insurer of last resort.

B. History and Development of the National Flood Insurance Program

Private flood insurance was available from 1895 to 1927, but a series of major losses in Mississippi river floods in 1927 and 1928 caused most insurers to conclude that flood risk was effectively uninsurable.[26] A pilot program was passed by Congress in 1956 to test the interest of private sector insurers to enter the flood market, but the unpredictable nature of losses and lack of robust data led the program to remain unimplemented.[27] After Hurricane Betsy caused $1.5 billion of damage and killed 76 people in Louisiana on September 9, 1965, and without a robust market for private flood insurance, the U.S. federal government was compelled to respond.[28]

The NFIP rests on two policy goals: "(1) to provide access to primary flood insurance, thereby allowing for the transfer of some of the financial risk of property owners to the federal government; and (2) to mitigate and reduce the nation's comprehensive flood risk through the development and implementation of floodplain management standards."[29] As compared with private insurance, this makes the NFIP immediately stand out in two ways: first, the scope of the program is national, and second, it includes "non-insurance" social goals such as mapping flood plains, encouraging more resilient land use policies, and backstopping

24. *Flood Insurance and the NFIP*, FED. EMERGENCY MGMT. AGENCY (June 14, 2021), https://www.fema.gov/fact-sheet/flood-insurance-and-nfip [https://perma.cc/RTS4-HM76].

25. DIANE P. HORN & BAIRD WEBEL, CONG. RSCH. SERV., R45242, PRIVATE FLOOD INSURANCE AND THE NATIONAL FLOOD INSURANCE PROGRAM 10 (2023), https://sgp.fas.org/crs/homesec/R45242.pdf [https://perma.cc/WV8V-R3RF].

26. *Id.*; *see* FED. EMERGENCY MGMT. AGENCY, A CHRONOLOGY OF MAJOR EVENTS AFFECTING THE NATIONAL FLOOD INSURANCE PROGRAM (2002), https://www.dhs.gov/xlibrary/assets/privacy/privacy_pia_mip_apnd_h.pdf [https://perma.cc/2BQM-CSVD] (detailing the longer-term progression of events preceding the passage of the act).

27. FED. EMERGENCY MGMT. AGENCY, *supra* note 26, at 6.

28. Erwann O. Michel-Kerjan, *Catastrophe Economics: The National Flood Insurance Program*, 24 J. ECON. PERSPS. 165, 165 (2010). The 1965 $1.5 billion dollar damage estimate for Hurricane Betsy would be $13.6 billion in 2022 dollars.

29. HORN & WEBEL, *supra* note 25, at 2; *see also* 42 U.S.C. §§ 4001–02 (containing the Congressional fact finding supporting the passage of the initial 1968 bill).

private lending institutions against defaults caused by uninsured losses.[30]

The NFIP remained relatively underutilized until the 1973 Flood Disaster Protection Act which required federally regulated mortgage lenders to require flood insurance for properties in Special Flood Hazard Areas (SFHAs).[31] Uptake jumped again in the 1990s and early 2000s after the program advertisement improved and a series of hurricane and other flooding events increased demand.[32]

Exactly as the private sector anticipated, claims on the NFIP spiked dramatically following major hurricanes, with the biggest loss occurring in the years 2005 (Katrina), 2012 (Sandy), and 2017 (Harvey).[33] These claims far exceeded premiums collected, and as a matter of course the program frequently runs in deficit. The Congressional Budget Office estimates that the program runs at an annual deficit of $1.4 billion dollars, and as of September 2017 the program owed $24.6 billion to the U.S. Treasury, out of a total borrowing limit of $30.4 billion.[34]

In response to major hurricanes and flooding events, as well as anticipated increases in risk due to climate change, Congress passed the Biggert-Waters Act in 2012.[35] Biggert-Waters had four key elements: (1) gradually reduce and eliminate below-market and grandfathered rates and allow full risk to be priced into new policies; (2) improve flood maps to define flood rates; (3) charge premiums based on the new maps; and (4) use reinsurance to shift some risk to the private sector.[36] However, once homeowners in affected areas noticed

30. HORN & WEBEL, *supra* note 25, at 2.
31. Michel-Kerjan, *supra* note 28, at 168.
32. *Id.* at 168–69.
33. *Budget Basics: The National Flood Insurance Program*, PETER G. PETERSON FOUND. (Feb. 12, 2020), https://www.pgpf.org/budget-basics/the-national-flood-insurance-program [https://perma.cc/XJ48-7ZZA]. For a discussion of further tweaks made to the program's funding structure and deficit, see FED. EMERGENCY MGMT. AGENCY, *supra* note 26; Michel-Kerjan, *supra* note 28.
34. CONG. BUDGET OFF, NO. 53028, THE NATIONAL FLOOD INSURANCE PROGRAM: FINANCIAL SOUNDNESS AND AFFORDABILITY 1 (2017), https://www.cbo.gov/system/files/115th-congress-2017-2018/reports/53028-nfipreport2.pdf [https://perma.cc/MY6G-FKKV]. The shortfall is estimated to come from two main sources: (1) expected claims exceeding premiums by $1.0 billion and (2) the cost of providing discounted rates for certain policies. According to the report, the "discounts are mainly for properties built before flood insurance rate maps (FIRMs) were developed. They are intended to prevent households from facing significant new costs that could impose hardship and cause some homeowners to forgo coverage." *Id.* This is similar to the concept of a tax expenditure, in which the government spends money, not necessarily by making a direct outlay from the Treasury, but by collecting less than it would otherwise expect to under neutral circumstances. *See also Facts + Statistics: Flood Insurance*, *supra* note 6 (presenting data on costs of natural disasters as well as insurance premium rates).
35. Biggert-Waters Act, Pub. L. No. 112-141, 126 Stat. 405 (2012).
36. Loren M. Vasquez, *Big Storms, Big Debt, and* Biggert-Waters*: Navigating Florida's Uncertain Flood Insurance Future*, 5 SEATTLE J. ENV'T L. 109, 121 (2015).

premium increases, a major backlash occurred and Congress modified the bill under the 2014 Homeowner Flood Insurance Affordability Act (HFIAA).[37] The HFIAA delayed premium increases, capped the rate of future annual increases at 18%, and retained many grandfathered rates.[38]

While Biggert-Waters itself was not a radical change to the NFIP, the response and passage of HFIAA shows the high political salience of premium rates and a lack of political will to tackle fundamental reform of the program. The acts did allow FEMA to incorporate a more dynamic pricing model, dubbed Risk Rating 2.0, which now factors in more variables, including (1) flood frequency, (2) flood type (e.g., "river overflow, storm surge, coastal erosion and heavy rainfall"), (3) distance of the property to a water source, (4) elevation, and (5) cost to rebuild.[39] Policies renewing after April 1, 2022 are subject to the revised premium pricing methodology.[40]

As of this writing it is too early to tell how significant the impact of Risk Rating 2.0 premium increases will be on homeowners and real estate prices. However, early estimates are that some eighty percent of homeowners will see an increase in their annual premium—limited by statute to eighteen percent annually—and media reports of shocked and dismayed homeowners have started to trickle out.[41] At least one study has found that coastal real estate values in eight East Coast states are already $14.1 billion lower than they would otherwise have been without sea level rise and more frequent flooding events.[42]

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37. *Id.* at 124–25.
38. *Id*. at 125–26.
39. *NFIP's Pricing Approach*, FED. EMERGENCY MGMT. AGENCY, https://www.fema.gov/flood-insurance/risk-rating (last updated Sept. 28, 2023) [https://perma.cc/6KLR-4GSD].
40. *Id.*
41. *See e.g.*, Paul Murphy, *Risk Rating 2.0 Goes Into Effect, More Than 80% of Policy Holders Could See Rate Increases,* 4WWL (Apr. 1, 2022), https://www.wwltv.com/article/news/local/risk-rating-20-goes-into-effect-more-than-80-of-policy-holders-could-see-rate-increase/289-6ec30e7c-22ac-4567-95e7-32d42ce695be [https://perma.cc/B2FC-W8KK]; Sabrina Wilson, *New Flood Insurance Rates Take Effect Friday; GNO Inc., & Elected Officials Seek a Delay*, FOX 8 LIVE (Mar. 29, 2022), https://www.fox8live.com/2022/03/29/new-flood-insurance-rates-take-effect-friday-gno-inc-elected-officials-seek-delay/ [https://perma.cc/ED5N-5SG6]; Dan Copp, *Sticker Shock: How Rising Flood Insurance Costs Are Affecting Houma-area Homeowners*, HOUMA TODAY (March 28, 2022), https://www.houmatoday.com/story/news/2022/03/28/flood-insurance-going-up-heres-why-flooding-housing/7118482001 [https://perma.cc/KRT7-T6CN]; John Luclew, *Flood Insurance Sticker Shock Stuns Susquehanna Valley Residents: Report*, PENN LIVE, PATRIOT-NEWS, https://www.pennlive.com/ business/2022/04/flood-insurance-sticker-shock-stuns-susquehanna-valley-residents-report.html (Apr. 26, 2022) [https://perma.cc/HVE2-2KEL].
42. Press Release, First St. Found., As the Seas Have Been Rising, Tri-State Home Values Have Been Sinking (Aug. 23, 2018), https://firststreet.org/press/

C. Moral Hazard

1. Background on Moral Hazard

Moral hazard is the "tendency of insurance protection to alter an individual's motive to prevent loss . . . [which] affects expenses for the insurer and therefore, ultimately, the cost of coverage for individuals."[43] The basic solutions available to the insurer are to limit the coverage available to the insured and to monitor the insured to prevent loss.[44]

The insurance industry necessarily relies on proper measurement of risk and basic business economics for its very existence, and thus incorporates moral hazard considerations into the policy writing and renewal process. In legal analysis, moral hazard came into increasing prominence with the rise and sophistication of the law and economics school of thought from the 1960s onward.[45]

There are several ways in which moral hazard may be expressed: "the insured may intentionally cause a loss . . . the insured may take less care to avoid a loss . . . the insured may intentionally increase the amount of the loss . . . [and] the insured may not take precautions to lessen the amount of a loss."[46]

However, moral hazard can also exist on the part of the insurer in the form of so-called "reverse moral hazard."[47] Insureds and insurers have aligned interests before an insurable event occurs, but "a fundamental conflict of interests arises in the post-occurrence stage," during which the insurer decides whether the claim is covered and pays damages.[48]

2. Use of Moral Hazard in the Property Insurance Industry

Insurers are naturally incentivized to reduce moral hazard by actuarially underwriting their policies, charging appropriate premiums and deductibles, and requiring proof of loss.[49] Thus, insurers' behavior aligns with the theory of moral hazard, in which the insurer must guard against the insured's lax behavior and possible incentives to cause damage to collect on the payout.

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as-the-seas-have-been-rising-tri-state-home-values-have-been-sinking [https://perma.cc/25T6-BTN8].

43. Steven Shavell, *On Moral Hazard and Insurance*, 93 Q. J. ECON. 541, 541 (1979).
44. *Id.*
45. Eric D. Beal, *Posner and Moral Hazard*, 7 CONN. INS. L.J., 81, 84–85 (2000).
46. *Id.* at 85.
47. Ronen Avraham, *The Economics of Insurance Law—A Primer*, 19 CONN. INS. L. J. 29, 87–88 (2012).
48. *Id.* at 87. The doctrines of *contra proferentem* and reasonable expectations have been developed in part to counter this potential conflict of interest. *Id.* at 88–90.
49. Peter Molk, *Playing with Fire? Testing Moral Hazard in Homeowners Insurance Valued Policies*, 2 UTAH L. REV. 347, 349 (2018).

Despite the size and robust market for homeowners' property insurance, relatively few empirical studies exist which causally link moral hazard theory with expected outcomes.[50] In one recent study, author Peter Molk used private insurance industry data to examine homeowner claims from eighteen states that have "valued policy" laws which require insurers to pay more than the value of the house under certain total loss scenarios.[51] During the period studied, Louisiana went from allowing such policies to outlawing them.[52]

Traditional moral hazard theory would suggest that if homeowners can earn excess gains through total loss, arson incidence may rise.[53] Paradoxically, however, the author found that "loss rates from covered causes are *lower*, rather than higher, in those states that allow policyholders excess financial recoveries."[54] In Louisiana "loss rates from covered causes *rise*, rather than fall . . . after the [excess] profit incentive is removed."[55]

The author explains these seemingly contradictory findings by noting, first, that the theoretical simplicity of moral hazard may not always translate directly into real world results when studied empirically.[56] Second, he suggests that the findings implicate "the usefulness of casting moral hazard as a concept that focuses on more than just the hard economic factors that affect policyholders . . . [and that t]he factors policyholders *believe* will affect their insurance payouts, rather than factors that truly determine those payouts, are what actually influence behavior."[57]

Finally, Molk notes that the basic theory of moral hazard relies "exclusively on policyholder behavior [but] ignore[s] how other actors may respond."[58] Specifically, the author suggests that insurers respond to states' restrictions on their ability to manage moral hazard through valued policy laws by "altering their underwriting practices, which in turn reduces policyholders' loss incentives and loss rates."[59] Accordingly, the author recommends a broader, multivariate conception of

50. *Id.* at 351 & n.20. The author notes that "empirical studies of homeowner moral hazard are few and draw only limited conclusions," but points out Michael D. Eriksen & James M. Carson, *A Burning Question: Does Arson Increase When Local House Prices Decline?,* 84 J. RISK & INS. 7 (2017), and Paul R. Goebel & David M. Harrison, *Money to Burn: Economic Incentives and the Incidence of Arson*, 21 J. HOUS. RSCH. 49 (2012), as "recent exceptions." *Id.*
51. Molk, *supra* note 49, at 347, 351.
52. *See id.* at 378–79.
53. *See id.* at 350.
54. *Id.* at 351.
55. *Id.*
56. *Id.*
57. *Id.* at 351–52.
58. *Id.* at 352.
59. *Id.*

moral hazard, in which actors on each side of the interaction take actions which dynamically alter the moral hazard calculus.[60]

D. Adverse Selection

1. Background on Adverse Selection61

Adverse selection "refers to the theoretical tendency for low risk individuals to avoid or drop out of voluntary insurance pools, with the result that, absent countervailing efforts by administrators, insurance pools can be expected to contain a disproportionate percentage of high-risk individuals."[62] It is further "a problem of asymmetric information in that the true risk level of the insured is hidden from the insurer."[63] Adverse selection is problematic for insurers because managing a risk pool requires both low-risk and high-risk policyholders in order to adequately fund the pool through premiums and avoid excess claims and payouts.

Reverse adverse selection "results when there is a disparity in the quality of policies offered by insurers and an information barrier that prevents insureds from accurately separating those policies into high and low quality."[64] It is easy to imagine reverse adverse selection occurring when consumers functionally have no choice but to accept a limited menu of policies, or if the complexity of the policy and its coverage is beyond the easy comprehension of the insured. The basic solutions for such problems are regulation requiring transparency or legislatively mandated minimum coverage standards.[65]

2. Use of Adverse Selection in the Insurance Industry

As with moral hazard, insurers use several tools to manage adverse selection risk, including the underwriting process and tiered deductibles. Such deductibles may provide the insurer a sense of the insured's self-assessment of their level of risk. In theory, if an insured chooses a higher deductible, it may mean that that they consider themselves a low risk.[66] Conversely, an insured opting for the lowest tier of deductible may indicate that they are aware of some risk factor which increases the likelihood of a claim.[67]

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60. *Id.*
61. *See* Tom Baker, *Containing the Promise of Insurance: Adverse Selection and Risk Classification*, 9 CONN. INS. L.J. 371, 375 (2003).
62. *Id.*
63. Randy E. Dumm et al., *An Examination of Adverse Selection in the Public Provision of Insurance*, 38 GENEVA RISK & INS. REV. 127, 134 (2013).
64. Avraham, *supra* note 47, at 61.
65. *Id.* at 63.
66. Dumm et al., *supra* note 63, at 135.
67. *Id.*

At least one study has empirically examined adverse selection in the U.S. homeowners' insurance market, specifically the residual risk market in Florida.[68] Akin to the lack of private market that spurred the creation of the NFIP, the largest single homeowners' insurer in Florida is Citizens Property Insurance Corporation, a state-backed insurer of last resort.[69]

The study hypothesized that higher risk individuals would choose coverage with lower deductibles, and lower risk individuals would choose higher-deductible coverage.[70] Following statistical analysis and discussion, the study ultimately found evidence indicating the existence of adverse selection in the Florida residual market, namely that higher-risk individuals choose policies with the lowest deductible.[71] Ultimately, the authors conclude that "in addition to the external challenges that Citizens faces in setting rates *vis-à-vis* the standard market, the internal challenges of pricing of risks within Citizens is also problematic."[72]

E. Distinguishing Between Moral Hazard and Adverse Selection

While the two concepts of moral hazard and adverse selection overlap and are theoretically similar in many ways, it is helpful to keep them distinct. The key difference is in the timing and nature of each. In terms of timing, adverse selection occurs before the policy is in force, while moral hazard occurs while the policy is in effect. In terms of the nature of the risk, adverse selection deals with characteristics inherent in the insured, creating a greater (or lesser) likelihood of making a claim. Moral hazard, on the other hand, has less to do with inherent risk characteristics and instead deals with the behavior-modifying

68. *See generally* Dumm et al., *supra* note 63.
69. *Id.* at 129–134; *see also* Leslie Scism & Arian Campo-Flores, *Insurance Costs Threaten Florida Real-Estate Boom*, WALL ST. J. (Apr. 25, 2021), https://www.wsj.com/articles/insurance-costs-threaten-florida-real-estate-boom-11619343002 [https://perma.cc/EF3M-9S2M] (discussing issues of rising costs). The major causes of private market insurers exiting the homeowners market in Florida include the unpredictability of catastrophic hurricanes and, in the inland portions of the state, damage from porous soil and sinkholes. Additional concerns include "the [swelling] cost of reinsurance . . . and a proliferation of what insurers see as sham roof-related claims." Scism & Campo-Flores, *supra*. As the authors note, Florida has the highest average cost for home insurance in the nation, with the average premium in Florida being $2,380 in 2021 as compared with $1,297 in the rest of the U.S. *Id.*
70. Dumm et al., *supra* note 63, at 139–40.
71. *Id.* at 144–45.
72. *Id.* at 145.

effects of insurance, and the risk that the insured will take less care to protect the property knowing that an insurance backstop exists.[73]

At least one study has theorized that the analytical difference between moral hazard and adverse selection is murkiest in the automobile and health insurance segments, specifically that "it is harder to determine whether or not the insurance is creating the moral hazard problem, or adverse selection within the insured group is creating the problem."[74] These authors posit that, in the homeowners context, the "nature of the insured property (the home)" is inherently less susceptible to moral hazard because it is difficult for a homeowner to alter the risk profile of the home.[75]

III. ANALYSIS

A. Application of Moral Hazard to the NFIP

If moral hazard is the idea that insurance causes insureds to take riskier behavior than they otherwise would, how does it play out in the context of the NFIP? The most straightforward application would find that the availability of NFIP insurance to protect homes in flood-prone areas encourages homeowners to buy homes in threatened areas and to repair them and stay if they are damaged in a flooding event. In this way, the NFIP changes the economic calculus of property threatened or damaged by flood and serves as a kind of subsidy to encourage development and rebuilding in inherently risky areas.

Reform attempts and Risk Rating 2.0, however, show that climate change-induced sea level rise, and the possibility of more frequent or more damaging hurricanes, creates a dynamic risk environment, rather than a static one. If at-risk properties are damaged or destroyed more frequently, or if the cost of insuring them rises, then the economic pendulum should swing back towards favoring either more robust adaptation such as raising houses on stilts, or abandoning certain homes or development areas due to an increase in risk. Some of these adaptations are already occurring, as discussed in section D of Part II, but arguably more slowly and at smaller scale than they already should.

There are three additional ways in which to analyze moral hazard in the NFIP: (1) the role of government as an insurer; (2) rational homeowner response to subsidized insurance; (3) reverse moral hazard.

First, the government's role as an insurer can be an imperfect fit. The government does not have the same basic profit motive and

73. For an econometric study analyzing quantitative methods to distinguish adverse selection from moral hazard in the insurance context, see Jaap H. Abbring et al., *Adverse Selection and Moral Hazard in Insurance: Can Dynamic Data Help to Distinguish?*, 1 J. EUR. ECON. ASS'N 512 (2003).

74. Dumm et al., *supra* note 63, at 139.

75. *Id.*

requirements as private insurers to ensure that premiums exceed claims costs. As discussed in section B of Part II, the NFIP frequently operates at a deficit and currently owes the U.S. Treasury $24.6 billion.[76] In part, this is because there are legislative solutions available, such as cancelling debt or raising the NFIP's borrowing limit.[77] There are also understandable political concerns about the affordability of premiums for policyholders.[78] Yet it remains true that if homeowners' policies against flooding were procured solely on the private market, such an outcome would not be possible for long, and rates would have to rise to account for increases in risk.

Second, homeowners can put off challenging decisions in part because the NFIP exists. While it may be impossible for a given homeowner to know of the exact risk of a hurricane in any given year, it is fair to say that homeowners buying in coastal areas or flood plains have notice of the risk of flooding—either by the very nature of the site (either near to an ocean or in a low-lying riparian plain), or by the NFIP application process showing the flood risk map and requiring flood insurance as part of the federally-backed mortgage process. Further, if homeowners relied solely on the private market, which is capable of charging actuarially sound rates and more nimbly adjusting rates on an annual basis, then the real estate market would adapt much more quickly to areas of risk.

Finally, the incidence of so-called reverse moral hazard is mixed. On one hand, the classical formulation of reverse moral hazard refers to the potential conflict an insurer has with an insured post-claim. By virtue of its status as a politicized, bureaucratic governmental program, the NFIP is less likely to suffer from reverse moral hazard because it has every incentive to pay claims. Further, the government can take extraordinary actions such as one-time disaster-relief payments and targeted tax relief.[79] However, the NFIP may create reverse moral hazard by artificially propping up risky developments while also providing a relatively low maximum claim amount of $250,000 for building damage. In this way, everyone involved simply hopes a major

76. *Facts + Statistics: Flood Insurance*, *supra* note 6.

77. R.J. Lehmann, *Congress Let NFIP Off Hook for $16B Debt, Despite Less Than $10B in Claims*, INS. J. (July 9, 2018), https://www.insurancejournal.com/blogs/right-street/2018/07/09/494466.htm [https://perma.cc/YU9N-LZG3].

78. For a recent report outlining both the concern for and possible solutions to the cost of premiums, see DIANE P. HORN, CONG. RSCH. SERV., R47000, OPTIONS FOR MAKING THE NATIONAL FLOOD INSURANCE PROGRAM MORE AFFORDABLE (2023), https://crsreports.congress.gov/product/pdf/R/R47000.

79. *See e.g.*, *Disaster Assistance and Emergency Relief Program*, BENEFITS.GOV, https://www.benefits.gov/benefit/4418 (last visited Oct. 2, 2023) [https://perma.cc/3LTB-56KT].

disaster is avoided, but when one does occur, the available coverage is inadequate.[80]

B. Application of Adverse Selection to the NFIP

Adverse selection is the problem of lack of risk diversity in the insurance pool. The NFIP is a straightforward example of adverse selection insofar as the program does not have full participation from potentially affected homeowners. First, homeowners can only participate in the NFIP if their community agrees to participate in the program and enact local land use regulations.[81] Further, only those homes in high-risk areas with a federally-backed mortgage are required to have flood insurance.[82] There have been further reported issues in the administration of the program, in that FEMA partners with private insurers to administer applications and claims, but they do not always enforce the mandatory purchase of flood insurance.[83] Accordingly, the low participation rate is a failure on its own terms, and is insufficient to accomplish the program goals of making communities resilient to flooding disasters and encourage more sustainable land use.

Conversely, reverse adverse selection exists within the program such that increased participation would likely further push the program into the red. Because the NFIP operates at an ongoing deficit and is especially harmed when paying claims on major events, more policyholders could mean an even greater deficit. The Congressional Research Service has said exactly this, noting that "[a]dding new policyholders . . . would not improve the finances of the NFIP unless the new policies increase receipts more than they increase expected claims and other expenses."[84]

In some ways, the NFIP looks like the worst of all worlds: some coverage for homeowners who know enough or care to acquire it, but not enough to fully protect them or accomplish the goals of the program. If flood insurance were offered entirely by the private market, then

80. Stories emerging from New Orleans and the Gulf Coast show the problem with a lack of robust, sustainable adaptation to large-scale disasters. In some cases, FEMA sought repayment of disaster relief funds 12 years after the event and, when it couldn't locate the recipients, transferred the debt to a collector. *See, e.g.*, Eric Flack, *12 Years After Hurricane Katrina, FEMA Asks Survivor for $12K Back*, 10 TAMPA BAY (Oct. 6, 2017), https://www.wtsp.com/article/news/12-years-after-hurricane-katrina-fema-asks-survivor-for-12k-back/67-480611234 [https://perma.cc/95DV-JE6F].

81. *See Participation in the NFIP*, FED. EMERGENCY MGMT. AGENCY, https://www.fema.gov/glossary/participation-nfip (last updated July 8, 2020) [https://perma.cc/7DFU-HH9M].

82. *Who's Required to Have Flood Insurance*, FED. EMERGENCY MGMT. AGENCY, NAT'L FLOOD INS. PROGRAM, https://www.floodsmart.gov/am-i-required-have-flood-insurance (last visited Oct. 2, 2023) [https://perma.cc/4KYW-MJHG].

83. *See, e.g.*, HORN & WEBEL, *supra* note 25, at 4, 16.

84. *See* HORN, *supra* note 78, at 15.

at least the process of adaptation to increasing risk would occur more quickly and at greater scale. As the current program stands, it seems we are kicking the can down the road, even while development seems to be speeding up in ever-riskier areas.[85]

C. Comparative Flood Insurance

The NFIP is a flawed government program that emerged to compensate for a private market failure. One of the flaws in the program is that it is an inherently political one, responding not to cold economics but to constituent demands and the inherently messy back-and-forth process of democratic compromise.

However, coastal areas in the United States are not the only ones that are currently being impacted by climate change-induced sea-level rise and whose insurance markets need to plan for future claims. As an additional point of analysis, how does the NFIP compare to other flood insurance regimes internationally?

Unfortunately, comparative insurance studies are difficult to find. The Wharton School at the University of Pennsylvania has attempted to create an online database which is available to anyone for research. The site is called Flood Insurance Around the World,[86] and it categorizes the flood insurance regimes of twenty-five countries around the world. Ultimately, this database may help understand whether the NFIP is completely unique or whether other countries similarly provide governmental subsidies to cover for private market failure in catastrophic flood insurance.

First, the NFIP system is characterized by the government as a primary insurer, with private insurers in limited roles as administrators and reinsurers. The only countries with a similar setup are Iceland and Spain.[87] No other countries place the government in primary responsibility for supplying flood insurance coverage. A more common system is a mixed one, in which both the government and the private market have responsibility as primary insurers. Countries with such

85. *See e.g.*, Christopher Flavelle, *Homes Are Being Built the Fastest in Many Flood-Prone Areas, Study Finds*, N.Y. TIMES (July 31, 2019), https://www.nytimes.com/2019/07/31/climate/climate-change-new-homes-flooding.html [https://perma.cc/BLJ6-BPW5]. The study in questions found that in "eight states, including Connecticut, Rhode Island, Mississippi, and South Carolina, the percentage increase [since 2010] in homes built in the flood zone exceeded the rate of increase in the rest of the state." *Id*. Though this development is often pushed to these areas because of challenges building elsewhere, often due to zoning and regulatory burdens, the study's author notes that "this kind of building activity will 'come back and bite.'" *Id.*

86. *Flood Insurance Around the World*, WHARTON SCHOOL U. PA., ENV'T SOC. & GOVERNANCE INITIATIVE, https://esg.wharton.upenn.edu/centers-labs/climate-center/flood-insurance-around-the-world (last visited Aug. 28, 2023) [https://perma.cc/AP7H-Q3Y5].

87. *Id.*

a hybrid system include: (1) Australia, (2) Hungary, (3) Poland, and (4) Romania.[88] Notably, most industrialized countries with significant coastlines have an entirely private flood insurance market. These countries include (1) Germany, (2) France, (3) Japan, (4) Mexico, (5) Norway, (6) Peru, and the (7) United Kingdom.[89]

The final noteworthy result is that the United States is the only country in which flood insurance is offered as a single, standalone policy. This is understandable given that most other consumers' needs are met through the private market, but in all but a few countries, flood insurance is offered as part of a bundle, whether the primary insurer is a government or a private actor. This highlights the inherent challenge in increasing participation in the U.S. when the NFIP flood policy cannot be easily bundled with other policies.

Further research is needed to determine how similar or different these countries' flood insurance regimes are to the NFIP. However, as with the Frankenstein's monster agglomeration that is the U.S. healthcare system, our property insurance system for coastal flooding is unique in the international context. With that context in mind, we can look to several ideas for reform.

D. Possibilities for Future Reform

As with any major program upon which constituents rely, fundamentally reforming the NFIP will be a major uphill battle. Whether or not the political will exists, there are several options for reform, namely: (1) market-based reform, (2) regulatory reform, (3) adaptation, and (4) eminent domain.

First, market-based reform would envision either dramatically overhauling the NFIP to make it function more like the private insurance market, or gradually sunsetting the program in favor of private insurers. There is some indication that the program is moving in this direction since it first relied on private market reinsurance in 2016. Further, some private insurers seem to believe that their data and models have advanced enough to allow them to underwrite policies, although the higher cost raises questions about whether any homeowners but the wealthiest would truly avail themselves of this option unless required by state or federal law.[90]

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88. *Id.*

89. *Id.*

90. Leslie Scism, *Big New Challenge for Insurers: Extreme Weather*, WALL ST. J. (Aug. 12, 2018), https://www.wsj.com/articles/chubbs-ceo-on-the-problem-with-government-flood-insurance-1534125961 [https://perma.cc/33F4-NBEN]. Evan Greenberg, CEO of Chubb, stated that "[t]he NFIP is deeply in the red, and it crowds out the private sector from playing a greater role in flood insurance . . . [Chubb and others] would be willing to write substantially more coverage if the government allowed private companies to charge an adequate, actuarially sound rate that is matched to the risk." *Id.* Regarding homeowners who could not afford private

Second, state and local regulatory solutions may help to limit further coastal development. One of the biggest challenges with flooding is buildings which have been repeatedly destroyed and rebuilt.[91] Some local governments have taken action to limit such development, including "[a]bout a half-dozen states . . . [that] have adopted floodplain building rules tighter than federal ones, and a few dozen communities [that] have prohibited building on floodplains altogether."[92]

However, there are two problems with municipalities or states getting too tough on floodplain development. The first is practical. Currently, housing prices are outpacing inflation and wages.[93] Few local leaders want to be responsible for further limiting the ability of new and renovated housing options from coming to market. Second, governmental regulatory prohibitions on building may give rise to Fifth Amendment takings challenges for restricting the ability of private property owners to develop their land.[94]

A third option is adaptation, or further altering building codes and zoning to require new builds and renovations to make structures more resilient in the face of flooding and storm surges. To some degree this is already happening but, as with other options, the sticking point is cost.

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policies, Chubb stated that "[t]here is still a role for the government to play to serve those who are less fortunate and have an affordability problem but cannot move. The government should subsidize the cost for those people. That's a societal decision." *Id.*

91. Gregory DL Morris, *When Are We Going to Stop Building in Flood Plains?*, RISK & INS. (Jan. 24, 2019), https://riskandinsurance.com/when-are-we-going-to-stop-building-in-flood-plains [https://perma.cc/ZT44-ZHSZ].

92. Sebastien Malo, *Stop Building on Floodplains, Say Flood-Hit U.S. Families*, REUTERS (June 24, 2019), https://www.reuters.com/article/us-climate-change-usa-floods/stop-building-on-floodplains-say-flood-hit-u-s-families-idUSKCN1TP2TY [https://perma.cc/78BD-R4BQ].

93. Jessica Dickler, *Home Prices Are Now Rising Much Faster Than Incomes, Studies Show*, CNBC (Nov. 10, 2021), https://www.cnbc.com/2021/11/10/home-prices-are-now-rising-much-faster-than-incomes-studies-show.html [https://perma.cc/9MH6-55D3]. A separate, but related, topic, beyond the scope of this paper, is the further-confounding factor of low-intensity, single-family housing zoning development patterns, which not only cause municipalities to sprawl horizontally, but increase demand for development in marginal greenfield areas such as wetlands. For a high-level overview on the problems with zoning overlays, see CHARLES L. MAROHN, JR., STRONG TOWNS: A BOTTOM-UP REVOLUTION TO REBUILD AMERICAN PROSPERITY (2020).

94. *See, e.g.*, Lucas v. S.C. Coastal Council, 505 U.S. 1003 (1992). For a recent example of how fear of takings challenges impacts local decision-making regarding floodplain development, see Alex J. Weidenhof, *Communities Learn Floodplain Limits*, CRANBERRY EAGLE (April 12, 2022), https://www.cranberryeagle.com/ 2022/04/12/ communities-learn-floodplain-limits [https://perma.cc/A6SE-ES6J], (recounting discussion between local community managers and the Pennsylvania NFIP coordinator and quoting a local attorney that "[c]ommunities can't outright ban building within a certain number of feet . . . [t]hat would be considered a 'taking of all economic uses' of that land, something for which the municipality would have to compensate a landowner").

For instance, on the Texas Gulf Coast, FEMA provides a small subsidy of up to $30,000 toward elevating rebuilt homes on stilts, but the true cost is typically closer to $200,000 for a standard-sized home.[95]

Finally, governments may offer to buy out landowners or use the power of eminent domain to acquire property and relocate residents. This too has problems of scale, especially considering the sheer quantity of people and economic value potentially at risk. In some extreme cases, including far southern Louisiana[96] and parts of Alaska,[97] small communities are already being bought out from rising tides. However, whether this solution can work at scale, or for any but the smallest communities, is unclear.

Ultimately, a combination of each of these methods is likely to be used in various flood-prone communities. The process of managing flood waters and adapting to climate-change induced flooding will challenge all sectors of society and require dynamic adaptation by all involved.

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95. FED. EMERGENCY MGMT. AGENCY, HOMEOWNER'S GUIDE TO RETROFITTING 2-17 (3d ed. 2014), https://www.fema.gov/sites/default/files/2020-08/FEMA_P-312.pdf [https://perma.cc/8N2H-DXTK]. Options include: elevation, wet floodproofing, relocation, and dry floodproofing. *Id.* at 3-1; *see also* Amanda Kolson Hurley, *The House of the Future is Elevated*, BLOOMBERG (Dec. 8, 2017), https://www.bloomberg.com/news/articles/2017-12-08/the-high-cost-of-flood-proofing-homes [https://perma.cc/28CG-ZULA] (statement of a general contractor in the Houston area quoting $75–100 per square foot, saying "'[i]f you have a 2,500-square-foot house, which is typical . . . the upper end of it would be $250,000. The lower end, around $180,000'"). FEMA may provide up to $30,000 through Increased Cost of Compliance (ICC) coverage, an amount clearly insufficient in nearly all cases to accomplish the necessary elevation to avoid future damage. *See* Press Release, Fed. Emergency Mgmt. Agency, Fact Sheet: Flooded Properties Get up to $30,000 to Meet Rebuild Requirements (May 2, 2018), https://www.fema.gov/press-release/20210318/fact-sheet-flooded-properties-get-30000-meet-rebuild-requirements. In a way, this appears to be throwing good money after bad. For further examples of individual homeowners' cases breaking upon the regulatory seawall, see Cat Cardenas, *Six Figures for Six Feet: Some Harvey Victims in Houston Spend Huge Sums to Elevate Their Homes*, TEX. TRIBUNE (March 14, 2018) https://www.texastribune.org/2018/03/14/harvey-elevate-homes-flood-houston-money-costs [https://perma.cc/VZR6-PEFC].

96. David Jacobs, *Louisiana Launches $30M Buyout Program for Oft-Flooded Neighborhood*, CTR. SQUARE LA. (May 21, 2021), https://www.thecentersquare.com/louisiana/louisiana-launches-30m-buyout-program-for-oft-flooded-neighborhood/article_0c41a202-ba75-11eb-875a-97c566119a55.html [https://perma.cc/48GL-URET].

97. Olivia Ebertz, *Federal Government to Fund Relocation Projects for 6 Alaska Communities,* ALASKA PUB. MEDIA (Mar. 9, 2022), https://www.alaskapublic.org/2022/03/09/federal-government-to-fund-relocation-projects-for-6-alaska-communities [https://perma.cc/S5NU-W8WU]; *see also New Report Sheds More Light on Climate Change Impacts to Alaska Native Villages*, KYUK (Nov. 20, 2019), https://www.kyuk.org/environment/2019-11-20/new-report-sheds-more-light-on-climate-change-impacts-to-alaska-native-villages [https://perma.cc/R9PV-NYCQ] (explaining that flooding is the greatest threat to some communities in Alaska, causing those communities to consider relocating).

IV. CONCLUSION

The NFIP is a well-intentioned government program which nonetheless needs fundamental reform. The program exhibits both moral hazard and adverse selection and appears unique globally for the primary role played by the public sector. Given the size and complexity of coastal development in the United States, the critical need to adapt will be borne by not just the NFIP, but by homeowners, local governments, and the private sector.