

FEMA, FLOODING, AND HOUSEHOLD FINANCES IN HORRY COUNTY, SOUTH CAROLINA



A Report by the Climate Cost Project
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EXECUTIVE SUMMARY

This paper presents the results of an analysis of wealth impacts to individual households from severe and repeat flooding in Horry County, South Carolina and examines the degree to which Federal Emergency Management Administration (FEMA) aid has protected the finances of flood survivors. The analysis relied on a household economic survey (n=127) of flood survivors, and follow-up phone interviews (n=15) of a subsample of households to validate results and obtain more context on survey response.

The larger survey (n=127) examined flood damage costs that were not covered by FEMA's National Flood Insurance (NFIP) or Individual Assistance Programs ("out-of-pocket costs"), damages to properties that were left unrepaired, and the number of times each household flooded. Respondents reported high out-of-pocket costs regardless of whether or not they had received FEMA assistance, with a median value of \$20,000 for houses that received FEMA assistance (70% of respondents) and \$7,500 for those that did not (30% of respondents). These expenditures represent a significant fraction of the median household income for the survey, which was \$37,500. The median income of survey respondents was below the county's median income of \$50,000.

Eighty-one percent of surveyed houses had flooded two or more times in the last five years. One third of surveyed homes were located in flood zones still designated as low risk in the proposed updated FEMA Special Hazard Flood Area maps for Horry County.

To obtain a better picture of the impact of FEMA assistance on total household wealth, the project carried out phone interviews of 15 respondents to obtain more detailed information about their FEMA experiences. Because many interviewees reported being underwater on their mortgage, the Climate Cost Project performed a follow-up property analysis for these households to get a more complete picture of the total wealth impacts from repeat flooding, including home values.

The 15 households suffered an average and median loss of wealth of \$139,146 and \$85,000, respectively, or 1.36 times the median household income of \$62,500 dollars of respondents in the subsample. The median decline in home value with respect to the purchase price of the home was 17%. All but one respondent indicated that they would have liked to have moved rather than rebuild their home in the same location, but none were offered buyouts. All respondents whose homes had declined in value cited the falling value of their home, and the amount of money they had lost to flooding, as a major factor in their inability to move.

In both the full sample and subsample, the Climate Cost Project found that many houses (30%) that faced devastating single or repeat floods did not receive any NFIP or Individual Assistance Program help from FEMA. Nevertheless, even people that did receive assistance from FEMA were still left with significant financial exposure and were often forced to deplete their savings and/or take on debt to rebuild a home that was declining in value. In some cases, this burden was exacerbated by FEMA requirements to rebuild to certain flood protective standards. In the end, respondents found themselves stranded in an area that was either already experiencing repeat flooding, or had a high risk of flooding again in the future.

Household losses in this survey reflect the onset of increasingly severe and frequent flooding that has emerged in the region in the last five years. The results add to a body of work demonstrating the urgent need for reform in FEMA policy in order to protect homeowners, counties, and the country as a whole from repeat flooding exposure, which will only increase the coming decades.

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I. INTRODUCTION

Horry County is located in the northeastern coastal region of South Carolina. Its major cities include Myrtle Beach and Conway. Geographically, the area is characterized by coastal, marsh and forested wetlands, Carolina Bay ecosystems, development and farmland. The inland of Horry County includes multiple watersheds fed by the Waccamaw, Lumber, Little Pee Dee and Great Pee Dee Rivers.

In the last decade, flooding patterns in the region have dramatically changed due to human and climatic factors. Over the same period, Horry County's population grew 38.4%, from 270,274 to 374,033 people.¹ Most of this growth has been driven by retirees from northern states and has led to considerable development in the County. The population is expected to grow by an additional 270,257 people by 2040.²

Since 2016, Horry County has been directly hit by two major hurricanes and impacted by severe winds and rainfall from eight additional hurricanes or tropical storms.³ Over the same period, total FEMA recovery spending in Horry County has totaled \$136 million.⁴ The majority of this spending, \$76.3 million, was devoted to individual assistance in the form of payouts from National Flood Insurance Programs (NFIP) claims (\$52.3 million) and FEMA's Individual Assistance Program (\$24 million), respectively. The Individual Assistance Program⁵ provides additional funds for repairs, housing, and other miscellaneous expenses, including medical costs, transportation-related costs, and damaged personal property that are not covered by insurance.

¹ World Population Review, <https://worldpopulationreview.com/us-counties/sc/horry-county-population>

² Watson, *Horry County Council approves 2040 plan that will guide leaders through rapid growth*, December 10, 2019, WMBF News. <https://www.wmbfnews.com/2019/12/11/horry-county-council-approves-plan-that-will-guide-leaders-through-rapid-growth>

³ National Oceanic and Atmospheric Administration. *Historical Hurricane Tracks*. <https://coast.noaa.gov/hurricanes>

⁴ Federal Emergency Management Administration. *Open FEMA Data Sets*. <https://www.fema.gov/data-sets>

⁵ North Carolina Department of Public Safety. <https://www.ncdps.gov/emergency-management/disaster-recovery/individual-assistance>

The remaining \$59.7 million in FEMA assistance was given to Horry County government,⁶ \$50.1 million toward FEMA's Public Assistance Program and \$9.6 million toward FEMA's Hazard Mitigation Grant Program (HMGP). Public Assistance provides grants to state and local government for debris removal, emergency protective measures, and the repair, replacement, or restoration of disaster-damaged property, while HMGP funds mitigation planning and projects that reduce future damages.

In order to examine the impact of NFIP and FEMA individual assistance on household finances and community resilience, the Climate Cost Project's Impact Census surveyed 127 households and conducted in-depth follow-up telephone interviews with a subsample of 15 homeowners. We examined the following quantitative measures:

- The amount of money respondents had to spend out of pocket to repair their homes to livable conditions
- The value of items left unrepaired or unreplaced
- In the subsample of 15 homeowners, lost equity in the form of home values dropping below the homeowner's original purchase price, and the amount of assistance respondents received from FEMA through its Individual Assistance Program and NFIP
- The number of times that people flooded

We also examined additional qualitative outcomes including:

- Whether neighborhoods still experienced routine flooding
- Whether respondents felt safe in their homes
- Whether people had to take on debt to cover their costs
- Whether respondents received FEMA assistance

Since 2016, Horry County has been directly hit by two major hurricanes and impacted by severe winds and rainfall from eight additional hurricanes or tropical storms.



⁶ Federal Emergency Management Administration. *Public Assistance Program and Policy Guide April 2018*.
https://www.fema.gov/sites/default/files/2020-03/public-assistance-program-and-policy-guide_v3.1_4-26-2018.pdf

II. FEMA ASSISTANCE

Respondents reported significant out-of-pocket expenses and home damages left unrepaired, regardless of whether they had received any form of FEMA assistance. Households receiving FEMA assistance reported higher out-of-pocket costs. A possible reason for this is that households who received FEMA assistance also had higher damages. In general, the out-of-pocket expenditures in the subsample, which will be used for the total wealth analysis in sections III and IV, were similar to the sample as a whole.

Key findings

- One-third (n=5) of respondents in the subsample and 30% (n=38) in the full sample received no FEMA help at all. For these respondents, the median out-of-pocket cost was \$10,726 and \$7,500, respectively.
- Sixty-seven percent of respondents in the subsample sample (n=10) and 67% in the full sample (n=82) received FEMA assistance.⁷ For these respondents, median out-of-pocket costs were \$21,425 and \$20,000, respectively.
- The median FEMA payout for people who received FEMA assistance in the sub-sample was \$30,434. This number is not available for the full sample. To understand how FEMA payouts in the subsample compare to the County as a whole, however, we looked at FEMA records for NFIP and Individual Assistance payouts during the survey period. Over the survey period, the median NFIP claim and individual assistance grant for home repairs for Horry County was \$39,631 and \$2,130, respectively.⁸
- The value of damages left unrepaired was \$21,000 in the subsample and \$7,500 in the full sample for people who received FEMA assistance. For people who did not receive FEMA assistance, the median value of damages left unrepaired was \$16,000 in the subsample and \$7,500 in the full sample.

In the decade of 2000–2009, the median NFIP payout in Horry County was \$7,457 (average \$13,634). By the period of 2010–2015 that number had increased to \$11,731, and by 2016–2020 \$39,631 (average \$69,148).

⁷ The percentage calculation is for a denominator of 123, as four respondents did not provide this information.

⁸ These figures exclude claims for which no money was disbursed. The data was obtained at the Federal Emergency Management Administration data set page. *Open FEMA Data Sets*. <https://www.fema.gov/data-sets>, updated as of March 2021.

III. HOME VALUES

The Impact Census carried out a detailed study of prices for fifteen homes based upon follow-up interviews with a subsample of respondents. The houses were widely geographically distributed across the County. We examined effects on home equity by estimating the present market values of the respondents' homes and comparing them to their original purchase prices.

We compared three similar properties for each home, in terms of their age, property location, size, and subjective measures, including their quality as indicated by renovations, appearance, etc. These comparison homes had similar flood risks to the impacted properties, were in the same neighborhood or nearby, and sold between September 2020 and January 2021. To estimate the current market value of the impacted homes (January 2021 at the time of the analysis), we calculated an average price per square foot for the recently sold similar homes, and then multiplied the impacted home's square footage by that average price.

Key Findings

- Of the 15 homes examined, all but three saw their market value decline in real terms below the homeowner's original purchase price. By comparison, in the last four years, Horry County home prices have increased approximately 29.4%.⁹ Trends in County wide property values are further discussed in section VI.
- The median and average estimated decline in home value was 17% and 26%, respectively.
- There was no relationship between a home's price and how much its value declined.
- There was no relationship between people who did and did not receive FEMA assistance in terms of the decline in home value.
- For people who received FEMA assistance, the median cost of restoration was 31% of the total value of the home. This number does not include damages that were left unrepaired.
- For several respondents in the subsample, the costs of repairing (FEMA + out of pocket expenses) the homes exceeded 100% of the current market value of the house. These homeowners were not offered buyouts.

Houses and infrastructure that were designed to withstand flooding once every 100 years, are now flooding more frequently.



⁹ Redfin.com, <https://www.redfin.com/county/2458/SC/Horry-County/housing-market>. This calculation adjusts for inflation, i.e., is also in real terms. Prices have seen a slight increase in the growth rate since the Covid-19 pandemic, but had been growing steadily prior as well.



IV. WEALTH IMPACTS

To put home equity losses into a larger context of overall household wealth, we estimated total wealth losses of individual households in the subsample, calculated using the sum of out-of-pocket spending by each household to repair their house to a livable condition and to replace necessary belongings destroyed by the flooding, and the estimated decrease in the market value of their house relative to the homeowner's original purchase price.¹⁰ All homes in the analysis were primary residences.

Key Findings

- The median and average loss of wealth per household in the subsample (n=15) analysis were \$85,000 and \$139,146 respectively.¹¹ As a comparison, median U.S. household net worth in 2019 was approximately \$121,700.¹²
- Sixty-three percent of respondents (n=76) in the full sample had to incur debt to cover some of their losses,¹³ almost 90% of which included credit card debt. For the subsample, 53% (n=8) had to incur debt, all of which included credit card debt.
- The median loss of wealth was 1.36 times the median household income (\$62,500) in the subsample. (Median household income for the full sample was \$37,500).

¹⁰This number does not include losses to income resulting from flood-related housing displacement costs, lost work, or health care. To the extent that these decreased household savings, the estimates presented here are conservative.

¹¹All prices in this analysis have been CPI adjusted to 2020 dollars.

¹²United States Board of Governors of the Federal Reserve System, *Changes in U.S. Family Finances from 2016 to 2019: Evidence from the Survey of Consumer Finances*, Federal Reserve Bulletin, 2020 vol 106. <https://www.federalreserve.gov/publications/2020-bulletin-changes-in-us-family-finance-from-2016-to-2019.htm>

¹³The percentage calculation is for a denominator of 121, as six respondents did not provide this information.

V. FLOODING AND FEMA SPECIAL HAZARD FLOOD ZONE DESIGNATIONS

The extent of financial harm experienced by the surveyed households is the result increasing frequency and severity of flooding that has emerged in Horry County only in the last decade. FEMA's Special Hazard Flood Zones, which consider high flood risk to be a one percent chance of flooding per year, do not accurately describe the risks faced by these households, which have flooded multiple times in a five-year period. Further, many households that faced repeat flooding are not even located in FEMA's high-risk flood zones.

Key Findings

- In the full sample (n=127), 81% of homes had flooded 2 or more times.
- In the full sample, one-third all flooded houses were still located in FEMA Zone X in the County's proposed new Special Hazard Zone FEMA flood maps; Zone X is outside of the 100-year flood zone, and not a high-risk flood designation.
- Two-thirds of the homes had flooded more than once in the subsample, and all respondents expected to flood again. One home had flooded three times, and another home had flooded four times, in the 5-year period the survey covered. All respondents in the subsample were concerned about repeat flooding in their neighborhoods and the threat that imposed to their properties, even if not always affecting their home.
- All but one respondent in the subsample indicated that they would rather have had a buyout than rebuild in the same location. None of the respondents were offered a buyout.

For the 2016–2020 period, an average of 147 NFIP claims were paid out annually in Horry County. This represents a 342% increase from the average of the previous five-year period of 2010–2015, and a 1,670% increase from the previous decade of 2000–2009.





VI. DISCUSSION

The home is the largest asset most people will have in their lifetimes, representing approximately 70% of median household net worth.¹⁴

Our findings indicate that, in Horry County, FEMA aid to individual homeowners is going into assets that in real terms are falling in value below their purchase price and require large expenditures on the part of the homeowner to maintain. Ultimately, for these homes, stipulations in FEMA assistance requiring the homeowner to rebuild in the same location end up contributing to eroding homeowners' financial security and mobility.

The end result is that homeowners are getting trapped in an area where they do not feel safe and are at risk of flooding again. At the same time, FEMA and out-of-pocket costs to individuals are mounting such that, over time, if the current pattern of repeat flooding continues, cumulative investments in these homes will ultimately exceed their values. It is for this very reason—to minimize damages the federal government pays out to homeowners and to promote sound investments—that an integral part of the National Flood Insurance Program's mission is to prevent development in floodplains in the first place. Unfortunately, due to many countervailing variables, NFIP is failing to meet these objectives, resulting in increasing, rather than decreasing, costs.

¹⁴Eggleston, J., Hays, D., Munk, R., and Briana Sullivan, *The Wealth of Households: 2017*. U.S. Census Bureau, Current Population Reports, Report Number P70BR-170, August 28, 2020. <https://www.census.gov/library/publications/2020/demo/p70br-170.html>

Policy design

The NFIP program is underpinned by the construction of 100-year and 500-year floodplains. Underlying this logic is the assumption that a home, having flooded once, is unlikely to flood again. As seen in Horry County, however, as climate change exacerbates severe storm and rainfall dynamics. The retrospective approach to determining flood risk no longer matches reality. Many people who never flooded up until five years ago have now experienced multiple floods in a five-year-period above the Base Flood Elevation, defined as the expected elevation level of a 1 in 100-year flood for a given area.

Table 1 below summarizes trends in the number and values of NFIP claims paid out in the last 20 years in Horry County. Starting in the mid 2000s, larger storms have resulted in increasingly more claims, and increasingly more damage per claim.

For the 2016–2020 period, an average of 147 NFIP claims were paid out annually in Horry County. This represents a 342% increase from the average of the

previous five-year period of 2010–2015, and a 1,670% increase from the previous decade of 2000–2009. Only a small portion of this increase can be attributed to population, which grew by 184% from 2000 to 2020.

The value of payouts also increased. In the decade of 2000–2009, the median NFIP payout in Horry County was \$7,457 (average \$13,634). By the period of 2010–2015 that number had increased to \$11,731, and by 2016–2020 \$39,631 (average \$69,148).¹⁵ Over the entire time period, the median payout increased 531% in real terms. Between 2000 and 2020, the housing price index for Horry County increased by about 50% in real terms since 2000.¹⁶ While rising property values no doubt played some role in increasing claim size, they also cannot account for the full extent of the increase.

The dramatic increase in the number and size of claims filed in Horry County is therefore likely the result of mostly increasing development in the existing flood prone areas, and the increasing number of severe storms, heavy rainfall, and high tide events.

Table 1: Horry County NFIP claims, home values, and population growth, 2000–2020

NFIP claims in Horry County	2000–2009	2010–2015	2016–2020	2000–2020 Increase
Average annual number	9	43	147	1670%
Average payout (excluding zeros)	\$13,634	\$27,921	\$69,148	507%
Median payout (excluding zeros)	\$7,457	\$11,731	\$39,631	531%
Home price index increase 2000–2020				50%
Population increase 2000–2020				184%

¹⁵These figures exclude claims for which no money was disbursed. The data was obtained at the Federal Emergency Management Administration data set page. *Open FEMA Data Sets*. <https://www.fema.gov/data-sets>, updated as of March 2021.

¹⁶Trading Economics. All-transactions house price index for Horry County sc. <https://tradingeconomics.com/united-states/all-transactions-house-price-index-for-horry-county-sc-fed-data.html>

This pattern of more and higher FEMA claim payouts is nationwide.¹⁷ To deal with the insolvency of the NFIP program, Congress passed the Biggert-Waters Flood Insurance Reform Act in 2012. Biggert-Waters pulled back federal subsidies for flood insurance, and set in place a regular schedule of rate hikes for policy holders. The next NFIP insurance increase is set for April 1st of 2021. Policyholders for longstanding residents of pre-FIRM homes (houses that were constructed or had substantial improvements on or before December 31, 1974) will see an average rate increase of 7.3 percent.¹⁸ To date, however, rising rates have not yet fixed insolvency of the NFIP program, which as of January 2021, still owed \$20.5 billion to the US Treasury. Absent even more severe rate increases, both politically infeasible and arguably punitive, it is not clear that they can.¹⁹

The rising cost of NFIP premiums is a significant financial burden for households that have flooded. While these costs were omitted from the survey, many respondents, both in open-ended questions in the original survey, and in the follow-up telephone interviews, mentioned the burden of rising insurance costs as a source of pressure and stress on their finances, adding to the already heavy financial burden of living in a repeat flooded area.

While we cannot say that these increased flood insurance rates have had no impact on development or home purchases in high-risk areas, the Impact Census will be releasing results from a forthcoming GIS analysis showing substantial development in these areas over the last two decades.

Unfortunately, current flood zone designations, and the structure and timing of NFIP payouts of FEMA programs, are making it difficult for people to both identify and leave repeat flooded areas.



¹⁷ Brandt, J, Kousky, C. *Flood Insurance in the US: Lessons from FEMA's Recent Data Release (Part I): Risk Management and Design Process* Research Center, Wharton Business School, University of Pennsylvania, January 14th 2020.

¹⁸ Huang, P. U.S. Federal Emergency Management Administration. WYO Bulletin w-20020, the National Flood Insurance Program. October 1, 2020 Memorandum: April 1, 2021, and January 1, 2022, Program Changes. <https://nfipservices.floodsmart.gov/sites/default/files/w-20020.pdf>

¹⁹ U.S. Congressional Research Service, *Introduction to the National Flood Insurance Program (NFIP)*. Washington D.C., updated January 5, 2021. <https://fas.org/sgp/crs/homesec/R44593.pdf>

One of the National Flood Insurance Program's current primary mechanisms for dealing with repeat flooding is the Increased Cost of Compliance (ICC) program. People experiencing repeat flooding can apply for an extra \$30,000 dollars of funding for the demolition, relocation, flood proofing, or elevation of their home. ICC is an option for homes assessed to be damaged at 50 percent of pre-damaged market value, or homes for which two or more NFIP claims have been filed within the past ten years, with the average damage in each flood assessed at 25 percent of the pre-damaged market value of the house.²⁰ There are also several additional buyout programs through the U.S. Department of Housing and Urban Development (HUD) and FEMA's Hazard Mitigation Grant Program. However, these programs were of very limited value to our surveyed homeowners, for a number of reasons.

First, some homeowners did not even have NFIP insurance, because they were not in a designated high-risk area for flooding, and therefore insurance was not required. Nevertheless, they experienced two or more floods. Second, some respondents flooded more than once, but only filed one NFIP claim because they were outside of the designated 100-year flood zone and only obtained flood insurance after their first flood. Thus, though they had suffered two floods in a five-year period, they only had one NFIP claim and did not qualify as a repeat flooded property. Finally, the \$30,000 payout from the ICC program among our respondents would not have been sufficient to elevate or move their homes.

Some respondents who had NFIP insurance also did not file claims for one or more of the floods they experienced because they could not meet insurance deductibles and, in any case, would not have had enough funds to pay the cost share for the repetitive loss programs. Owners explicitly stated that they could not afford their cost share to rebuild to the standard FEMA required, even though doing so might keep them

These incidents prevented people from going to work, caused erosion time to the land (and, in some cases, to the property structure), instilled chronic fears of ending up trapped in emergency situations, and caused other significant mental stresses.

safer. Some owners chose to do the work themselves, or to accept the help of church missions that help rebuild their houses. While this was the only affordable option available to some, failing to rebuild their house to FEMA-specified standards puts them at risk of being denied FEMA help if they flood again.

In the end, repetitive flooding programs were unhelpful to people in mid and lower income groups. Homeowners without sufficient means are either forced to live in dilapidated homes or consider selling their homes, sometimes to predatory developers who can afford to upgrade the properties and flip them. The latter option further has a perverse effect of supporting continued development, in-migration, and sometimes even gentrification in high flood risk areas.

Unfortunately, current flood zone designations, and the structure and timing of NFIP payouts of FEMA programs, are making it difficult for people to both identify and leave repeat flooded areas. First, property buyers cannot always distinguish high risk areas when homes are not officially designated as being in a flood zone, or where the flood zone designation understates the real risk to the property. Second, NFIP and other FEMA program structures result in people rebuilding in flooded areas where they no longer wish to be.

²⁰Federal Emergency Management Administration, Federal Insurance Mitigation Administration, *Fact Sheet: Increased Cost of Compliance Coverage*. https://www.fema.gov/sites/default/files/2020-08/fema_increased-cost-of-compliance_fact-sheet.pdf



A Jan. 5th Petition to Regulate²¹ filed by the Natural Resources Defense Council and Association of Floodplain Managers points out that FEMA's flood maps do not currently account for heightened flood risks from increasing sea-level, heavy rainfall, and severe storms. The petition observes that, by 2050, the 100-year flood event would see a median increase of 25-fold in the International Panel on Climate Change's Representative Concentration Pathway (RCP) 4.5 scenario, and a 40-fold increase in the RCP 8.5 scenario.²² That is, the chance of a flood reaching a property in the high-risk flood zone will increase from 1 percent per year to 25 to 40 percent per year.

These outdated flood maps are already impacting people in Horry County, as evidenced by the fact that 81% of the people in our larger sample of 127 households have experienced a flood at or above the 100-year Base Flood Elevation more than once in the last 5 years.

Further, even when flood waters did not enter the house, many respondents experienced persistent flooding in the streets around their homes due to severe rainfall events, and some encroachment into

their yards that reached the foundations of their homes. These incidents prevented people from going to work, caused erosion to the land (and, in some cases, to the property structure), instilled chronic fears of ending up trapped in emergency situations, and caused other significant mental stresses.

At the same time that people in Horry County are suffering from the consequences of chronic flooding, the County is growing rapidly, creating constant demand for housing. Warm weather, comparatively affordable prices, and access to the coast, have made it a major retirement destination for people from the Northern states. The increased population over the past decade, and projected increases in the coming decades, have meant that many developers are looking to expand housing and retail in the County. Some of this demand is being met by buying up flooded houses cheaply from people with few options, and rebuilding in the same location. While the newer, more expensive houses are often elevated and flood hardened, they are still in areas where roads routinely flood, and where it is likely that flooding will continue to worsen.

²¹Natural Resources Defense Council and the National Association of State Floodplain Managers Inc., *Petition Requesting That The Federal Emergency Management Agency Amend Its Regulations Implementing the National Flood Insurance Program*. January 5, 2021. https://asfpm-library.s3-us-west-2.amazonaws.com/ASFPM_Pubs/petition_fema_rulemaking_nfip_20210105.pdf

²²RCP stands for representative concentration pathway. For a detailed explanation, see the National Climate Change Adaptation Research Facility, *What are the RCPs?*. 2016. <https://nccarf.edu.au/what-are-rcps/>

Conclusions and Recommendations

Flood Mapping

Updated flood mapping needs to reflect the real risk of flooding. At present, the highest risk FEMA-designated flood zones are the V and A designated Special Hazard Flood Areas. These zones are supposed to indicate a one percent chance per year of flooding, with additional hazards implied in the V designated zones due to their coastal locations and susceptibility to wave action.

Houses and infrastructure that were designed to withstand flooding once every 100 years are now flooding more frequently. Housing and infrastructure development was generally avoided in flood zones where the chance of flooding was significantly greater than one percent per year. But the reality has changed so that much existing infrastructure and housing, as well as planned new developments, are now in high-risk zones for repeat flooding, for which there is no designation in FEMA's Special Hazard Flood Maps.

The County's ability to update its maps is limited by the lack of the descriptive power in FEMA's current flood hazard rating system, which, with its implicit assumption of construction compliance for 100-year floods, does not capture real flood risk in extant and developing communities that are facing repeat flooding and climate change. This is a known problem with FEMA's flood maps.²³ Horry County is yet another example of a situation where the consequences of these problems are being felt in the deteriorating finances and security of its residents.

The County is aware that its flood maps need to be updated and is currently in the process of redesignating its floodplain, changing some special hazard risk areas, and changing some areas from lower risk Zone

X to higher risk A zones. However, as with the survey results reported here, forthcoming Impact Census mapping of flooded houses indicates that many houses experiencing repeat flooding will still be designated as being in a low-risk flood zone. New FEMA Special Flood Hazard Area mappings in Horry County must account for the present and future reality of flooding.

Buyouts and Relocation

Our study indicates that, at least in some repeat flooding communities, there is a high willingness to participate in buyouts, supporting the idea that lowering the barriers for buyouts would be a good investment for both the government and individuals. Federal funding for buyouts through FEMA's Hazard Mitigation Grant Program, Building Resilient Infrastructure and Communities (BRIC) and Pre-Disaster Mitigation Program, and the Department of Housing and Urban Development's Block Grant-Disaster Recovery Program, and local programs under the South Carolina Disaster Relief and Resilience Act, are likely to increase in coming years. However, a number of structural barriers exist to making people eligible for these programs.

Federal buyouts are currently only for individuals in the 100-year floodplain, but many houses outside this are already experiencing repeat flooding. The process of updating the maps is likely to take many years. FEMA's investment in failing properties through the NFIP program, however, can be updated more quickly. The federal buyout programs should be made more accessible to people who are willing to relocate by opening the program to people whose homes have been damaged by a flood, regardless of previous NFIP payouts.

²³Sisson, *How federal flood policy is, and isn't, addressing climate change today*, Curbed, Vox Media. Updated Sep 20, 2019. <https://archive.curbed.com/2019/7/29/8931718/storm-flood-climate-change-insurance>

The NRDC and the Sabin Center, in a recent buyout reform proposal, “Discounts for Buyouts,”²⁴ has supported lowering the damaged threshold for buyouts to 25%. The Climate Cost Project’s Horry County study preliminary research gives anecdotal support for this change. It is important to note that FEMA damage percentage estimates are often underestimate the final cost of repairing the house. The final combined payout from FEMA and homeowners’ out-of-pocket costs in our sample was 31% of the market value of the house, and this did not include unrepaired damages. This percentage included FEMA and individual expenses, placing most of the houses at below a 25% FEMA damage threshold. Despite this, the consequence of rebuilding in the same location was that homeowners were reinvesting dwindling resources into homes that were declining in value. While the study sample is limited, it supports the notion that properties with a damage threshold below 50% should qualify for buyouts. More investigation is needed, but we believe that a threshold even below 25% could be merited and cost-saving in the long run for FEMA.

Development

FEMA currently employs a CRS (Community Rating System) that allows for lower flood insurance rates for homeowners in communities fostering comprehensive floodplain management. Despite this system, rapid development has continued in many communities, both in the current floodplain and in repeat flooded

areas outside it. With Horry County’s rapidly growing population, the CRS’s lowered insurance rates are not a sufficient incentive to overcome the pressures and financial benefits to the County of development in repeat flood areas, such as a higher property tax base. Strategies that are easier to implement, such as avoiding construction of critical infrastructure in the floodplain, or hardening and floodproofing of houses, cannot substitute for a comprehensive flood plan and protection strategy for existing houses in a location where significant infrastructure already exists in repeat flooding areas.

Strategic planning is needed to address the transport network disruptions that are a routine part of life in repeat flooded areas, increase the number of buyouts available to homeowners, and discourage wealthy homeowners from gentrifying in high-risk areas through building, or rebuilding.

Hazard mitigation funding will dramatically increase in the coming years through BRIC and other programs. However, rather than funding individual projects and homes piecemeal in communities that are otherwise experiencing destructive development, these grants should stress comprehensive and equitable community flood planning that prevents lower to middle income communities from being stranded, both physically and financially, in homes with declining value. Strategic public investments tailored to local circumstances and infrastructure could also reduce damages for residents that are not relocated.

²⁴Adler, D., Burger, M., Moore, R, and Joel Scata, *Changing the National Flood Insurance Program for a Changing Climate*. Environmental Law Institute, 2019. Washington D.C. https://www.eli.org/sites/default/files/images/4910320_.pdf



VII. METHODOLOGY

The Impact Census carried out a survey of flood-related expenses in Horry County incurred from 2016 through the spring of 2020, recruiting respondents through two methods. First, the project deployed a random sample postcard mailing that invited homeowners of flooded households to complete the survey. Four hundred and fifty-eight households were randomly selected from a sampling frame of 1,374 homes that had flooded one or more times since 2016.

To obtain addresses for the mailing, the project submitted FOIA (Freedom of Information Act) requests to the City of Conway and unincorporated Horry County for data detailing flood-impacted homes. Due to funding limitations, the City of Conway was the only incorporated municipality included in the mailing, excluding 16.2 percent of the County population from this sampling frame. However, our second recruitment method, discussed further below, reached households in this area.

The mailing yielded a total of 58 completed surveys, twenty-six from postcards sent in late March of 2020, and an additional thirty-two after a follow-up mailing three weeks later to households that had not responded. Twenty-three postcards were returned as undeliverable.

The second recruitment invited respondents through a non-random convenience sample in October of 2019, carried out by a local flood survivors advocacy non-profit, Horry County Rising (HRC). HRC recruited participants through direct person-to-person community outreach, HRC's email list-serv, and Facebook posts. From this effort, the Impact Census received a total of 61 completed surveys. Due to heavy rainfall in 2021, HRC conducted additional outreach, and received eight additional completed surveys, and three updated surveys. Significantly more floods were reported among these respondents compared to earlier responses. The year 2021 has seen more flooding in the County as a whole, and we expect that if all of our respondents updated their surveys, more flooding would have been reported in our results. However, there are too few additional responses with which to make any meaningful comparisons.

Between the postcard mailing and HRC's outreach, the Impact Census received a total of 127 completed surveys. The demographics of the sample differ somewhat from the population as a whole, with 96% of respondents being white (vs. 78% for the County), and a median income \$37,500 (vs. approximately \$50,000 for county).²⁵

The end result is that homeowners are getting trapped in an area where they do not feel safe and are at risk of flooding again.



²⁵U.S. Census 2019. <https://www.census.gov/quickfacts/horrycountysouthcarolina>

VIII. LIMITATIONS

We should note that, as with any relatively small sample, our analysis has some limitations. The sample contained 127 households, 58 of whom were recruited through a random sampling procedure, and 69 from an internet convenience sample and direct personal outreach. The home equity analysis was for a small subsample of 15 households who indicated they would be available for follow up contact.

Statistics summarizing respondents' flooding experiences, such as financial burdens, demographics, and other measured variables, did not meaningfully differ between the randomized mailing and convenience samples. However, we cannot know

how representative the sample is of Horry County homeowner flooding experiences in general. We do not know if individuals who chose to complete the survey were systematically different from those who did not, nor if our sampling procedure excluded any particular type of flood survivor. A priori, we would conjecture that households with more traumatic experiences could have been disproportionately drawn to the survey, which could skew our results to higher cost estimates. However, FEMA NFIP and Individual Assistance repair payouts for our subsample were lower than amounts over the entire 2016–2020 period in FEMA's complete database.

The financial devastation of the households in our sample was real, and representative of some flood survivor experiences in Horry County, but we do not know the overall distribution of this burden. We do know, however, that both households and the government are bearing ever increasing costs as our climate changes, and that these must be addressed with better planning, more effective policies, and increased support.

