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NATURAL RESOURCES DEFENSE COUNCIL



COLUMBIA LAW SCHOOL

SABIN CENTER FOR CLIMATE CHANGE LAW

**BREAKING THE CYCLE OF
“FLOOD-REBUILD-REPEAT”:
Local and State Options to Improve
Substantial Damage and Improvement
Standards in the National Flood
Insurance Program**

By Dena Adler & Joel Scata

January 2019

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The Sabin Center for Climate Change Law develops legal techniques to fight climate change, trains law students and lawyers in their use, and provides the legal profession and the public with up-to-date resources on key topics in climate law and regulation. It works closely with the scientists at Columbia University's Earth Institute and with a wide range of governmental, non-governmental and academic organizations.

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EXECUTIVE SUMMARY

Congress established the National Flood Insurance Program (NFIP) in 1968 to reduce flood damages nationwide and ease the Federal government’s financial burden for providing disaster recovery. Today, approximately 22,000 communities in all 50 states and U.S. territories participate in the NFIP. The program has 5.1 million flood insurance policies providing \$1.3 trillion in coverage. Due largely to recent flood disasters, the NFIP is over \$20.5 billion in debt.

A proportionally small number of properties insured through the program are repeatedly flooded, repaired, and rebuilt. These properties, known as “severe repetitive loss” (SRL) properties, contribute disproportionately to the rising debts of the NFIP program. SRL properties represent just 0.6 percent of the roughly 5.1 million properties insured through the NFIP, but they account for 9.6 percent of all damages paid, as of 2015. Climate change impacts, including sea level rise, more intense and frequent precipitation events, and increased storm surge, put these already vulnerable properties at even greater risk and will greatly increase the number of properties caught in this cycle of “flood-rebuild-repeat.”

The NFIP contains an adaptive mechanism—the substantial improvement/damage (“SI/SD”) standard—which can break the cycle of “flood-rebuild-repeat.” To join the NFIP, communities must adopt and enforce a uniform set of floodplain regulations, which include the SI/SD standard. The SI/SD standard requires property owners making significant improvements or repairs to structures in areas most vulnerable to flooding to take certain measures to mitigate their risk. These measures include requirements to elevate, relocate, or demolish a residential structure. Non-residential structures may be floodproofed. However, two critical shortcomings of the current FEMA SI/SD definition undermine the effectiveness of program: 1) the SI/SD standard is only triggered when damages or repair work are equal to or exceed 50 percent of the fair market value of the structure, and 2) the regulatory definitions of “substantial improvement” and “substantial damage” do not consider repetitive cumulative repair work or cumulative damage over time.

A number of NFIP communities have undertaken more rigorous SI/SD standards as part of the Community Rating System (CRS) Program which rewards communities which mitigate their flood risk by reducing flood insurance premiums for their citizens. Our review of 2013 data from FEMA, the most current that the agency could provide, revealed that among the 1,444 communities participating in the CRS program, roughly 1/3 receive points for taking some action

toward instituting a more rigorous cumulative or lower threshold SI or SD standard. More specifically:

- At least 309 communities received CRS credit for a cumulative SI or SD standard with at least a 10-year tracking requirement.
- At least 90 communities received CRS credit for a cumulative SI or SD standard with at least a 5-year tracking requirement.
- Collectively, these communities represent roughly a quarter of CRS communities (399/1444 or 27.6 percent), illustrating an opportunity for many more communities to follow suit.
- Few communities utilize a threshold below 50 percent of market value for measuring substantial damage or improvements. FEMA data identifies 25 communities receiving credit for less than a 50 percent threshold and 32 communities receiving credit for a regulatory threshold that is no more than 25 percent of the square footage of a building’s lowest floor.

Reforming the SI/SD standard to calculate damages cumulatively over time and to be triggered for damages and repair work worth less than 50 percent of the fair market value of the structure can help the NFIP program better weather a changing climate, lessen the taxpayer burden, and increase the safety of millions of homeowners. Through model flood ordinances, building codes, other regulations, and guidance, states have several mechanisms to encourage or require municipalities and counties to adopt these more protective standards. We propose model ordinance language for state-level programs or direct adoption by communities that integrates both cumulative and lower threshold definitions of substantial damage and improvement. Communities will yield three primary benefits from adoption of such standards:

1. The proposed model ordinance should help communities better protect people and property by bringing older housing stock into current floodplain management requirements more expediently.
2. The proposed cumulative and lower threshold model ordinance is structured to satisfy Increased Cost of Compliance (ICC) coverage requirements to ensure that NFIP policyholders are eligible for financial assistance to bring their structure into compliance after a flood.

3. The proposed model ordinance is designed to maximize Community Rating System (CRS) credit, which will help communities attain a higher CRS ranking, and thus, reduced insurance costs for their residents.

Nevertheless, several challenges arise in effectively raising the SI/SD standard related to tracking, financing, and equity. These challenges can be at least partially mitigated through: 1) issuing disclosure laws that track expenditures for repairs and damages over time so that potential buyers and new owners are aware of their property's history, 2) pursuing novel financing and insurance strategies that could reduce the administrative and monetary burden of implementing the proposed SI/SD standard, and 3) integrating equity and underlying social vulnerability considerations into a reform package and providing adequate financing and other support.

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1. THE NATIONAL FLOOD INSURANCE PROGRAM AND CLIMATE CHANGE

Congress established the National Flood Insurance Program (NFIP) in 1968 to reduce flood damages nationwide and ease the Federal government’s financial burden for providing disaster recovery.¹ Prior to the creation of the NFIP, the absence of widely available private flood insurance had left the federal government, and consequently taxpayers, with escalating costs to provide disaster relief for the uninsured. At the time, the government’s primary strategy was to invest in flood control works like dams, levees, and seawalls, but these public works did not discourage unwise development in the floodplain—in fact, they may have encouraged it. The creation of the NFIP addressed these problems by providing federally backed flood insurance protection for property owners and for renters, but tying access to this insurance to the creation of community-enforced building and zoning ordinances that would reduce risky development and flood-related damage to homes.

The NFIP is structured as a partnership between the federal government, states, communities, and insurers. To join the NFIP, communities adopt and enforce policies for smarter floodplain development that meet minimum standards set by the Federal Emergency Management Agency (FEMA), the agency responsible for administering the program. These policies include building and zoning code requirements and adoption of Flood Insurance Rate Maps (FIRMs), maps created by FEMA to designate the level of flood hazard across an area. These maps include Special Flood Hazard Areas (SFHAs) which are areas in the 100-year flood plain—meaning they have a 1-percent chance of a flood occurring in a given year. NFIP’s minimum standards primarily regulate development in the SFHA and ensure properties in the SFHA obtain flood insurance if they have a federally backed mortgage or a mortgage from a federally regulated institution. Once a community enters the program, federally backed flood insurance becomes available for homes and small businesses in that area. While insurers write the policies and process claims on behalf of NFIP, they are only intermediaries; the federal government sets prices and bears the risk.

¹ National Flood Insurance Act of 1968, as amended, and the Flood Disaster Protection Act of 1973, 42 U.S.C.A. § 4001 *et. Seq.* It was further modified by the National Flood Insurance Reform Act (NFIRA) of 1994

1.1 Rising Costs of the NFIP Program

Today, the NFIP has 5.1 million flood insurance policies providing \$1.3 trillion of insurance coverage to policyholders in more than 22,000 communities spanning all 50 states and other U.S. territories.² Over its lifetime, the NFIP has provided more than \$68 billion to help policyholders rebuild their homes in the aftermath of inland floods and coastal storms.³ After the staggering losses from the 2017 hurricane season, Congress canceled \$16 billion of debt accrued by NFIP.⁴ Even so, as of July 2018, the NFIP remained \$20.5 billion in debt because it collects too little in insurance premiums from policyholders to cover the damages it must pay out.⁵ This debt continues to escalate, due at least in part to recent storms causing catastrophic flooding. Between 2005 and July 2018, nine storms caused losses in excess of \$500 million each.⁶

A proportionally small number of properties that are repeatedly repaired and rebuilt in areas vulnerable to flooding, called “severe repetitive loss” (SRL) properties, contribute to the rising debts of the program. The NFIP paid \$5.5 billion to repair and rebuild more than 30,000 SRL properties between 1978 and 2015.⁷ These SRL properties constitute only 0.6 percent of the 5.1 million properties insured through the NFIP, but have consumed a disproportionate 9.6 percent of all damages paid out of the NFIP as of 2015.⁸ As discussed below, climate change puts these already vulnerable properties at even greater risk and current NFIP policies do not adequately

² The Federal Emergency Management Agency (hereinafter FEMA), *Policy Statistics Country-Wide*, <https://perma.cc/3NR6-RSZF> (last updated September 2018). Roughly 20 percent of the nation-wide policy base is subsidized. Holders of these policies pay premiums that are 40 to 45 percent of their true risk rate. See Government Accountability Office (hereinafter GAO), *GAO-13-607, Flood Insurance: More Information Needed on Subsidized Properties* 6 (July 2013).

³ FEMA, *NFIP Loss Statistics*, <https://perma.cc/KV55-V7TW> (last updated Sept. 2018).

⁴ Cong. Research Service, *R45242, Private Flood Insurance and the National Flood Insurance Program* 1 (July 2018) (stating Congress canceled \$16 billion of NFIP debt to allow the program to pay claims).

⁵ Diane Horn, Cong. Research Service, *IN10784, CRS Insight: National Flood Insurance Program Borrowing Authority* 5 (April 2018) (showing the National Flood Insurance had accrued \$20.5 billion in debt). See also, GAO, *GAO-17-425, Flood Insurance: Comprehensive Reform Could Improve Solvency and Enhance Resilience* 1 (April 2017) (stating the debt level in March 2017, before Hurricanes Harvey, Maria, and Irma, stood at \$24.6 billion due and collection of premiums would likely be insufficient to repay the debt), available at <https://perma.cc/F6FL-3GXL>.

⁶ FEMA, *Significant Flood Events*, <https://perma.cc/7N99-FFX5> (last updated as of July 31, 2018).

⁷ Robert Moore, NRDC IB: 17-07-A, *Seeking Higher Ground: How to Break the Cycle of Repeated Flooding with Climate-Smart Flood Insurance Reforms*, NATURAL RESOURCES DEFENSE COUNCIL 2 (July 2017), <https://perma.cc/O66X-D4HE>.

⁸ *Id.*

ensure property owners rebuild in a manner to lessen their vulnerability to flooding or incentivize property owners to relocate to areas with a lower risk of flooding.

1.2 Climate Risks Will Further Burden the NFIP Program

Climate change is exacerbating flood risk through a combination of factors that combine synergistically, including heavier precipitation events, sea level rise, and greater storm surge. The U.S. Global Climate Change Research Program (USGCCR), the body designated by Congress to determine the state of climate science to inform federal policy, finds that heavy precipitation events have increased in both intensity and frequency in most parts of the United States.⁹ In their most recent assessment, the USGCCR concludes that global average sea levels will rise by 1-4 feet by 2100 and that a rise of as much as 8 feet by 2100 is possible.¹⁰ Further, sea level rise along the East and Gulf Coasts of the United States will exceed the global average. Rising sea-level has already increased the number of tidal floods each year that cause minor impacts (also called “nuisance floods”) by 5- to 10-fold since the 1960s in several U.S. coastal cities, and this trend is already accelerating in over 25 Atlantic and Gulf Coast cities.¹¹

Climate change is driving up the already escalating costs of maintaining the NFIP by expanding the floodplain—and thus the number of people within the SFHA needing coverage—and by driving up the average loss cost per policy. A FEMA sponsored study conducted by AECOM estimates the SFHA will grow by between 40-45 percent by 2100 depending on whether coastal recession is assumed or not.¹² Under the assumption of a fixed shoreline, AECOM projects that the total number of NFIP policies may increase by approximately 100 percent by 2100 due to the combination of population growth and a larger SFHA due to climate change.¹³ Under this scenario, the average loss cost per policy may increase approximately 90 percent by the year 2100

⁹ Wuebbles, D.J., et al., 2017: *Executive Summary*, in CLIMATE SCIENCE SPECIAL REPORT: FOURTH NATIONAL CLIMATE ASSESSMENT, VOLUME I 20 (Wuebbles, D.J., D.W. Fahey, K.A. Hibbard, D.J. Dokken, B.C. Stewart, and T.K. Maycock eds., U.S. Global Change Research Program), <https://perma.cc/9GYV-ZKDV>.

¹⁰ *Id.* at 25-26.

¹¹ *Id.* at 27.

¹² AECOM, *The Impact of Climate Change and Population Growth on the National Flood Insurance Program through 2100* ES-7 (2013), <https://perma.cc/5RVD-A4VQ>. Coastal recession assumes the shoreline retreats inland, which could serve to reduce the size of the floodplain.

¹³*Id.*

and the average premium per policy would need to increase as much as 70 percent in today’s U.S. dollars by the year 2100 in order to offset the projected increase in loss cost.¹⁴

Sea level rise will further exacerbate the cycle of “flood-rebuild-repeat” plaguing the NFIP. NRDC estimates that 3 feet of sea level rise by 2100 could result in an additional 820,000 severe repetitive loss (SRL) properties and 6 feet of SLR would result in 2.57 million more SRL properties.¹⁵ This study estimates that 650,000-2.03 million of these SRL properties would sustain damage crossing the “substantial damage” fifty-percent threshold.¹⁶ This means hundreds of thousands of properties could be repeatedly rebuilt through the NFIP without needing to enhance their resilience, driving the program further into debt and endangering residents. However, NFIP can improve its tools to incentivize claimholders to rebuild resiliently rather than setting them up for future losses.

2. SUBSTANTIAL IMPROVEMENT/DAMAGE STANDARD: A TOOL FOR REDUCING FLOOD RISK?

When buildings in the SFHA undergo repair or improvement, it creates an opportunity to increase resilience and reduce the vulnerability of individual structures, their inhabitants, and entire communities to future flooding events. The NFIP includes a substantial improvement/damage (“SI/SD”) standard which requires property owners making significant repairs or rebuilding structures in the SFHA to take certain measures to bring their structure into compliance with the community’s current floodplain management requirements, such as elevating the home above the base flood elevation level, to reduce their exposure to future flood damages.¹⁷

“Substantial damage” is defined by FEMA as damage of any origin sustained by a structure for which the cost of repairing the structure would equal or exceed 50 percent of the market value

¹⁴ *Id.* at ES-8.

¹⁵ Moore, *supra* note 7, at 12.

¹⁶ *Id.*; *infra* Part 2.

¹⁷ 44 C.F.R. § 60.3(a-c)(providing regulatory requirements for to new construction and substantial improvement under the NFIP program); *see also* FEMA, *FEMA P-578, Substantial Improvement/Substantial Desk Reference* (2010), <https://perma.cc/UHK8-GXBZ>; FEMA, *R4 DR-4338-GA FS 008 9, Fact Sheet: NFIP “Substantial Damage” – What Does It Mean?* (Oct. 6, 2017), <https://perma.cc/2B69-F4DU> (offering alternative options to elevating a structure, including demolishing or relocation of a residential structure or floodproofing a non-residential structure).

of the structure before the damage occurred.¹⁸ The “substantial improvement” standard similarly applies for renovation or improvement work to a structure.¹⁹ When the costs of an improvement or repair of damage to a structure surpass this threshold, the structure must be brought into compliance with current community floodplain management requirements. For example, if a home, located in the SFHA (1 percent annual chance floodplain), was built before the community joined the NFIP and it was damaged by 50 percent of its pre-damage market value, the home would most likely have to be elevated to, at a minimum, the base flood elevation. The SI/SD standard requirement ensures older structures are brought into compliance with modern building requirements for flood risk, thereby, reducing the vulnerability of those structures to future flood events.

The SI/SD requirement provides a critical lever to enhance resilience to climate change and break the cycle of sinking taxpayer dollars into repeatedly rebuilding and repairing the same vulnerable structures. It creates an opportunity to make communities stronger, safer, and smarter while reducing future damage costs. However, in practice it has several limitations. First, the prevalence of SRL properties demonstrates buildings are repeatedly damaged by flooding events below the 50 percent threshold and rebuilt. Since the standard is not cumulative, meaning it requires a one-time event that surpasses the 50 percent to trigger compliance, it does not sum up these repeated repairs and potentially creates a perverse incentive to do multiple repairs over time to avoid exceeding the threshold with any single repair. Second, it fails to incentivize increasing resilience to flooding of buildings that are heavily damaged, but below the 50 percent damage threshold. For example, a lower threshold of 25 percent damage would more rapidly bring the existing housing stock up to code, decreasing vulnerability for future floods. Third, it creates an incentive to lowball damage estimates to help residents avoid the high costs of bringing structures into compliance with flood ordinances. An investigation by the Houston Chronicle indicates the

¹⁸ See 44 C.F.R. 59.1 (defining substantial damage as “damage of any origin sustained by a structure whereby the cost of restoring the structure to its before damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred”).

¹⁹ *Id.* (defining “substantial improvement” to apply for “any reconstruction, rehabilitation, addition, or other improvement of a structure” for which the estimated cost equals or exceeds 50 percent of the market value of the structure would equal prior to “start of construction” of the improvement).

intentional lowballing of damage estimates is pervasive nationwide.²⁰ The Chronicle examined claims records for more than 36,000 SRL properties, and found about 16 percent had “evidence of being substantially damaged—beyond the 50 percent threshold—at least once before flooding again.”²¹ Lax enforcement of the substantial damage standard and its correlation to repeated flooding has been recognized for more than twenty years as a major shortcoming of the NFIP.²²

2.1 Options for Communities to Increase Climate Resilience: Cumulative Standards and Lower Thresholds for Defining Substantial Damage

The NFIP provides a mechanism to incentivize communities to take on more rigorous SI/SD standards to ensure better flood protection. Communities with stronger flood protection regulations than those mandated by the NFIP can join the NFIP’s Community Rating System (CRS) and receive a discount on flood insurance premiums for their residents. Communities receive credit points for the different activities they take to reduce flood losses. Based on their score classification, communities can receive up to 45 percent off flood insurance premiums for residents in their communities.²³ As of 2017, nearly 3.6 million policyholders in 1,444 communities participated in the CRS.²⁴ Of the over 22,000 communities participating in the NFIP, only 5 percent participate in the CRS program, but more than 69 percent of all flood insurance policies are written in CRS communities.²⁵

The CRS program principally rewards higher regulatory standards for floodplain development, including two reforms for stronger SI/SD standards:

²⁰ Mark Collette, *Flood Games: Manipulation of Flood Insurance Leads to Repeat Disasters*, HOUSTON CHRONICLE (JULY 5, 2018), available at <https://perma.cc/84YV-CETU>.

²¹ *Id.*

²² David Conrad, Ben McNitt, and Martha Stout, *Higher Ground: A Report on Voluntary Property Buyouts in the Nation’s Floodplains, A Common Ground Solution Serving People at Risk, Taxpayers, and the Environment*, NATIONAL WILDLIFE FEDERATION (July 1998) available at <https://perma.cc/3AMV-EQ35> (stating “that large numbers of substantially damaged properties have apparently not been elevated or removed as required, and substantial damage requirements have often not been enforced in many communities.”)

²³ FEMA, *CRS Credit for Higher Regulatory Standards 1* (2006), <https://perma.cc/EM77-YAHT>.

²⁴ FEMA, *Community Rating System Fact Sheet* (June 2017), <https://perma.cc/DW5Q-VNMH>.

²⁵ *Id.*

Cumulative Substantial Improvement/Damage Standard

- The first option is a “cumulative substantial improvement” (CSI) standard under which all improvements or repairs during a certain period of time are counted cumulatively toward the substantial improvement requirement. This prevents owners from undertaking many small repairs over time that eventually would add up to a larger repair. For example, this standard may count all repairs from major flood events over a ten-year period cumulatively toward a fifty-percent threshold of substantial damage. The CRS program allocates points according to the type of cumulative standard. See the Annex for a breakdown of how CRS points are awarded for this standard and suggested FEMA draft text for a point-earning CSI standard.

Lower Substantial Improvement/Damage Threshold

- The second option is a “lower substantial improvement” (LSI) standard which uses a threshold lower than 50 percent of the building’s value to determine when the substantial improvement requirement takes effect. For example, it might trigger requirements to elevate or make buildings more flood resilient if a flood causes damages that equal or are greater than 25 percent of the pre-damage market value. The CRS program allocates points according to the damage threshold established. See the Annex for a breakdown of how CRS points are awarded for this standard and suggested FEMA draft text for a point-earning LSI standard.

2.2 Are States and Municipalities Integrating Stronger Substantial Improvement/Damage Standards?

Among the 1,444 communities participating in the CRS program, roughly 1/3 receive points for taking some action toward instituting a more rigorous cumulative or lower threshold SI or SD standard.²⁶ Among these communities, ISO Community Hazard Mitigation, the consulting

²⁶ FEMA, 2007 & 2013 CSI and LSI Communities Data, Emails received from David Arkens, ISO/CRS Technical Coordinator at ISO Community Hazard Mitigation, to Joel Scata, Attorney, Natural Res. Def. Council (between June 2018-October 2018)(on file with authors)(hereafter referred to as “FEMA CSI and LSI Data”). These datasheets were obtained via email from David Arkens, ISO/CRS Technical Coordinator at ISO

company employed to manage the NFIP dataset, identifies at least 309 communities receiving CSI credit for a cumulative SI or SD standard with at least a 10-year tracking requirement and at least 90 communities receiving credit for at least a 5-year tracking requirement.²⁷ Collectively, these communities represent more than a quarter of CRS communities (399/1444 or 27.6 percent), but would only represent less than 2 percent of communities participating in the NFIP program.²⁸ Even fewer communities utilize a threshold below 50 percent of market value for measuring substantial damage or improvements. FEMA data identifies 25 communities receiving credit for LSI1, which requires a less than a 50 percent threshold, and 32 communities receiving credit for LSI2, with a regulatory threshold that is no more than 25 percent of the square footage of the building's lowest floor.²⁹

Community Hazard Mitigation, on Aug. 20, 2018. This data is the most recent from FEMA based on their 2007 and 2013 manuals listing all CRS communities that received points toward CSI or LSI standards for those years. The datasheets showed 522/1433 communities received points.

²⁷ ISO CRS SI/SD Standards Data, Emails received from David Arkens, ISO/CRS Technical Coordinator at ISO Community Hazard Mitigation, to Joel Scata, Attorney, Natural Res. Def. Council (between June 2018-October 2018)(on file with authors) (hereafter "ISO CRS SI/SD Standards Data"). ISO Community Hazard Mitigation maintains CRS data for FEMA and these estimates are based on their most current spreadsheets which are based on data from the 2007 and 2013 FEMA manuals, but with a further level of detail than the "FEMA CSI and LSI Data" sheets that he was able to provide to us. David Arkens reported 134 communities with a 10-year Cumulative Substantial Improvement requirement, 121 communities with a 10-year Cumulative Substantial Damage requirement from their 2013 data, and an additional 175 communities with a 10-year Cumulative Substantial Improvement or Damage requirement from the 2007 data. David confirmed the 2007 communities did not overlap with the 2013 communities. To estimate communities with a 10-year cumulative tracking requirement, we combined the 134 "2013 communities" with an SI standard with the 175 "2007 communities." This may result in a lower estimate of communities because some additional 2013 communities may have an SD standard without an SI standard, but as SI is frequently defined to include SD, this approach avoids a high-level of potential overlap between the 2013 SI and SD communities. The same approach was used for calculating communities with a 5-year cumulative standard. The data received on communities with a 5-year standard was 80 communities with a 5-year CSI Improvement requirement in the 2013 manual, 66 communities with a 5-year CSI Damage requirement in the 2013 manual, and 10 communities with a 5-year CSI Improvement or Damage requirement in the 2007 manual.

²⁸ While additional non-CRS communities have adopted cumulative standards, there is no record-keeping to track what percentage of these communities have adopted higher standards. We assume that adoption of cumulative standards would be much less frequent in non-CRS communities than CRS communities. However, a floodplain manager from Illinois reports that there are many non-CRS communities in Illinois who have adopted the cumulative standard. See, E-mail from Paul Osman, Chief, Statewide Floodplain Programs, Illinois Office of Water Res., to Joel Scata, Attorney, Natural Res. Def. Council (Dec. 10, 2018, 1:39 CST)(on file with the authors).

²⁹ *Id.*

CRS Communities with a Cumulative SD and/or SI Standard (2007 and 2013 Data) ³⁰		
Standard	Number of Communities Receiving CRS Credit for Standard	Percent of CRS Communities Receiving CRS Credit for Standard
10-Year Tracking Requirement	309	21.4%
5-Year Tracking Requirement	90	6.2%
Total	399	27.6%

2.2.1 Survey of State Model Flood Ordinances

The low penetration of communities with higher SI/SD standards in the NFIP program indicates an opportunity to increase the resilience of communities to flooding and the adaptability of the NFIP program through wider adoption. While communities must individually choose to adopt higher standards, states can help promote greater adoption of more stringent standards through a variety of mechanisms. Many states have model flood ordinances which communities can adopt.³¹ Several states have multiple ordinances which are tailored to meet the respective needs of communities with different zones from the flood maps.³² Others distinguish between riverine or coastal communities.³³ Some states have separate ordinances with higher standards for CRS communities.³⁴ In addition to model ordinances, states may also provide regulatory language for substantial improvement and damage standards through building codes, other flood regulations, quick guides, desk references, or strategic plans.

We surveyed state model flood ordinances and related documents to assess how frequently these documents endorse standard NFIP requirements for substantial damage and improvement

³⁰ ISO CRS SI/SD Standards Data, *supra* note 27.

³¹ State-level model ordinances are dependent on municipal level authorities to adopt the relevant standards. In certain states, legal authority to adopt these standards must be delegated to municipalities. Municipalities and counties should carefully review their local authorities before adopting any standards.

³² See e.g., Delaware Flood Ordinance Revision Resources, <https://perma.cc/9R6N-KBNN>, (last accessed Oct. 16, 2018).

³³ See e.g., Alabama Department of Economic and Community Affairs, Office of Water Resources, Floodplain Management, “NFIP Community Participation Resources,” available at <https://perma.cc/MS9R-FFC4> (last accessed Oct. 16, 2018)(linking to respective model flood ordinances for coastal and riverine communities).

³⁴ See e.g., Idaho’s Flood Damage Prevention Ordinance – Idaho Model Ordinance for CRS communities. Information obtained via email from Maureen O’Shea, State NFIP Coordinator, Idaho Dept. of Water Resources on Sept. 19, 2018 (on file with authors).

versus how frequently they provide models for a higher standard. Of fifty states surveyed, we were able to obtain and review ordinances or other regulations containing SI/SD standards for thirty-nine states.³⁵ Roughly half of these ordinances provided only the standard FEMA definition for substantial damage. Another twelve provided the standard FEMA definition, but also suggested optional text for more stringent requirements in at least one of their ordinances. It is worth noting that additional states outline options for more protective requirements in instruction documents or guidance associated with their ordinances. Only eight states utilize a more stringent definition of substantial damage or improvement as the default text of their ordinances, rather than optional, additional text. This section provides further detail on these trends.

SI/SD Standards in State Model Flood Ordinances	
Total States for Which Model Flood Ordinance or Similar Document Reviewed*	39
Ordinances Using Standard FEMA Definition of Substantial Damage/Substantial Improvement	19
Ordinances with Optional Language for a Cumulative Damage Standard	12
Ordinances with Optional Language for a Lower Threshold Damage Standard	4
Ordinances with Primary Definition of SI or SD as a Cumulative Standard	8
Ordinances with Primary Definition of SI or SD as a Lower Threshold Standard	0
*The remaining eleven states either A) did not have a model flood ordinance or B) did not have an ordinance publicly available online and officials did not respond to requests to provide a copy of the ordinances.	

³⁵ For states without ordinances available online, we contacted state agencies responsible for flood plain management to obtain copies of any existing ordinances. In cases, where an ordinance was subsequently provided, we included those in our dataset. Twelve states either did not have an ordinance or did not have an ordinance available online and did not respond to our queries to provide a copy. Of the remaining thirty-eight states, we included a building code for Michigan and the Hawaii county ordinances which are places those states use the FEMA definitions of substantial damage and improvement.

2.2.2 Nineteen States Use the Standard FEMA Definition for Substantial Damage or Improvement

Nineteen states use the standard FEMA definition for substantial damage, with no additional optional language. Several of these states use the standard FEMA definition, but encourage communities to adopt more stringent standards through other resources. For example, Delaware provides an accompanying technical support document that encourages communities to enhance the substantial damage definition.³⁶

2.2.3 Twelve States Include Higher Standard for Substantial Damage or Improvement as Optional, Alternative Definition

Twelve states include optional, alternative definitions for substantial damage or improvement that are either cumulative or have a lower market value threshold for damages. Some states only have optional text for certain flood zones. For example, of California’s three model ordinances, two of them (coastal and non-coastal zones) include cumulative and lower-threshold optional text in the definition, while the third ordinance (which covers areas without FEMA-identified special flood hazard zones) uses the standard FEMA definition alone.³⁷ Of these twelve states, all included cumulative standards as an option in at least one ordinance, and four additionally noted the option of lowering the damage threshold below 50 percent of market value.³⁸

2.2.4 Eight States include Higher Substantial Standard for Substantial Damage or Improvement as Primary Definition

Only a handful of states—Alabama, Mississippi, West Virginia, Hawaii, Illinois, and Vermont—were found to directly include stronger standards as part of their primary definitions of substantial damage in a flood ordinance. Illinois, Georgia, and Kentucky have cumulative language in their primary definitions of substantial improvement. Illinois and Kentucky further include “repetitive loss” structures in their definitions of “substantial damage” to create a

³⁶ Delaware Flood Ordinance Revision Resources, <https://perma.cc/L58V-SYTE>, (last accessed Oct. 16, 2018).

³⁷ California NFIP Community Resources, <https://perma.cc/J2CT-QADV>, (last accessed Oct. 16, 2018).

³⁸ The four states which included optional language for a lower damage threshold were NE, NC, NJ, and ID.

cumulative SD standard. These primary definitions all concern cumulative standards rather than lowered thresholds which may be best explained by the fact that a cumulative standard often counts “repetitive loss” properties which is a requirement for communities seeking FEMA funding to bring their structures up to code.³⁹ However, these states can also add lower threshold in additional, optional text. For example, Alabama’s model ordinance for riverine communities has a note that a lower threshold could be adopted.⁴⁰

States with a model flood ordinance that includes a cumulative standard as the primary definition of substantial damage show a high percentage of CRS communities adopting that higher standard. This suggests that among communities seeking to undertake more robust flood management, the presence of ordinance language can encourage communities to shift their requirements for substantial damage. For example, among states with cumulative definitions, over 90 percent (15/16) of CRS communities in Alabama, 100 percent (32/32) of CRS communities in Mississippi, 100 percent (62/62) of CRS communities in Illinois, 60 percent (6/10) of CRS communities in West Virginia, and 83 percent (44/53) of CRS communities in Georgia have included cumulative substantial damage language in their floodplain ordinances.⁴¹ These rates are all significantly higher than the national average of 1/3 of CRS communities receiving some level of credit for cumulative standards.⁴² However, it is certainly not a guarantee, as there is low adoption of cumulative language among CRS communities in Hawaii, Vermont, and Kentucky.⁴³ Additionally, the work of state agencies through model ordinances, guidance documents, or informal conversation to increase community awareness of these standards can play an important role in community adoption.

³⁹ See *infra* Part 3.2.2 “ICC Coverage” for more information.

⁴⁰ Alabama Flood Damage Prevention Ordinance (Riverine), 2018, <https://perma.cc/ZMK9-U9QT> (last accessed Oct. 16, 2018).

⁴¹ FEMA CSI and LSI Data, *see supra* note 26.

⁴² *Id.*

⁴³ *Id.*

3. POLICY RECOMMENDATIONS

Floodplain management standards that exceed the NFIP minimum requirements better protect a community’s citizens and property. As noted above, some states recommend and some communities have adopted such higher requirements for Substantial Improvement/Substantial Damage (SI/SD).⁴⁴ Given “the vast majority of flood damages to structures amount to less than 50 percent of the value of the structure,”⁴⁵ imposing a more stringent SI/SD standard can help communities break the cycle of flood-rebuild-repeat.⁴⁶ The following definitions for substantial damage and substantial improvement can be adopted directly by communities or be assimilated by states as part of a model ordinance, building code, or other regulation. By adopting these higher standards, communities can reduce their residents’ flood risk, lower residents’ flood insurance premiums, and enable residents to secure federal funds for rebuilding more resiliently after flood damage. The 40 percent threshold is meant as an example and could be adjusted based on the needs of the community. The recommended cumulative definition for substantial damage is based on the definition of an NFIP repetitive loss structure and ensuring access funding from FEMA to offset costs of compliance as further discussed in Part 3.2.2.

3.1 Cumulative and Lower Threshold Substantial Damage/Improvement Standard Model Ordinance

Substantial Damage

*Substantial damage means damage of any origin sustained by a structure whereby the cost of restoring the structure to its before damaged condition would equal or exceed **40 percent** market value of the structure before damage occurred.⁴⁷ Substantial damage also means flood related damage sustained by a structure on two (2) separate occasions during a 10-year period for which the costs of repairs at the time of each such flood*

⁴⁴ The two approaches that exceed the NFIP minimum requirements for Substantial Improvement/Substantial Damage are either a cumulative approach or a lower threshold approach.

⁴⁵ ASFPM Floodplain Regulations Committee, *A Guide for Higher Standards in Floodplain Management* 8-9 (March 2013), <https://perma.cc/565M-WPDE>.

⁴⁶ See Moore, *supra* note 7 (Analyzing how 30,000 properties, built before the requirements of higher flood protection standards, repeatedly flood).

⁴⁷ 44 C.F.R 59.1.

event, on average, equals or exceeds 25 percent of the market value of the structure before the damage occurred.

Substantial Improvement

Substantial improvement means any combination of repairs, reconstruction, rehabilitation, addition, or other improvement, the cost of which equals or exceeds 40 percent of the market value of the structure before the ‘start of construction,’ taking place during a [10+ year time period]. This term includes structures that have incurred ‘substantial damage,’ regardless of the actual repair work performed.

3.2 Potential Benefits of Adopting Such a Model Ordinance

The above SI/SD model ordinance language addresses the shortcomings of the traditional approach by 1) cumulatively assessing damage to a structure over time, and 2) lowering the threshold for damage triggering the requirement. This approach has three major benefits. First, the proposed model ordinance should help communities better protect people and property by bringing older housing stock into current floodplain management requirements more expediently. Second, the proposed cumulative and lower threshold model ordinance is structured to satisfy Increased Cost of Compliance (ICC) coverage requirements to ensure that NFIP policyholders are eligible for assistance to bring their structure into compliance after a flood. Third, the proposed model ordinance is designed to maximize Community Rating System (CRS) credit, which will help communities attain a higher CRS ranking, and thus, reduced insurance costs for their residents.

3.2.1 Reduced Flood Risk

As discussed earlier in this paper, the minimum NFIP requirement for the SI/SD standard is dependent on a one-time event (damage or improvement) that equals or exceeds 50 percent of the structure’s value in cost. Such a one-time event threshold can provide a perverse incentive to either limit improvements or under-appraise damage to a structure so as not to reach the 50 percent compliance trigger. Additionally, as noted by the Association of State Floodplain Managers, the majority of flood events do not reach the SI/SD standard threshold, which means a flooded home

will likely only be rebuilt to its pre-flood condition, which perpetuates a cycle of flooding and rebuilding.⁴⁸

Combining a cumulative approach and a lower threshold approach ensures that the trigger for bringing a structure into compliance with a community’s floodplain management standards is tripped more quickly, which will become increasingly imperative as climate change exacerbates the risk of flooding. As noted above, an AECOM report prepared for FEMA projects the nation’s 1 percent annual chance floodplains will expand, on average, by 45 percent to 55 percent by 2100.⁴⁹ As the floodplains expand, housing stock not previously subjected to a community’s floodplain management criteria will become increasingly vulnerable.

Further, a cumulative approach deters intentional lowballing damage estimates to avoid triggering the requirement that structures be brought into compliance with flood ordinances. Counting improvements and damages over a period of 10 years greatly diminishes the potential to avoid compliance by underestimating damage from a single event.

3.2.2 ICC Coverage

ICC coverage can provide NFIP policyholders additional monetary assistance to rebuild after a flood. If an NFIP policyholder experiences a qualifying flood event, ICC coverage may provide up to \$30,000 to help cover the cost of flood mitigation measures, like elevation of the home.⁵⁰

To be eligible for ICC coverage, a NFIP policyholder must suffer a flood loss, located in the SFHA, and be declared “substantially damaged” or “repetitively damaged.”⁵¹ To receive ICC coverage for the latter, the community must adopt and uniformly enforce a repetitive loss provision or a cumulative substantial damage provision in its floodplain management laws or regulations.⁵² In the context of ICC eligibility, FEMA defines repetitive damage to a structure as “a building covered by a contract for flood insurance that has incurred flood-related damages on two

⁴⁸ ASFPM, *supra* note 45 at 8-9.

⁴⁹ AECOM, *supra* note 12 at ES-7.

⁵⁰ See FEMA, *FEMA p-1080, Fed. Emergency Mgmt. Agency, Answers to Frequently Asked Questions about Increased Cost of Compliance Coverage 1* (Feb. 2017), <https://perma.cc/6CKC-Y8W6>.

⁵¹ *Id.* at 3.

⁵² *Id.*

occasions during a 10- year period ending on the date of the event for which a second claim is made, in which the cost of repairing the flood damage, on the average, equaled or exceeded 25 percent of the market value of the building at the time of each such flood event.”⁵³ This has encouraged communities to adopt a cumulative standard.

While ICC coverage previously required flood-related damage to equal or exceed 50 percent of the market value for the structure, FEMA has authorized ICC coverage if a community has adopted a lower threshold.⁵⁴ FEMA made this authorization to comply with directions from Congress under the National Flood Insurance Act of 2004 that FEMA broaden the definition of substantial damage, in the context of ICC compliance, in order to uphold claims under more stringent local requirements.⁵⁵ It would be consistent with this objective for FEMA to also honor ICC coverage claims for multiple flood damages that equal or exceed a community’s repetitive flood damage ordinance. We recommend that FEMA’s guidance should be interpreted to encompass a combined lower threshold and cumulative standard, (e.g. 2 events over 10 years causing damage past a 20% threshold), but localities should consult with their state floodplain managers and FEMA officials to determine if ICC coverage would be awarded in that scenario.

The above model ordinance is designed to satisfy ICC coverage criteria for both substantial and repetitive flood damage, while simultaneously providing a lower threshold to expedite the transition of the older, more-flood prone housing stock. However, communities should be clear ICC coverage is only provided if a homeowner has NFIP flood insurance and the damage to the home is caused by flooding. All other damage and improvements to the structure that trigger the SI/SD standard threshold will not be eligible for ICC coverage, and thus, the cost of compliance will be borne by the homeowner.

⁵³ *Id.*

⁵⁴ FEMA, No. 01-2011, *National Flood Insurance Program Policy Issuance 2* (2011), <https://perma.cc/UP4U-MHG2> (stating that ICC claims are authorized for a substantial damage threshold that has been adopted and uniformly enforced by the community that may be lower than 50 percent).

⁵⁵ S2238, the Bunning-Bereuter-Blumenauer Flood Insurance Reform Act of 2004, Title I, Sec. 105(b)(4) National Flood Insurance Act of 1968 (42 U.S.C. §4011(b)) as amended.

3.2.3 CRS Credit

The proposed model ordinance is designed to maximize Community Rating System (CRS) credit. The NFIP established the Community Rating System to encourage communities to adopt floodplain management ordinances that exceed the NFIP minimum requirements and are effective at reducing flood damages and claims under the NFIP.⁵⁶ In CRS participating communities, NFIP policyholders may benefit from premium discounts ranging from 5 to 45 percent depending on the community’s CRS classification.⁵⁷ A community’s CRS classification is a ranking based on the credit points for specific floodplain management activities, including higher regulatory standards. The higher the accumulated credit points a community attains, the better CRS ranking they will receive. For example, a community with 1,000 points will be ranked as a CRS Class 8, which will provide its citizens with NFIP policies located within the SFHA at a 10 percent premium discount.⁵⁸ As the average NFIP policy premium costs roughly \$1,000, policyholders in a CRS Class 8 community would save \$100 per year.⁵⁹ The above model ordinance, if adopted, could provide a community up to 110 CRS credits, 90 points for counting substantial damage and improvement cumulatively and 20 points for a SI/SD threshold below 50 percent.⁶⁰

⁵⁶ FEMA, *Substantial Improvement/Substantial Desk Reference*, *supra* note 17 at 5-17.

⁵⁷ *Id.*

⁵⁸ FEMA, *FIA-15/2017, National Flood Insurance Program Community Rating System Coordinator’s Manual*, 110-3 (2017), <https://perma.cc/5FJH-VTAU>.

⁵⁹ Insurance Journal, *Federal Flood Insurance Average Premium to Rise 8%* (April 2, 2018), <https://perma.cc/5HJ8-AGR2>.

⁶⁰ FEMA, *National Flood Insurance Program Community Rating System Coordinator’s Manual*, *supra* note 58 at 110-7 (2017) (A community may not receive a total of 110 points due to FEMA’s “impact adjustment” formula, which adjusts CRS credit for the portion of the regulatory floodplain to which the “creditable element is applied”).

3.3 Challenges of Adopting Such a Model Ordinance and Opportunities to Overcome Them: Mechanisms to Assist Communities Faced with Financial and Social Costs of Rebuilding

3.3.1 Disclosure Laws to Track Cumulative Improvements & Damages Running with the Property

While the proposed model ordinance will help communities better protect their citizens and property, each community should consider all the implications of imposing a higher regulatory standard than that of the NFIP minimum SI/SD standard. For instance, a cumulative tracking of SI/SD carries with the property. Therefore, an unsuspecting home buyer may purchase a property that is close to the threshold, and then due to a small improvement or repair may cross that threshold and be obligated to bring the entire structure into compliance with the community’s floodplain management requirements.⁶¹ As ICC coverage is only available for flood-related damage that satisfies FEMA’s repeatedly flooded damage requirements, the new home owner could be burdened by a substantial expense.

States and communities could mitigate this situation by adopting a local real estate disclosure law that pertains specifically to cumulative improvement/tracking. Such a disclosure law would provide home buyers the necessary information to make a more informed decision about purchasing in the 100-year floodplain, and better understand the risks and costs associated with such a purchase.

3.3.2 Financing Challenges & Solutions

As the frequency and severity of climate impacts, like extreme precipitation events, continue to rise, communities will increasingly face post-disaster situations in which numerous properties have suffered damage sufficient to trigger the SI/SD standard threshold. Such situations could encourage underestimating total damage to a property as ICC coverage is not always

⁶¹ Telephone Interview with Paul Osman, Chief, Statewide Floodplain Programs, Illinois Office of Water Res. (Sept. 10, 2018) (Mr. Osman has experienced 3-4 cases where a home was sold with an accumulated 40 to 49 percent improvement and damage costs, and the buyer was unaware until they triggered the provision due to a small scale project).

sufficient to cover the cost of all required mitigation measures due to triggering of the SI/SD standard.⁶² Innovative financing mechanisms, such as parametric insurance or resilience bonds, may help cover the costs of bringing older structures into compliance.

Parametric insurance is a risk transfer arrangement that, unlike indemnity insurance, does not indemnify one for the full loss caused by a disaster event.⁶³ Instead, a purchaser of parametric insurance buys a pre-defined amount of protection which pays out according to an agreed upon triggering event.⁶⁴ An example would be a parametric insurance policy that pays out \$10 million if a 0.2 percent annual chance flood occurs.

Parametric insurance can greatly increase the speed of payout and eliminate disputes over the amount of the payout, a key benefit. Unlike indemnity insurance, parametric insurance policies do not require a claims adjustment process.⁶⁵ Rather, such policies pay out based on objective, independently collected data.⁶⁶ Like in the above example, a parametric policy insuring against flood damage might set a threshold flood height required to trigger the policy, and then NOAA data will be consulted to determine if the policy will be paid.

Regarding SI/SD standard compliance, a community could, theoretically, estimate the number of older structures that would be substantially damaged by varying magnitudes of flooding, and then work with a parametric insurance provider to structure a policy that could cover the associated compliance costs. An added benefit of such an approach is that the faster availability of funds that parametric insurance can provide “can be 3.5 times as effective as delayed payments from aid” in improving the speed in which a community can recover post-disaster.⁶⁷

⁶² Costs to raise a house are highly variable, but consistently estimated to be above the ICC cap. See e.g., Wharton Center for Risk Management and Decision Processes, *Post-Flood Mitigation: The NFIP’s Increased Cost of Compliance (ICC) Coverage 4* (Fall 2017), <https://perma.cc/TF66-JH7Y> (estimating that home elevation can cost 3-5 times the ICC cap). See also, the HomeImprovement.net, “How Much Will It Cost to Raise Your House?” (last visited Oct. 16, 2018) <https://perma.cc/QC4H-83M4> (estimating the average cost to elevate a home is between \$30,000 and \$100,000).

⁶³ The National Association of Insurance Commissioners, The Center for Insurance Policy and Research, *Parametric Disaster Insurance*, <https://perma.cc/L6EF-765S> (last visited Oct. 19, 2018).

⁶⁴ *Id.* (Parametric insurance is not affiliated with the NFIP).

⁶⁵ *Id.*

⁶⁶ *Id.*

⁶⁷ *Id.*

The parametric trigger is also utilized in catastrophe bonds or “cat bonds.” Such bonds create risk-linked securities which transfer the risk of a specified event occurring—like a certain category hurricane in a particular city—from an issuer or sponsor to investors. If the qualifying event occurs, then the investors lose some or all of their principal and the issuer receives that money to cover their anticipated losses.⁶⁸ Catastrophe bonds with a parametric trigger may be a more attractive alternative than a stand-alone parametric insurance policy as the cost of coverage may be less as the insurance provider transfers the risks to capital markets.⁶⁹ A community could potentially sponsor a parametric cat bond designed to be triggered by a flood event likely to substantially damage homes and the payouts could be used by those homeowners to achieve compliance with floodplain regulations.

However, a community pursuing either a parametric insurance policy or cat bond must have a solid understanding of the exact exposure that they seek to insure against. Parametric insurance payouts are divorced from the actual cost of damage a community may suffer from a disaster event.⁷⁰ So there is “an inherent basis risk” that a community may suffer an event that causes damage below the triggering threshold or the loss a community suffers might far exceed the modeling used to develop the trigger.⁷¹

3.3.3 Equity Concerns

The National Flood Insurance Program faces a number of equity challenges. While disasters do not themselves discriminate, a history of discriminatory policies like red-lining and segregation as well as economic and social disparities have located low-income communities and communities of color in highly vulnerable floodplains in certain states.⁷² Socially vulnerable communities were

⁶⁸ Nathaniel Bullard, *Blockchain Used as Settlement Mechanism for Cat Bond with Parametric Trigger*, INSURANCE JOURNAL 9 (Aug. 14, 2017), <https://perma.cc/6KJK-GT3Y>. See also, Re.Bound Program, *Leveraging Catastrophe Bonds as a Mechanism for Resilient Infrastructure Project Finance* (Dec. 2015), <https://perma.cc/C6QN-8R5R>.

⁶⁹ Michael Edesess, *Catastrophe Bonds: An Important New Financial Instrument*, 4.3 ALTERNATIVE INVESTMENT ANALYST REVIEW 6 (2015), <https://caia.org/aiar/1957>.

⁷⁰ Nigel Brook, et al., *Parametric Insurance: Closing the Protection Gap* 20 (2018), <https://perma.cc/8FBA-G5P2>.
⁷¹ *Id.*

⁷² See e.g., Tanvi Misra, *The Ugly Story of South Dallas*, City Lab (May 11, 2016), available at <https://perma.cc/D2LE-323H>; Marilyn C Montgomery and Jayajit Chakraborty, *Assessing the Environmental Justice Consequences of Flood Risk: a Case Study in Miami, Florida* 2015 ENVIRON. RES. LETT. 10,

some of those most heavily impacted by flooding after Hurricane Harvey.⁷³ These vulnerable communities include the elderly, disabled, poor, and those who don’t own a car or cannot speak English.

For several reasons, low-value homes are more likely to be assessed as substantially damaged.⁷⁴ First, an equivalent dollar value of damage (e.g. \$55,000), would trigger the 50 percent SI/SD threshold in a home worth \$100,000, but not a home worth more than \$110,000. Further, low-value homes may be more likely to be more significantly damaged due to location in vulnerable areas, poor construction, or construction under outdated building codes.⁷⁵ At least one study found that officials were more likely to subjectively assess homes in low-income neighborhoods to be substantially damaged than in high-income neighborhoods.⁷⁶ Our proposed changes to the SI/SD standards would likely increase the number of homes assessed as substantially damaged, making it important to bundle these standards with other reforms to financially assist low-income and vulnerable communities in bringing their homes into compliance with local floodplain regulations.

The disproportionate effect of flooding on vulnerable communities coupled with financing challenges is a crucial concern to address in any proposed reform to the NFIP. In the case of SI/SD standards, disproportionate impacts and opportunities for financial and other assistance must be an integral part of a reform package. As noted earlier in this paper, existing ICC funds are unlikely to provide sufficient support for households with fewer financial resources. FEMA has produced an affordability framework with several strategies to provide subsidies to low-income families that would be directly linked to reducing the cost of flood insurance premiums.⁷⁷ Given the escalating

<https://perma.cc/F3VG-P3N9>. For some of the difficulties in analyzing these trends at the national level, see NYU Furman Center, Population in the U.S. Floodplains: Data Brief (Dec. 2017), <https://perma.cc/289C-NHQ6>.

⁷³ Jeremy Deaton, *Hurricane Harvey Hit Low-Income Communities Hardest*, THINKPROGRESS (Sept. 1, 2017), <https://perma.cc/CM6B-ATAR>.

⁷⁴ Anne Siders, *Social Justice Implications of U.S. Managed Retreat Buyout Programs*, 2018 CLIMATIC CHANGE 1-19, <https://perma.cc/X3LL-MG9W>.

⁷⁵ Substance Abuse and Mental Health Support Administration, *Greater Impact: How Disasters Affect People of Low Socioeconomic Status* (July 2017), <https://perma.cc/2KP2-74VK>.

⁷⁶ D. H. de Vries, J. C. Fraser, *Citizenship Rights and Voluntary Decision Making in Post-Disaster U.S. Floodplain Buyout Mitigation Programs*, 30 INTERNATIONAL J. MASS EMERGENCIES DISASTERS 1–33 (2012), <https://perma.cc/PD98-DPGG>.

⁷⁷ FEMA, *An Affordability Framework for the National Flood Insurance Program* (April 17, 2018), <https://perma.cc/OK5R-O4D9>.

risks of sea level rise and inland flooding, any of these subsidy programs would be best enhanced if combined with mitigation assistance to reduce exposure to flooding.

However, lowering premiums will not address the high costs of elevating homes to make them compliant with floodplain regulations. One solution may include working with communities to create more transparent buyout programs that emphasize relocation and address issues of social inequality directly. Under FEMA's Hazard Mitigation Grant Program, substantial damage assessments can trigger the option for a buyout. Community-supported relocation to less-vulnerable areas through an expedited, voluntary buyout process could be paired with the lower SI/SD thresholds to provide an alternative option to rebuilding for low-value homeowners under this program.

4. CONCLUSION

Reforming the SI/SD standard to calculate damages cumulatively over time and to be triggered for damages and repair work worth less than 50 percent of the property can help the NFIP program better weather a changing climate, lessen the taxpayer burden, and increase the safety of millions of homeowners. Through model flood ordinances, building codes, other regulations, and guidance, states have several mechanisms to encourage municipalities and counties to adopt these more protective standards. Through adoption of higher SI/SD standards, communities can reduce their residents' flood risk, lower residents' flood insurance premiums, and enable residents to secure federal funds for rebuilding more resiliently after flood damage. Challenges can be mitigated through: 1) issuing disclosure laws that track expenditures for repairs and damages over time so that new owners are aware of their property's history, 2) novel financing and insurance strategies such as parametric insurance which reduce administrative burden, and 3) integrating equity and underlying social vulnerability considerations into a reform package that provides financing and supportive services for low-income and other vulnerable communities.

5. ANNEX

Communities receive their CRS classifications based upon the total credit they receive for various floodplain management activities. There are 10 CRS classes. The CRS classes, required points, and flood insurance premium discount are illustrated in the table below.

CRS Classes, Credit Points, and Premium Discounts ⁷⁸		
CRS Class	Credit Points	Premium Reduction (in SFHA)
Class 1	4,500+	45%
Class 2	4,000 – 4,499	40%
Class 3	3,500 – 3,999	35%
Class 4	3,000 – 3,499	30%
Class 5	2,500 – 2,999	25 %
Class 6	2,000 – 2,999	20%
Class 7	1,500 – 1,999	15%
Class 8	1,000 – 1,499	10%
Class 9	500-999	5%
Class 10	0-499	0%

The below tables illustrate the points available through the CRS program for more stringent SI/SD standards. FEMA draft language for SI/SD standards earning points under the CRS program are also included as examples.

CRS Points System for Cumulative Substantial Improvement/Damage Standards ⁷⁹		
	Requirement	Points
Cumulative Improvements		
	Improvements, modifications, and additions to existing buildings are counted cumulatively for at least ten (10) years	45
	Improvements, modifications, and additions to existing buildings are counted cumulatively for at least five (5) years	25
Repairs for Cumulative Damage		
	Reconstruction and repairs to damaged	45

⁷⁸ FEMA, *National Flood Insurance Program Community Rating System Coordinator's Manual*, *supra* note 58 at 110-3.

⁷⁹ FEMA, *Substantial Improvement/Substantial Desk Reference*, *supra* note 17 at 5-17 (2010) (also source for FEMA draft text)

	buildings are counted cumulatively for at least ten (10) years	
	Reconstruction and repairs to damaged buildings are counted cumulatively for at least five (5) years	25
	Regulatory language that qualifies properties for Increased Cost of Compliance insurance coverage for repetitive losses.	20
Additions		
	Regulations that any addition to a building be protected from damage from the base flood.	20
Total Points Available		110

FEMA Draft Language for a Cumulative Standard:

"Substantial improvement" means any combination of repairs, reconstruction, rehabilitation, addition, or other improvement of a structure taking place during the life of the structure the cumulative cost of which equals or exceeds fifty percent of the market value of the structure before the "start of construction" of the improvement. This term includes structures that have incurred "substantial damage," regardless of the actual repair work performed. . . ."

CRS Points System for Lower Substantial Improvement/Damage Thresholds⁸⁰	
Requirement	Points
<i>Regulatory Threshold for Substantial Damage to Entire Structure</i>	
Less than 10%	90
10% to 24%	70
25% to 39%	50
40% to 44%	30
45% to 49%	10
<i>Other Regulatory Threshold Requirements</i>	
Threshold is no more than 25 percent of the bulk or square footage of the building's first floor.	20
* If the lower substantial improvements threshold applies to EITHER improvements, modifications, and additions OR reconstruction and repairs, but not both, the value for LSI is multiplied by 0.5.	N/A

⁸⁰ FEMA, *Substantial Improvement/Substantial Desk Reference*, *supra* note 17 at 5-17 (2010) (also source for FEMA draft text).

FEMA Draft Language for a Lower Threshold Standard:

"A non-conforming building in a Flood Plain District may be altered, enlarged, or extended, on a one-time-only basis, provided the cost of such alterations, enlargements, or extensions does not equal or exceed 40 percent of its pre-improvement market value, unless such building is permanently changed to a conforming structure. Any non-conforming building in a Flood Plain District that is damaged by flood, fire, explosion, Act of God, the public enemy or other cause may be restored to its original dimensions and conditions, provided the cost of restoring the building to its before damage condition does not exceed 40 percent of its pre-damage market value, excluding the value of the land."