Drawing Lines: FEMA and the politics of mapping flood zones

Abstract**:** Flooding is the most common and damaging of all natural disasters in United States, and climate change is exacerbating the problem. Accurate flood maps are critical to communicating flood risk to vulnerable populations, to mitigating and adapting to floods, and to the functioning of the federal flood insurance program. Yet we know little about how the mapping process works in practice. This paper represents an initial attempt to understand the politics of mapping flood zones in the United States. Because mapping takes place within the context of the National Flood Insurance Program, mapping in the U.S. cannot be separated from the costs of flood insurance. The concern over costs tends to dominate and drive discussions at the local level. In some cases, this leads to less than optimal responses by individuals and communities. But the case of Syracuse, New York points to the potential for grassroots organization that raises broader issues of equity and endorses collective solutions to the problem of flooding.

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When Hurricane Sandy hit the east coast of the United States in late October 2012, it caused a record-breaking flood height of over thirteen feet, a level that experts predicted would not occur until 2050 during a 100-year storm event.[1] It is not surprising, then, that half of all the buildings in New York City affected by the floods were not within the Federal Emergency Management Agency's (FEMA's) then-mapped flood zones. Indeed, the maps themselves dated from 1983, and while FEMA has revised and updated them since Hurricane Sandy, the maps still do not take into account future vulnerability due to climate change.[2] The New York City region is not alone in this respect; FEMA's flood maps are based on historical data and for regulatory purposes cannot include future flood projections.[3]

As the New York City example suggests, an essential building block of any climate adaptation policy and process is a set of flood maps that communicate future flood risk associated with climate change. In recent years the government agency responsible for creating flood maps, the Federal Emergency Management Agency (FEMA), has worked with municipalities to update and revise county flood maps, many of which date back to the 1980s. This remapping project provides a unique opportunity to research the responses of FEMA and municipalities to this process, and provide a window into how communities may respond to future risks from climate change. Will communities accept the reality of

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[1] Kim Knowlton, Miriam Rotkin-Ellman, and Perry Sheffield, "Post-Sandy Preparedness Policies Lag as Sea Levels Rise," *Environmental Health Perspectives* 121 (7), July 2013: A208.
[2] Ibid. Interestingly, FEMA's initial 2013 flood maps for New York City did not take into account Hurricane Sandy and other storm events because the remapping process dated from 2010.
[3] Interview with Andrew Martin, FEMA Region 2 Risk Analysis Branch Chief, February 14, 2017; Interview with William Nechamen, Chief, Floodplain Management Section, New York State Department of Environmental Conservation, March 15, 2017; Interview with Jennifer Marcy, Project Manager, Water Resources East, Atkins consulting group, July 20, 2017. Communities can ask FEMA to map future flood conditions but these maps are for informational purposes only and are not used to determine flood insurance rates or requirements. See Federal Emergency Management Agency/ Federal Insurance and Mitigation Administration, "National Flood Insurance Program: Program Description," August 2, 2002.

increased flood risk and adapt in ways that minimize risk and increase resiliency? Or will economic, social, and political pressures derail adaptation policies or even lead to maladaptation? Will FEMA give in to pressures to underestimate the risk of future floods, or can the agency persuade local officials to accept the science behind new flood maps and assume the costs associated with implementing them?

Recent news from across the United States suggests that the process of creating and implementing new flood maps has been contentious and the results disappointing. In New Orleans, for example, the new FEMA maps show that more than half of the population is no longer in the high-risk flood zone even though many residents live at or below sea level. Local officials lobbied FEMA for seven years after the agency initially painted a dire picture of New Orleans, and they succeeded in convincing the agency that recent infrastructure projects reduced the city's flood risk.[4] New York City provides another prominent example. Mayor Bill DeBlasio recently convinced FEMA to take another look at the city's revised Flood Insurance Rate Map (FIRM) after it added 70,000 properties into the "highest risk" category. In 2016, after a year or more of lobbying by the city, FEMA agreed to take a second look at the map, accepting the city's argument that FEMA "could have done better" in analyzing the city's flood risk.[5]

To critics, though, FEMA's decisions in these cases were more political than scientific: putting more properties in high-risk zones increases flood insurance rates for homeowners, may dampen development, and could decrease property values. For these

[4] Ryan Kailath, "New Maps Label Much of New Orleans Out of High Risk Flood Area," NPR: All Things Considered, 30 September 2016.

[5] Dennis Lynch, "Scrap the Map! Feds Go Back to the Drawing Board on Flood Maps That Would Hike Insurance," *Downtown Express*, November 9, 2016, available at http://www.downtownexpress.com/2016/11/09/scrap-the-map-feds-go-back-to-the-drawing-board-on-flood-maps-that-would-hike-insurance/ (accessed on Februrary 10, 2017).

reasons, local officials are under significant pressure to prevent properties and neighborhoods from being designated high-risk, leaving individuals and the community vulnerable in the event of a major flood.

This paper represents a preliminary attempt to understand the challenges involved in updating federal flood maps. It explores these processes by situating them in the context of national, state, and local policies and politics in the United States. I rely on a variety of data sources, including: scholarly and technical analyses of the National Flood Insurance Program (NFIP); policy histories of the program; local and national newspaper coverage; maps and other documents associated with the remapping project in Syracuse, New York; interviews with key individuals involved in flood mapping processes at the national, state, and local level; and participant observation at community meetings about the Syracuse remapping project.[6] After briefly reviewing climate change-induced flood risks and the NFIP, the paper turns to an analysis of how politics enters into FEMA's flood mapping process and its consequences.

Climate change-induced flooding and the importance of accurate maps

Climate change is expected to lead to increased flooding in many parts of the world due to rising sea level and changing precipitation patterns. The impacts will be felt most acutely along the coasts but models predict a significant increase in inland flooding as well, as heavy and more frequent rain events increase the risk of flash floods and riverine

[6] Interviews were conducted with: a founder of the National Association of Floodplain Managers; an official at FEMA Region II who is responsible for remapping projects throughout the northeast; a floodplain expert at the New York State Department of Environmental Conservation; an expert on the NFIP who consults with FEMA; the Syracuse city engineer; a representative of the Syracuse Mayor's office; and the director of Syracuse United Neighbors, a community group representing low-income residents of Syracuse.

flooding events.[7] Flooding is costly and becoming more so as coastal population density increases, development in flood zones continues, and other land use changes exacerbate flood impacts.[8] In the United States, flooding already does more damage than any other natural disaster, and the costs go well beyond monetary costs to include loss of life, health impacts, displacement, and social disruption. Flooding will continue to cost the world billions of dollars and countless lives if nothing is done to account for (and adapt to) rising sea levels, subsiding land, and extreme weather events. Implementing a variety of adaptation measures could cut those costs significantly, but few countries and communities are seriously pursuing and implementing such policies.[9]

Adaptation to increased flooding due to climate change requires, at a minimum, accurate maps that reflect current and future flooding risk. Individuals and communities, along with regional and national authorities, need to know what geographical areas and individual properties are at the greatest risk of flooding now and in the future. This is true even if governments manage to enact and implement only a bare-bones policy of providing accurate information about flood risk to the public. The effectiveness of more interventionist policies such as land use and building code regulations, relocation programs, and infrastructure improvements also rely on accurate maps. Finally, updated

[7] National Oceanic and Atmospheric Administration, "U.S. Resilience Toolkit: Inland Flooding," available at https://toolkit.climate.gov/topics/coastal-flood-risk/inland-flooding (accessed 28 January 2017). Since 2003, riverine and flash floods in the U.S. have cost an estimated $100 billion.

[8] In 2012, insured losses from all floods cost $58 billion. The economic losses from Hurricane Sandy alone were in the realm of $68 billion. See Scott G. Knowles and Howard C. Kunreuther, "Troubled Waters: The National Flood Insurance Program in Historical Perspective," *The Journal of Policy History* 26 (3) 2014: 327-353. In the U.S., total and per capita flood damage have been increasing since 1934. See Adelle Thomas and Robin Liechenko, "Adaptation through Insurance: Lessons from the NFIP," *International Journal of Climate Change Strategies and Management* 3 (3) 2011, 250-263.

[9] Deborah Javeline, "The Most Important Topic Political Scientists Are Not Studying: Adapting to Climate Change," *Perspectives on Politics* 12 (2), June 2014: 420-434. In a 2009 article, Andrew Healy and Neil Molhorta estimate that every dollar spent on natural disaster preparedness (including but not limited to flood mitigation) is worth fifteen dollars of savings on future damages. "Myopic Voting and Natural Disaster Policy," *American Political Science Review* 103 (3) August 2009: 387-406.

maps are critical to the effective functioning of flood insurance programs, widely regarded as a key policy tool for climate change adaptation.[10] Scott Knowles and Howard Kunreuther argue that "[w]ithout accurate flood-hazard maps, it is impossible to sustain the knowledge required to set insurance premiums that reflect risk, or to establish floodplain development rules, building codes, and other tools of flood mitigation."[11] Indeed, one reason that U.S. municipalities are laggards when it comes to climate adaptation planning, according to Sarah Adams-Schoen and Edward Thomas, is because of "out-of-date or inaccurate flood hazard maps" that have "impeded the efforts of communities to understand and assess vulnerability to sea level rise, coastal storm surge, and riverine flooding and to develop policies and projects to reduce risk."[12]

A lack of adequate resources and accurate models predicting future climate change risks at the regional and local level are part of the problem. According to Larry Larson, a founding member of the Association of State Floodplain Managers (ASFPM), the government would need to spend 400 million dollars a year for ten years to properly update the nation's flood maps.[13] Congress allocated over $200 million to the project as recently as 2010, but has since slashed funding, which FEMA claims will delay its map program by three to five years.[14] Andrew Martin, the FEMA Region 2 Risk Analysis Branch Chief, claimed that it was "financially impossible" for FEMA to update flood risk maps every

[10] Thomas and Liechenko 2011, 250-263.
[11] Knowles and Kunreuther 2014.
[12] Sarah Adams-Schroen and Edward Thomas, "A Three-Legged Stool on Two Legs: Recent Federal Law Related to Local Climate Resilience Planning and Zoning," *The Urban Lawyer* 47 (3) Summer 2015: 525-542.
[13] Theodoric Meyer, "New FEMA Flood Maps Needed, but Funding Is Slashed," *Scientific American* 27 May 2013, available at https://www.scientificamerican.com/article/new-fema-flood-maps-needed-but-funding-slashed (accessed on March 18, 2017). Interview with Larry Larson, April 3, 2017.
[14] Meyer 2013. See also FEMA, "National Flood Insurance Program: Program Description," August 1, 2002. .

five years as the agency is directed to do.[15] Moreover, flood maps can quickly become outdated as better information and technology are developed and as climate impacts accelerate.[16] This suggests that funding for map updates would need to remain at a high level for the foreseeable future.

Another significant problem is the uncertainty inherent in climate change impact predictions, particularly at the local level. Global climate models can predict temperature changes and climate change impacts at the global scale but these models are not highly accurate at local and regional levels, especially when it comes to riverine flooding. And while scientists are developing more accurate models for local climate impacts, many communities still lack information about climate-induced hazards, including flood risks.[17]

Clearly, resource and information deficits stand in the way of creating accurate flood maps. However, this is not the full story. The remainder of the paper argues that flood mapping in the United States is shaped by political dynamics and policy contexts that ultimately impede its effectiveness as a tool for climate change adaptation.

The National Flood Insurance Program: Design and Implementation

The National Flood Insurance Program was enacted in 1968 to address long-standing problems associated with natural disasters in the United States. At the time, most

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[15] Interview with Andrew Martin, FEMA Region 2 Risk Analysis Branch Chief, February 14, 2017. See also Knowles and Kunreuther 2014, 344. See also FEMA 2002. According to Larry Larson,FEMA essentially has the same staff today as it had back in 1983 when just 6,000 communities were in the NFIP (compared to over 22,000 today). Interview with Larry Larson, 2017.

[16] Throughout the 2000s, improvements in mapping technology raised the question of whether it was rational to invest in updating existing maps using "old-fashioned" techniques. Knowles and Kunreuther 2014, 344.

[17] Interview with Andrew Martin 2017; "Method to Predict Local Climate Change Developed," *ScienceDaily* February 18, 2016, available at https://www.sciencedaily.com/releases/2016/02/160218133407.htm (accessed March 18, 2017); see also Adams-Schoen and Thomas 2015.

homeowners were not insured against floods, and after a series of particularly devastating and expensive natural disasters in the mid-1960s, the public and policymakers agreed that the federal government had an important role to play in protecting homeowners and communities from flood risks.[18] The policy was designed to decrease the public cost of natural disasters by asking property owners to shoulder some of the cost by purchasing insurance policies. At the same time, policymakers expected that the aggregate costs of flooding would decline over time as development moved out of floodplains and construction standards improved.

Under the program, the federal government offers flood insurance to at-risk communities and property owners as long as the participating community regulates development in flood-prone areas and enforces building code regulations designed to reduce flood-related damages. The Federal Emergency Management Agency provides flood hazard maps (officially, Flood Insurance Rate Maps, or FIRMs) to participating communities, which indicate the location of Special Flood Hazard Areas, or SFHAs (those areas with a 1% chance of flooding in any given year), base flood elevation levels (BFEs), and floodways. Once a community accepts the maps, they become a part of the NFIP program and are eligible for federal disaster assistance and federally backed flood insurance.

The National Flood Insurance Program was based on a set of assumptions, some of which proved overly optimistic. The designers of the policy assumed subsidized insurance rates would provide a significant incentive for communities to enroll in the program and

[18] Melissa Checker, "Stop FEMA Now: Social Media, Activism, and the Sacrificed Citizen," *Geoforum* 79, February 2017: 124-133. Private insurers left the flood insurance market after the 1927 Great Mississippi River Flood, a costly event that convinced insurers that the market for flood insurance was too risky.

for individuals to purchase flood insurance. But "take up" rates were initially low. Some communities were hesitant to join the program because they feared their tax revenues would decrease if they limited development or made it too costly. Pressure from the real estate and construction industries provided additional reasons to opt out; "Faced with restricting development or taking chances on a hurricane and hoping for disaster-relief payments, it is clear that many communities in the early NFIP years chose to take their chances."[19] Participation in the NFIP rose significantly, however, after Congress enacted a law in 1973 that mandated flood insurance for properties with federally backed mortgages and that prohibited certain disaster assistance to non-participating flood-prone communities.[20] Over 20,000 communities now voluntarily participate in the program and millions of flood insurance policies are in effect. Nevertheless, a 2006 study estimated that less than half of all properties that carried a 1% risk of flooding were covered by flood insurance.[21]

While insurance coverage remains a problem, some critics of the NFIP complain that the program's biggest weakness is that it creates a "moral hazard" and may exacerbate the very problem it is trying to solve. The argument goes like this: affordable flood insurance encourages people to live in flood-prone areas and allows development of these areas to proceed. About one-fifth of policyholders receive significant discounts on their insurance because they bought their homes before flood hazard areas were mapped.[22] The rest of

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[19] Knowles and Kunreuther 2014, 337.

[20] FEMA, "National Flood Insurance Program: Program Description," August 2, 2002

[21] Study cited in Thomas and Liechenko 2011, 354. In New York City, only 20% of those suffering damage by Hurricane Sandy were insured before the disaster struck. See Howard Kunreuther, "Reducing Losses From Catastrophes: Role of Insurance and Other Policy Tools," *Environment: Science and Policy for Sustainable Development* 58 (1), 2016: 30-37.

[22] FEMA 2002.

NFIP policyholders, while officially paying "actuarial" rates, receive a number of other hidden subsidies, according to experts on the NFIP.[23] Taken together, relatively affordable flood insurance and the promise of a government bail out in the event of a disaster sends a distorted market signal that underestimates the true cost of living in a flood-prone area. As a result, the NFIP "incentivizes staying put, whatever the cost, rather than moving to higher ground" and it has "had only limited success in discouraging development in questionable areas."[24]

Larry Larson, Director Emeritus and Senior Policy Advisor for the Association of State Floodplain Managers (ASFPM) points to another cause of floodplain development: FEMA's mapping priorities. According to Larson, FEMA selects the highest density and already-developed areas to map or remap rather than "cornfields and cow pastures" on the edge of urban and suburban areas. In other words, mapping follows development in many cases rather than precedes it. As a result, some communities allow development in unmapped areas with little attention to or concern about flood risk. FEMA may identify the area as a mapping priority for inclusion in the NFIP, but only *after* it has been developed.

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[23] Interview with Jennifer K. Marcy, Project Manager for Atkins Global, July 11, 2017. The 2012 Biggert-Waters Act phased out subsidies over time so that insurance rates would finally reflect the actuarial cost of living in a flood zone. As Congress quickly found out, though, those benefitting from the program were outraged and they mobilized and lobbied to protect the insurance benefits. Congress repealed many of the new provisions two years later by passing the Grimm-Waters Act of 2014. For an insightful analysis of this rapid policy shift, see Struther (forthcoming).

[24] Brady Dennis, "The country's flood insurance program is sinking. Rescuing it won't be easy," *The Washington Post*, July 16, 2017. Scholars disagree about whether continued development in flood zones is mainly due to the moral hazard problem, weak implementation and enforcement of the NFIP, or cognitive limitations that lead individuals to forego protection for low-probability events. For the former argument, see Kyle Logue and Omri Ben-Shahar, "The Perverse Effects of Subsidized Weather Insurance," Kreisman Working Papers Series in Housing Law and Policy No. 23, 2015. For the latter two, see Knowles and Kunreuther 2014, 343. Federal, state, and local governments share responsibility for monitoring and enforcing the NFIP. According to Bill Nechamen, a floodplain expert at the New York Department of Environmental Conservation, building code officers in New York often fail to fully enforce building codes in flood plains, particularly in smaller communities. His agency has very few tools to enforce compliance and a shortage of staff to oversee participating communities. Interview with William Nechamen, Chief, Floodplain Management Section, New York State Department of Environmental Conservation, March 15, 2017.

New property owners are often surprised that they have to buy costly insurance and understandably complain to local authorities.[25]

This brief overview of the National Flood Insurance Program should make clear the centrality of flood maps to the insurance program. As Knowles and Kunreuther point out, "the continuous updating of flood-hazard maps provides the technical underpinning of everything the program strives to do."[26] The program relies on accurate flood maps, but what are the consequences of embedding the mapping program into an insurance policy? The next section considers this question.

Mapping and Insurance Premiums

"Our maps do one very specific thing: they are flood insurance rate maps so they decide who has to buy flood insurance and who doesn't." --Andrew Martin, FEMA Region 2 Risk Analysis Branch Chief

Bill Nechamen, Chief of the Floodplain Management Section at the New York State Department of Environmental Conservation (NYDEC), would like to see the conversation around the NFIP change from "what is this going to cost me" to "what is the risk and what could happen to our community" if it were hit with a catastrophic flood?[27] By way of example, Nechamen tells the story of the village of Canajoharie, a small town located next to the New York State Thruway between Utica and Schenectady. In 2006, a major flood damaged the 118-year old Beechnut factory, the largest employer and taxpayer in town, and the dominant funder of the village's water and wastewater systems. After the flood, the factory relocated and the small town "lost its purpose." Nechamen thinks this case

[25] Interview with Larry Larson, April 4 2017.

[26] Knowles and Kunreuther 2014, 344.

[27] Interview with William Nechamen, Chief, Floodplain Management Section, New York State Department of Environmental Conservation, March 15, 2017.

illustrates a broader point: that even those who live outside designated flood zones should be concerned about the potential impact of floods on their community. He is dismayed by a tendency to focus on the short-term costs of insurance rather than the long-term risks to communities. Put differently, flood maps should encourage people to think about what might happen to their communities as a result of flooding and to take actions to mitigate the risks. The primary discussions during the mapping process, however, are too often focused on insurance costs.

Map Modernization

With over 20,000 communities currently participating in the NFIP, FEMA struggles to keep flood maps up to date. The agency sets priorities by targeting communities where maps are the most out of date and where development is greatest.[28] In the early 2000s, it began a map modernization process (dubbed "Map Mod") to update its decades-old maps. The project has involved 1.1. million miles bordering streams, lakes, coasts, and other flood areas around the country. As of 2014, the agency had surveyed nearly half of its target area, about 3,800 communities.[29] While this number sounds impressive, it is important to keep in mind that about two-thirds of floodplains in the United States have never been mapped.[30]

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[28] FEMA, "Flood Map Revision Processes," available at https://www.fema.gov/flood-map-revision-processes (accessed March 15, 2017). Details about the process are available on the FEMA website; they have been left out of this summary for purposes of readability and length.

[29] Miranda Leitsinger, "For Average Joes, Fighting FEMA Flood Maps Isn't Easy or Cheap," NBCNews.com, February 20, 2014, available at http://www.nbcnews.com/news/us-news/average-joes-fighting-fema-flood-maps-isnt-easy-or-cheap-n23871 (accessed March 21, 2017).

[30] Interview with Larry Larson 2017.

It takes about three years from start to finish for the average community to complete the map modernization process.[31] FEMA begins the process by examining existing data and working with local communities to identify priority areas to map. Sometimes FEMA is mapping areas for the first time, but often they are revising existing flood zones to account for changes over time in construction, geography, precipitation patterns, and mitigation activities.[32] Critically important is the fact that the maps are based on historical data and do not model future risk scenarios. This is referred to as "stationary mapping" and is based on the assumption that "what happened yesterday will happen tomorrow."[33] While the U.S. Geological Service, the National Oceanic and Atmospheric Administration, and the National Weather Service are making "great strides" in modeling future flood risks, FEMA can "only use information that is available up to now."[34]

After extensive information gathering, the agency releases preliminary maps to the community. A formal 90-day review period follows the release of the preliminary maps, allowing the community time to "challenge [FEMA's] information or provide it with better information if they have it" according to Andrew Martin.[35] It is common for communities to complain about the preliminary maps, but it takes resources to lodge challenges in the form of a Physical Map Revision (PMR) or a Letter of Map Revision (LOMR). For formal challenges, municipalities must hire an engineering firm to conduct additional studies. This

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[31] Interview with Andrew Martin 2017.

[32] Mark Stevens and Steve Hanschka, "Municipal Flood Hazard Mapping: The Case of British Columbia, Canada," *Natural Hazards* 73 (2014), 907-932.

[33] Interview with Larry Larson 2017. See the Technical Map Advisory Council, "TMAC Annual Report", December 2016, available at https://www.fema.gov/media-library/assets/documents/111853.

[34] Interview with Andrew Martin 2017. In FEMA's 2002 description of the NFIP, the agency notes that some rapidly developing communities expressed interest in mapping future land use development to understand its impact on flood hazards. FEMA provides such maps at the community's request, but these maps are for "informational purposes only" and the community decides whether to use the information to regulate development. FEMA 2002.

[35] Interview with Andrew Martin 2017. See also FEMA 2002.

is out of reach for many smaller communities, although FEMA may respond to valid community concerns even in the absence of an official challenge.[36] Community negotiations with FEMA can result in significant changes to the final map, as the previous examples of New Orleans and New York City illustrate.

Individual property owners can also challenge flood maps by working with their local community and filing Letter of Map Amendments (LOMAs). Property owners may demonstrate that their structure sits above the floodplain (e.g. it may be on a small berm or hill) or prove that only a small (uninhabited) portion of their property is in the flood zone. Property owners who live on the edge of the flood zones may argue that their entire property is mistakenly mapped into the flood hazard area.[37] These appeals, like the community ones, require adequate supporting data. To file a credible challenge, individuals, businesses, or developers may spend hundreds—sometimes thousands—of dollars to hire land surveyors or engineering firms. FEMA and NYDEC officials confirmed that many individual property owners challenge their inclusion in flood zones; in the case of FEMA Region 2, around 80 to 90% of appeals are from individuals, according to Andrew Martin. While appeals can be costly, they are also largely successful. FEMA cites an 89% success rate for the 30,000 flood map amendments sought annually.[38]

The costs associated with community and individual appeals raise concerns about equity. New York City and New Orleans can afford to launch appeals and engage in lengthy negotiations with FEMA, but less well-resourced communities may be incapable of doing

[36] Interview with Bill Nechamen 2017; Interview with Larry Larson 2017.
[37] See FEMA 2002.
[38] Leitsinger 2014. Jennifer Marcy argued that filing individual appeals is less daunting than sometimes portrayed but admitted that FEMA could do a better job communicating with the public about the appeals process. Interview with Jennifer Marcy, 2017.

so. Moreover, individual property owners with the means to file an appeal benefit by reducing or eliminating their flood insurance premiums. Residents who cannot afford to challenge their designation must rely on local officials to file a community-wide appeal or else pay the higher insurance premiums. This may lead to a scenario where the better off can protect their interests in two ways: first, through less visible, individual action and second, through more public appeals led by community officials. Lower income individuals, on the other hand, may be limited to more public and collective actions to challenge the burden of flood insurance.

An investigation into the FEMA appeals process by NBC news in 2014 reveled some disturbing trends. Investigators examined over 500 appeals that resulted in a reclassification of coastal properties from the highest-risk flood zone to a lower risk zone. They uncovered numerous cases where FEMA agreed to reclassify high-end luxury condominium developments and other valuable properties from high-risk to lower risk. Some of the properties had flooded in the past, and many were in vulnerable areas that later flooded.[39] "Carving the flood zone map like a parent cutting a notch in a jack-o-lantern to make a tooth, FEMA moves the lines on a map for one property, while leaving its neighbors in the highest-risk zone."[40] Flood insurance rates decreased by as much as 97% for some of the downgraded properties; other owners found that insurance was optional.

These appeals, while nominally public (requiring public notice and a line in the Federal Register) are not very visible. And while most Americans probably support the right of individuals to correct map errors, they may object to wealthy property owners who

[39] Bill Dedman, "Why Taxpayers Will Bail Out the Rich When the Next Storm Hits Us," NBCNews.com, available at http://www.nbcnews.com/news/investigations/why-taxpayers-will-bail-out-rich-when-next-storm-hits-n25901 (accessed March 21, 2017).
[40] Ibid.

evade paying their fair share into the national flood insurance program, or who ask for a government bailout if disaster strikes. Some studies show that the National Flood Insurance Program redistributes wealth upwards like other "hidden" government policies.[41] A study by the Institute for Policy Integrity paints a somewhat more complex picture: both wealthy and poor counties benefit disproportionately from the program, while counties representing more middle income residents receive fewer benefits.[42]

Stakeholder Concerns

The costs of insurance are central to the FIRM process and dominate discussions in communities undergoing FEMA's map modernization process. Negotiations are centered around lines on a map that demarcate who has to pay flood insurance and who does not. Often, the goal of local elected officials is to decrease the number of residents and businesses that must purchase flood insurance. Officials are concerned about the financial burden on individual property owners, but also worry about decreased property values and increased restrictions on developmentt.[43] Andrew Martin, in comparing the goals of city engineers with elected officials, had this to say:

> Politicians, unfortunately tend to only see it [the mapping process] as a risk to themselves and to constituents in terms of financial risk. FEMA comes in, remaps everything and everyone has to buy flood insurance. So they think let's just fight it

[41] Logue and Ben-Shahar, 2015. On "hidden" government policies, see Suzanne Mettler, *The Submerged State: How Invisible Government Policies Undermine American Democracy* (Chicago: University of Chicago Press, 2011 and Christopher Faricy, *Welfare for the Wealthy: Parties, Spending, and Inequality in the United States* (Cambridge: Cambridge University Press, 2016).

[42] J. Scott Holladay and Jason A. Schwartz, "Flooding the Market: The Distributional Consequences of the NFIP," Institute for Policy Integrity, Policy Brief No. 7, April 2010.

[43] My interview subjects all agreed that insurance costs were central to the map negotiation process, and suggested that elected officials were most concerned about the insurance costs and their potential effect on residents and development. One subject admitted that most communities sought the smallest flood zones and lowest base flood elevations possible, but added that if these were based on accurate technical data, then it was not a problem.

> no matter the cost. It happens time and time again and it is unfortunate. At the same time, I understand it.[44]

Bill Nechamen from the New York State Department of Environmental Conservation said much the same thing when asked about elected officials' primary concern: "It is the price of flood insurance and what flood maps do to property values and the need for people to buy flood insurance. This is not what the answer should be but this is a reality." Larry Larson of ASFPM has heard stories of community leaders using appeals to delay the process for a few years, "during which time they [elected officials] have a floodplain that they can develop. As long as there is not an agreed-upon map, there aren't regulations."[45]

Martin, Nechamen, and Larson were quick to provide counter examples, praising "enlightened," "progressive," and "proactive" communities that used flood information to rethink development patterns and build community resilience. Most of their praise was reserved for local engineers and planners who "understood modeling and science," "want to understand risk and take corrective steps to reduce it," and "who can help steer thinking at the local level about how to reduce risk instead of just fighting it politically."[46] Indeed, the NBC investigation into FEMA appeals identified some local floodplain managers who opposed the exclusion of expensive coastal properties from flood zones.[47] Martin argues that planners who bring good ideas to the table may get "trumped by political considerations"; they can start out independent, but "as political implications become more apparent" succumb to elected officials' preferences.[48]

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[44] Interview with Andrew Martin 2017.
[45] Interview with Larry Larson, 2017.
[46] Interview with Andrew Martin 2017.
[47] Dedman 2017.
[48] Interview with Andrew Martin 2017.

In short, for elected officials, a successful outcome of the mapping process is often one that reduces the size of the flood zone and the severity of the hazard designation. This is understandable, even to FEMA officials. The also understand why individuals and groups within the communities appeal or protest the maps. "I understand the confusion and anger, absolutely," says Martin. "We try not to be cold-hearted bureaucrats. We are humans here and we understand the implications for people. But we look at it as trying to provide communities and property owners with a better understanding of their risk so they can be prepared."[49] Research suggests that FEMA maps *can* serve as an important communication tool to at-risk populations and encourage more risk-averse behavior.[50] But many property owners pursue the shorter-term objective of reducing their insurance costs. This is especially true in areas that have not flooded in decades; residents who have not experienced a flood argue that "my house has never flooded," or "it has not flooded here" for generations and therefore, "we don't live in a floodplain" and "I don't need insurance."[51]

The larger point is that the flood mapping process in many communities is dominated by discussions about insurance and costs. While these are serious—even vital—considerations, particularly in low-income communities, a focus on insurance can steer the conversation away from equally important topics about how to reduce flood risk and improve a community's resiliency in the face of natural disasters. It may also lead to misleading maps that underestimate the likelihood and severity of flood risk and provide

[49] Interview with Andrew Martin 2017.

[50] One study, for example, showed that FEMA's flood maps helped to communicate to at-risk coastal populations and positively affected their voluntary purchase of flood insurance. Wanyun Shao et. al., "Understanding the Effects of Past Flood Events and Perceived and Estimated Flood Risks on Individuals' Voluntary Flood Insurance Purchase Behavior," *Water Research* 108 (2017): 391-400.

[51] Several interview subjects raised this issue, claiming that people did not understand the concept of insurance. I also heard this objection at a community meeting in Syracuse about the new flood maps.

individuals outside the designated zone with a false sense of security.[52] As climate change intensifies and expands flood risks around the United States, the relative absence of conversations about how to adapt to a changing climate is troubling. The next section explores these themes in the case of Syracuse, New York.

"A New Form of Redlining": FEMA's Maps and Community Opposition in Syracuse, NY

In an April 2017 meeting on the south side of Syracuse, residents confronted representatives of the U.S. Congressional delegation with stories of hardship brought on by FEMA's new flood maps. Many residents in the area, containing one of the highest rates of concentrated poverty in the nation, had received notices from their banks earlier in the year. The banks alerted them that they had to purchase flood insurance because their property was in a designated FEMA flood zone. For some, this was the first time they learned about the results of a process that had taken ten years to complete.

In many ways, the remapping project in Syracuse, New York is unusual. It is not just that the process took far longer than typical (from 2006-2016); also unusual is the fact that Congressional representatives have intervened in the process and citizens have lodged claims of environmental injustice. While unique, this case provides a useful window into the myriad challenges confronting FEMA and the nation as it attempts to address, however feebly, the reality of flood risks and the increasing vulnerability of citizens to a changing climate. Syracuse is useful in part because it does *not* have a recent history of catastrophic

[52] The Technical Mapping Advisory Council, a committee that makes recommendations to FEMA, recognizes this problem. In their 2015 and 2016 reports, they recommend transitioning to a flood risk assessment that is structure specific. Each building, in other words, would be rated for its flood risk based on its elevation, the nature and severity of the flood risk, and other characteristics. Insurance premiums would be based on these factors, not on whether a property is in or outside the 100-year flood zone. See TMAC, Annual Report, December 2016.

floods. The last major flood was in the summer of 1974 when flooding in Onondaga Creek forced the evacuation of more than 1,000 city and county residents.[53] Climate change will lead to more flooding in these types of communities in the future, providing us an opportunity to examine how communities who are not accustomed to frequent flooding may respond to the adaptation measures.

In 2006, FEMA targeted the Syracuse area for a flood-remapping project because the city's flood maps dated from the 1980s and were based on flawed models from the late 1970s. The models were particularly inaccurate for Onondaga Creek, a main tributary to Onondaga Lake that originates 27 miles south of the city, flows through the Tully valley, crosses the Onondaga Nation (where a dam regulates the flow), and eventually empties into Onondaga Lake to the north of downtown Syracuse. The creek runs directly through the south side of Syracuse and some of the poorest communities in the city. The outdated maps showed "no risk" to communities on the south side from the channelized creek, according to Andrew Martin.[54] But gauge data from the creek indicated that water flows had increased by about 25% over previous studies, creating an "overbank" flood hazard in the event of extreme precipitation events.[55]

When FEMA released its preliminary flood maps in 2008, city officials were "pretty shocked and surprised" by the size of the flood plain for Onondaga Creek, according to Russell Houck from Syracuse's Department of Engineering.[56] In 2010, the city hired the C & S engineering firm to gather additional data to ensure the "maps were accurate." As Houck

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[53] Howard Fischer, "1,000 Flee High Waters," *The Post Standard* 145 (291), July 4, 1972.
[54] Interview with Andrew Martin 2017.
[55] Interviews with Russell Houck and Andrew Martin 2017. My interview subjects thought the increased flows were due in part to the changing climate.
[56] Interview with Russell Houck 2017.

went on to explain, "If all these people are going to be paying insurance, is this truly the flood plain?" The studies led to some "minor tweaks" to the maps, but did not end the controversy. It was just the "first round," says Houck, hinting at the adversarial nature of the process.[57]

The conflict expanded in the summer of 2010 when newly elected Syracuse Mayor Stephanie Minor reached out to Syracuse's congressional delegation for help. Senator Charles Schumer's office (with the support of Senator Kristin Gillibrand and Representative John Katko) succeeded in stopping the process from moving forward. This was very unusual, according to Martin, "but the political scrutiny was so high that we [FEMA] put a stop work order on it."[58] The city hired another engineering firm to do more refined flood hazard modeling in Onondaga Creek. They also convinced New York State and the Army Corps of Engineers to do some additional dredging on the creek and remodeled the flood risk based on what the post-dredging channel looked like.[59] FEMA and the city "went back and forth" for some time, and FEMA finally completed the revised maps in 2015. On May 4, 2016, FEMA sent a "letter of final determination" to the city, foreclosing any further appeals or revisions to the maps. The city adopted the maps in August 2016.

Local officials, by marshaling additional data on flood risk, undertaking some mitigation measures, and reaching out to the New York congressional delegation, had succeeded in reducing the size of the floodplain on the south side of Syracuse near Onondaga creek by about one-third. This fact was lost on many south side residents,

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[57] Interview with Russell Houck 2017. Officials directly involved in the remapping process characterized it as tense and adversarial, at least at the beginning.

[58] Interview with Martin 2017.

[59] Interview with Martin 2017. City of Syracuse Engineering Department, "Flood Insurance Study/ Map Modernization, City of Syracuse- Summary," July 2016.

however. Rich Puchalski, the Executive Director of the 40-year old community organization Syracuse United Neighbors, claimed that residents were "not involved during the years of back and forth. Maybe they were told at some point," he adds, "but they didn't receive any specific information and were not involved in the discussions."[60] The process "left a lot of people in the dark" and failed to inform the residents about a number of very practical issues, such as where to get flood insurance and how much they should expect to pay for it.[61]

The south side community, largely African-American and low income, protested the new maps in the fall of 2016 and they continue to organize around the issue, demanding that elected officials do something to relieve the additional economic burden of flood insurance premiums. The conversation is not limited to the cost of insurance, however. Syracuse United Neighbors, the city, and residents hav raised the issue of flood hazard mitigation—what can be done to Onondaga Creek to decrease the risk of future floods and the size of the floodplain. This conversation is also contentious, however. First, not everyone is sold on the three major mitigation options outlined by O'Brien and Gere the engineering firm the city hired to study the creek. Second, some residents continue to insist that their homes are not at risk of flooding, implying that FEMA was wrong to include them in the flood zone. "This is the new form of redlining," insisted one activist, referring to the practice of denying services like banking, insurance, and even convenient grocery stores to predominantly poor and minority areas of a town or city. Many residents have worked hard to achieve home ownership and fear that their properties may be worth far less now

[60] Interview with Rich Pulchalski, Executive Director, Syracuse United Neighbors, March 6, 2017.
[61] Interview with Pulchalski 2017.

that they are in a flood zone. “People are going to walk away from these houses,” warned one community member.[62]

The conflict over FEMA flood maps is not over, but as Andrew Martin admitted, there are “not a whole lot of good options if you live in a floodplain. You can do things to adjust the cost of your flood insurance, the community can do things to reduce the flood risk, but these things take time and don’t protect everyone. And sometimes communities don’t have the money to do that—in fact, most do not.”[63] As one resident of the south side put it, “we have to run all around and try to get a grant [for flood mitigation projects] and put in way more energy than privileged communities.”[64] In a recent meeting with representatives from Syracuse’s congressional delegation, many residents appeared unsatisfied with the options presented to them by the congressional delegation. A representative from Senator Gillibrand’s office described three federal programs that support pre and post-disaster community mitigation projects. But the representatives did not explain the overall purpose of the FEMA mapping project and its long-term goals, nor did they mention increased flooding risks due to climate change.[65]

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[62] Comments were made at a Syracuse United Neighbors (SUN) meeting with representatives from Syracuse’s congressional delegation. April 11, 2017.

[63] Interview with Andrew Martin 2017.

[64] Comment made at SUN community meeting 2017.

[65] Importantly, some individuals and organizations are providing a counter-narrative to the question of who or what should be blamed for the increased flood risk on Onondaga Creek. Lawyers for the Onondaga Nation are arguing that the main culprit is so-called “mud boils” in the Tully valley caused by industrial processes that date to the 19th century. Salt was mined from the Tully valley to support the soda ash industry (soda ash is used in the manufacturing of glass). The mining created large caverns, some of which have subsequentl collapsed and changed the hydrology in the valley. According to Joe Heath, lawyer for the Onondaga Nation, the mudboils discharge a “muddy salty mix into Onondaga Creek to a rate of 20 tons of silt a day.” The sediment builds up in the creek, reduces its capacity to move water through, and therefore increases the flood risk in the city of Syracuse. Heath and others are targeting Honeywell Corporation, which is cleaning up Onondaga Lake, claiming that they should fix the problem. See Onondaga Nation, “Onondaga Creek Mudboil Study,” available at http://www.onondaganation.org/land-rights/onondaga-creek-mud-boils/ (accessed April 2 2017).

Conclusion

Flooding is the most common and damaging of all natural disasters in United States, and climate change is exacerbating the problem. Accurate flood maps are critical to communicating flood risk to vulnerable populations, to mitigating and adapting to floods, and to the functioning of the federal flood insurance program. Yet we know little about how the mapping process works in practice. This paper represents an initial attempt to understand the politics of mapping flood zones in the United States. Because mapping takes place within the context of the National Flood Insurance Program, mapping in the U.S. cannot be separated from the costs of flood insurance. The concern over costs tends to dominate and drive discussions at the local level. In some cases, this leads to less than optimal responses by individuals and communities.

At the same time, questions about equity and fairness are likely to become an increasingly important part of the conversation over the National Flood Insurance Program as the risks and costs of floods increase in the United States. Some of the lower income residents of Syracuse, New York, for example, felt that their flood insurance premiums were being used to bail out wealthy coastal homeowners. Such resentments are likely to grow as communities and residents who have not experienced a lot of flooding are forced to buy flood insurance. And it raises the question of who should—and who is able—to pay for the high cost of climate change impacts. How should these costs be distributed across the country and across communities? These are uncomfortable questions that we are not yet asking.[66]

[66] Voters tend to reward politicians for delivering disaster relief but not for investing in disaster preparedness, which does not bode well for climate change adaptation policies. Healy and Malhotra 2009.