



Drawing lines: FEMA and the politics of mapping flood zones

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Abstract

Flooding is the most common and damaging of all natural disasters in USA, 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 article argues that politics can shape the remapping process in ways that leave communities vulnerable. Because mapping takes place within the context of the National Flood Insurance Program, the conversation at the local level often centers on *the costs* of revising the flood hazard zones rather than *the risks* associated with flooding. This can lead to less than optimal responses by individuals and communities, and suggests that the USA is not adequately preparing for future climate change impacts.

When Hurricane Harvey hit the Texas coast late in the summer of 2017, it caused massive flooding in Harris County and the City of Houston. Subsequent analyses of the flooding indicated that nearly three quarters of the damaged homes and apartment buildings were outside the regulated 100-year flood zone and over half were outside the 500-year flood zone (Hunn et al. 2018). Similarly, when Hurricane Sandy hit the east coast of the USA in late October 2012, 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. This story is likely to be repeated across the country as cities, suburban communities, and small towns struggle to cope with increased flooding due to climate change. They will need, at a minimum, accurate flood maps that communicate future flood risk due to climate change. As the Houston and New York cases indicate, however, flood maps may not even accurately communicate current flood risk, let alone provide a guide to the future.

In recent years, the government agency responsible for creating flood maps, the 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 provides a window into how communities

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may respond to climate change risks. Will communities accept the reality of increased flood risk and adapt in ways that increase resiliency? Or will economic, social, and political pressures derail adaptation policies or lead to maladaptation?

Recent news from across the USA suggests that the process of creating and implementing new flood maps has been contentious. In New Orleans, for example, local officials lobbied FEMA for 7 years after the agency initially painted a dire picture of New Orleans, convincing the agency in 2016 that recent infrastructure projects reduced the city's flood risk. As a result, FEMA's revised 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 (Kailath 2016). FEMA defends such decisions as scientifically sound, but politics can shape the remapping process in ways that leave communities vulnerable.

This article 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 USA. I rely on a variety of data sources, including scholarly and technical analyses of the National Flood Insurance Program (NFIP); local and national newspaper coverage; interviews with key individuals involved in flood mapping processes at the national, state, and local level; maps and other documents associated with the remapping project in Syracuse, New York; participant observation at community meetings about the Syracuse remapping project; and participation at the 2018 New York State Floodplain and Stormwater Manager's Association annual meeting.¹

1 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 flooding events (NOAA 2016).² 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 (Knowles and Kunreuther 2014; Thomas and Liechenko 2011). In the USA, 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.³ Flooding will

¹ 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; three FEMA officials who work in FEMA's Washington, D.C., headquarters; a floodplain expert at the New York State Department of Environmental Conservation; an expert on the NFIP who consults with FEMA; a 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. The semi-structured interviews were conducted between February 2017 and January 2018 and lasted an average of 1 h. Some interviewees requested anonymity when discussing sensitive topics.

² The 2014 US National Climate Assessment report attributes the increase in heavy precipitation events in the USA over the last three to five decades to changing weather patterns and storms due to human-caused warming of the atmosphere. The report also warns that floods may intensify in many parts of the USA due to climate change (Melillo 2014).

³ From 1980 to 2009, floods caused more than half a million deaths worldwide and affected more than 2.8 billion people. In the USA, floods caused over 4500 deaths from 1959 to 2005 while property and crop damage cost around 8 billion dollars annually over a 30-year period from 1980 to 2011. See Melillo (2014).

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 (Javeline 2014).

Adaptation to increased flooding due to climate change requires, at a minimum, accurate maps that reflect current and future flood 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 implement only a bare-bones policy of providing flood risk information 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 flood maps. Moreover, updated maps are critical to the effective functioning of flood insurance programs, widely regarded as a key policy tool for climate change adaptation (Thomas and Liechenko 2011). Knowles and Kunreuther (2014) 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.” Indeed, one reason that US municipalities are laggards when it comes to climate adaptation planning, according to Adams-Schroen and Thomas (2015), is because of “out-of-date or inaccurate flood hazard maps.”

A lack of adequate resources and accurate models predicting future climate change risks at the regional and local level are part of the problem. In 2013, the Association of State Floodplain Managers (ASFPM) estimated a price tag of \$4.5 to \$7.5 billion dollars to complete the mapping process, and another \$100 million to almost \$300 million annually to keep the maps up to date. While funding for the program increased in the early 2000s, it has dropped in recent years (ASFPM 2013; Meyer 2013). Another significant problem is the uncertainty inherent in climate change impact predictions. Scientists are developing more accurate models to gauge the impacts of climate change at the local level, but many communities still lack detailed information about climate-induced hazards like flood risks, particularly in non-coastal areas (Martin 2017; Winter et al. 2016; Adams-Schoen and Thomas 2015).

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

2 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 USA. At the time, most 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 (Checker 2017; Strother 2018). Under the NFIP, 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 (FIRMs)) to participating communities, which indicate the location of special flood hazard areas (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, it enters the program and is 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 that subsidized insurance rates would provide adequate incentive for communities to enroll in the program and for individuals to purchase flood insurance. But “take up” rates were initially low. Some communities were hesitant to join the program because they feared that 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 (Knowles and Kunreuther 2014). Participation in the NFIP rose significantly, however, when Congress in 1973 mandated flood insurance for properties with federally backed mortgages and prohibited certain disaster assistance to non-participating flood-prone communities (FEMA 2002). Over 22,000 communities now voluntarily participate in the program and about five and half million homes are insured against floods. Nevertheless, a 2006 study estimated that less than half of all properties that carried a 1% risk of flooding were covered by flood insurance (Thomas and Liechenko 2011; ASFPM 2013).

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. To critics, 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 (see Holladay and Schwartz 2010). 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” (Dennis 2017). Scholars, however, 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 (see Logue and Ben-Shahar 2015; Knowles and Kunreuther 2014).

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 (AFSPM 2013).

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 (2014) point out, “the continuous updating of flood-hazard maps provides the technical underpinning of everything the program strives to do.” 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.

3 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, the former 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? 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 said in an interview with the author. He thinks this case 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.

3.1 Map modernization

With over 22,000 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.⁴ In the early 2000s, it began a map modernization process (dubbed “Map Mod”) to update its decade-old maps. FEMA begins the remapping 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 (Stevens and Hanschka 2014). 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 as Larry Larson explains, is based on the assumption that “what happened yesterday will happen tomorrow” (TMAC 2016).

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, and it is common for communities to suggest map revisions, according to experts familiar with the process. However, it takes resources to lodge official 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 is out of reach for many smaller communities although FEMA may respond to valid community concerns even in the

⁴ Details about the process are available on the FEMA website; they have been left out of this summary for purposes of readability and length.

absence of an official challenge, according to Nechaman and Larson. Community negotiations with FEMA can result in significant changes to the final map, as the previous example of New Orleans illustrates.

Individual property owners can also challenge flood maps by filing Letter of Map Amendments (LOMAs). Property owners may demonstrate that their structure is above the base flood elevation level or that their entire property has been mistakenly mapped into the flood hazard area (FEMA 2002). 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, and their appeals are largely successful; FEMA cites an 89% success rate for the 30,000 flood map amendments sought annually (Leitsinger 2014).

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 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 revealed 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 (Dedman 2014). 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 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 (Logue and Ben-Shahar 2015).⁵ A study by the Institute for Policy Integrity of NFIP insurance claims paints a somewhat more complex picture but concludes that the benefits of the program accrue largely to wealthy households in a few geographical areas (Holladay and Schwartz 2010).

3.2 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

⁵ On “hidden” government policies, see Mettler (2011) and Faricy (2016).

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 development.⁶ One FEMA official, 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 no matter the cost. It happens time and time again and it is unfortunate. At the same time, I understand it.

Bill Nechamen, former floodplain specialist at the NYDEC, 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."

Nechamen, Larson, and other interview subjects were quick to provide counter examples, praising "enlightened," "progressive," and "proactive" communities that used flood information to rethink development patterns and build community resilience. In the interviews, 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." But one FEMA official acknowledged in an interview 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.

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. They also understand why individuals and groups appeal or protest the maps. "I understand the confusion and anger, absolutely," a FEMA official admitted in an interview. "We try not to be cold-hearted bureaucrats. 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." Research suggests that FEMA maps *can* serve as an important communication tool to at-risk populations and encourage more risk-averse behavior (Shao et al. 2017). 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. At a community meeting in Syracuse, New York, about FEMA's revised flood maps, residents who were recently required to buy flood insurance complained argued 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."⁷

⁶ 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.

⁷ Interviews with FEMA officials and others involved in floodplain management confirmed that this is a common refrain that they hear in communities that have not recently experienced flooding events.

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 individuals outside the designated zone with a false sense of security.⁸ And because NFIP maps do not take into account future flood risks due to climate change, these conversations are likely to be even more limited as an effective risk communication tool going forward.

4 “A New Form of Redlining”: FEMA’s maps and community opposition in Syracuse, New York

In an April 2017 meeting on the south side of the City of Syracuse, New York, residents confronted representatives of their US 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 10 years to complete.

In many ways, Syracuse’s remapping project is unusual. It is not just that the process took far longer than typical (from 2006 to 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 confronts the reality of flood risks and the increasing vulnerability of citizens to a changing climate. Syracuse is instructive in part because it does *not* have a recent history of catastrophic floods. The last major flood was in the summer of 1974 when flooding in Onondaga Creek forced the evacuation of more than 1000 city and county residents (Fischer 1972). 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 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 tributary that flows through the heart of the city and some of the city’s poorest communities on its way north to Onondaga Lake. An engineer with the city explained that the outdated maps showed “no risk” to communities on the south side from the channelized creek, 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.⁹

⁸ 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 (2016).

⁹ Several interview subjects thought the increased flows were due in part to the changing climate.

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 one city employee who worked on the flood maps. In 2010, the city hired an engineering firm to gather additional data to ensure the maps were accurate. As the city employee 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 changes to the maps, but did not end the controversy. It was just the “first round,” said one interview subject, hinting at the adversarial nature of the process.¹⁰

The conflict expanded in the summer of 2010 when newly elected Syracuse Mayor Stephanie Minor reached out to Syracuse’s congressional delegation for help. The delegation succeeded in stopping the process from moving forward. According to one FEMA official who worked on the project, “the political scrutiny was so high that we [FEMA] put a stop work order on it.” 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 (City of Syracuse 2016). FEMA and the city “went back and forth” for some time, according to one interview subject, 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, 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.” The process “left a lot of people in the dark” said Puchalski, 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.

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. “This is the new form of redlining,” insisted one activist at a community meeting, referring to the practice of denying services like home mortgages 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 that they are in a flood zone. “People are going to walk away from these houses,” warned one community member, raising the possibility that their neighborhoods will be deserted over time.¹¹ Some residents insist that their homes are not at risk of flooding, implying that FEMA was wrong to include them in the flood zone. These concerns are real and critically important. However, the solution is not to exclude such properties from the flood hazard zone, but to mitigate flood hazard risks, offer grants so low-income homeowners can flood-proof their homes, and fully fund buyout programs so those who would like to move out of the flood zone are able to do so.

¹⁰ Officials directly involved in the remapping process characterized it as tense and adversarial, at least at the beginning.

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

5 Conclusion

Flooding is the most common and damaging of all natural disasters in USA, 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 article represents an initial attempt to understand the politics of mapping flood zones in the USA. Because mapping takes place within the context of the National Flood Insurance Program, mapping in the USA 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.

Many communities will be underprepared to address future flooding risks due to climate change because of the pressures at the local level to minimize the costs of flood insurance. The insurance rate maps themselves are inadequate as an information tool since they do not model future climate risks but are based on current and historical flood data. And, while FEMA is encouraging communities to consider how flood risk may change over time due to weather changes, development, and other factors (FEMA 2017), the maps that model future risks are for informational purposes only. Communities can request them, but FEMA does not use them to set insurance rates or guide development decisions.

Setting aside the question of how to incorporate future climate risks in the flood mapping program, questions about equity and fairness are likely to become an increasingly important part of the conversation over the NFIP as the risks and costs of floods increase in the USA. 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. Do we hold homeowners who live in flood zones liable for risks that they could not necessarily foresee? How should these costs be distributed across the country and across communities? These are uncomfortable questions that we are not yet asking.¹²

References

- Adams-Schroen S, Thomas E (2015) A three-legged stool on two legs: recent Federal law Related to local climate resilience planning and zoning. *Urban Lawyer* 47:525–542
- Association of State Floodplain Managers (2013) Flood mapping for the nation: a cost analysis for the nation's flood map inventory, 1 March
- Checker M (2017) Stop FEMA now: social media, activism, and the sacrificed citizen. *Geoforum* 79:124–133
- Dedman B (2014) 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>
- Dennis B (2017) The country's flood insurance program is sinking. Rescuing it won't be easy. *The Washington Post*, July 16
- Faricy C (2016) *Welfare for the wealthy: parties, spending, and inequality in the United States*. Cambridge University Press, Cambridge

¹² 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. See Healy and Malhotra (2009).

- Federal Emergency Management Agency (2002) National flood insurance program: program description, 2 August
- Federal Emergency Management Agency (2017) Risk Mapping, Assessment and Planning (Risk MAP). Available at <https://www.fema.gov/risk-mapping-assessment-and-planning-risk-map>
- Fischer H (1972) 1,000 flee high waters. *The Post Standard* 145, 4 July
- Healy A, Molhorth N (2009) Myopic voting and natural disaster policy. *Am Polit Sci Rev* 103:387–406
- Holladay S, Schwartz JA (2010) Flooding the market: the distributional consequences of the NFIP. Institute for Policy Integrity, Policy Brief No. 7
- Hunn D, Dempsey M, Zaveri M (2018) Harvey's floods: Most homes damaged by Harvey were outside flood plain, data show. *Houston Chronicle*, March 30. Available at <https://www.houstonchronicle.com/news/article/In-Harvey-s-deluge-most-damaged-homes-were-12794820.php>. Accessed 4 Sept 2018
- Javeline D (2014) The most important topic political scientists are not studying: adapting to climate change. *Perspect Polit* 12:420–434
- Kailath R (2016) New maps label much of New Orleans out of high risk flood area. NPR: All Things Considered, 30 September
- Knowles SG, Kunreuther HC (2014) Troubled waters: the National Flood Insurance Program in historical perspective. *J Policy Hist* 26:327–353
- Leitsinger M (2014) For average Joes, fighting FEMA flood maps isn't easy or cheap. *NBCnews.com*. Available at <https://www.nbcnews.com/news/us-news/average-joes-fighting-fema-flood-maps-isnt-easy-or-cheap-n23871>. Accessed 4 Sept 2018
- Logue K, Ben-Shahar O (2015) The perverse effects of subsidized weather insurance. *Kreisman Working Papers Series in Housing Law and Policy* No. 23
- Martin A (2017) FEMA Region 2 Risk Analysis Branch Chief. Personal interview with author. February 14 2017
- Melillo JM, Richmond TS, Yohe GW eds (2014) Highlights of climate change impacts in the United States: the third national climate assessment. U.S. Global Change Research Program
- Mettler S (2011) *The submerged state: how invisible government policies undermine American democracy*. University of Chicago Press, Chicago
- Meyer T (2013) New FEMA flood maps needed, but funding is slashed. *Scientific American* 27 May
- National Oceanic and Atmospheric Administration (2016) U.S. Resilience Toolkit: Inland Flooding. 6 July
- Shao W, Xian S, Lin N, Kunreuther H, Jackson N, Goidel K (2017) Understanding the effects of past flood events and perceived and estimated flood risks on individuals' voluntary flood insurance purchase behavior. *Water Res* 108:391–400
- Stevens M, Hanschka S (2014) Municipal flood hazard mapping: the case of British Columbia, Canada. *Nat Hazards* 73:907–932
- Strother L (2018) The National Flood Insurance Program: a case study in policy failure, reform, and retrenchment. *Policy Stud J*. <https://doi.org/10.1111/psj.12189>
- Technical Map Advisory Council (2016) TMAC annual report. December
- Thomas A, Liechenko R (2011) Adaptation through insurance: lessons from the NFIP. *Int J Clim Change Strategies Manage* 3:250–263
- Winter JM, Beckage B, Bucini G, Horton RM, Clemins PJ (2016) Development and evaluation of high-resolution climate simulations over the mountainous northeastern United States. *J Hydrometeorol*. <https://doi.org/10.1175/JHM-D-15-0052.1>